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TAXONOMIC STUDY ON CAPPARIDACEAE AND  
CRUCIFERAE OF W. PAKISTAN, AFGHANISTAN,  
AND N. W. HIMALAYA.

BY

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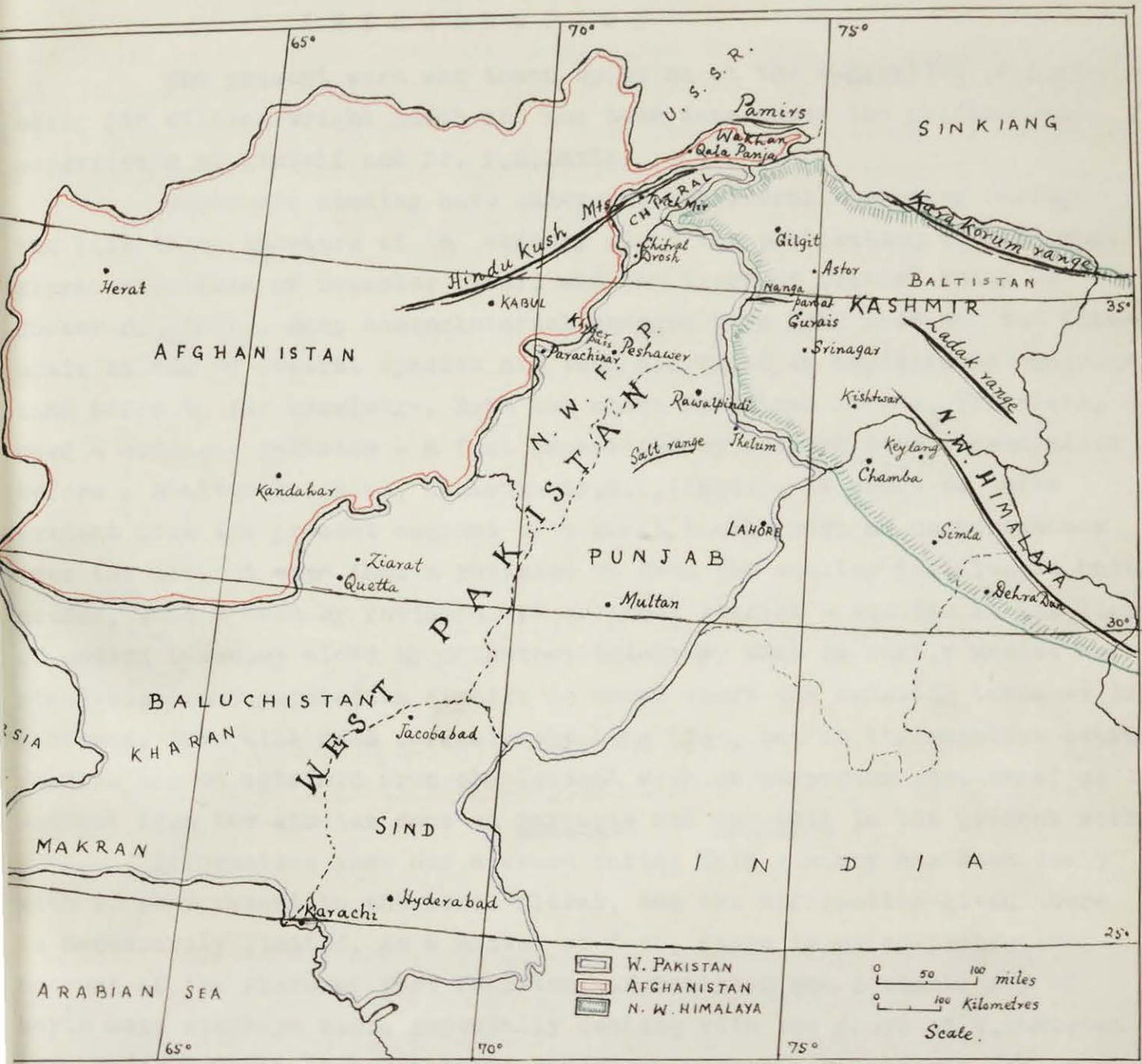
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MAP A.



# WEST PAKISTAN, AFGHANISTAN AND N.W. HIMALAYA

## I N T R O D U C T I O N

The present work was taken up by me at the suggestion of Professor Sir William Wright Smith and has been done under the guidance and supervision of himself and Dr. P.H. Davis.

Taxonomic studies have undergone considerable changes during the last three quarters of a century since the publication of the great Flora Orientalis of Boissier (1867) and the Flora of British India of Hooker f. (1872). Many nomenclatorial changes have been made and the taxonomic status of several species has been clarified in addition to numerous taxa added to our knowledge. Both the above mentioned Floras, therefore, need a complete revision - a fact emphasized by several other taxonomists before [Blatter, E. (1930); Chakravarty, H.L. (1948)]. It would be quite evident from the present account of a small family such as Cappariaceae over the present area that a revision of even the smaller families is badly needed. What I mean by revision are critical studies - studies in the light of modern taxonomy aided by classical taxonomy. What is really needed are statistical and population studies in cases where the existing taxonomy is confused. This will need sufficiently long time, but in the meantime useful results can be obtained from statistical work on herbarium specimens (as is evident from the studies done on Capparis and Ferretia in the present work).

Information that has accrued during this century has been dealt with to some extent in the local floras, but the information given there is necessarily limited. As a matter of fact, there is no comprehensive account of the Flora of West Pakistan, Afghanistan and I should say of North West Himalaya also. Especially dealing with the Flora of W. Pakistan one has to consult at least three different Floras : Boissier's Fl. Or. (1867), Hooker's Fl. Brit. India (1872) and Komarov's Flora U.R.S.S. (1939). None of these Floras is separately sufficient for the Flora of W. Pakistan. The Flora Orientalis includes only Baluchistan and Afghanistan of the present area and only cites specimens of J.E. Stocks and W. Griffith. The Flora of Brit. India is poorly representative of the plants of W. Pakistan and does not include Afghanistan at all. Important parts of W. Pakistan, especially for Cruciferae, such as Baluchistan, Chitral and North West Frontier Province are almost omitted - due to the fact that specimens from the last two areas were not available at that time. The first collection to

be made in Chitral come from Sgt. Major Giles in 1885, about 15 years after the publication of the Fl. Brit. India. Therefore, this Flora serves very little purpose when considering the Cruciferae of W. Pakistan. Chitral and the northern part of Afghanistan, which share quite a good number of Central Asian crucifers, also need the help of some Flora dealing with Central Asian crucifers. In this respect Komarov's Fl. U.R.S.S. viii (1939) was of great help.

The only useful paper dealing with the Cruciferae of the entire present area and India is Hooker f. and Thomson's paper 'Praecursores ad Floram Indicum - Cruciferae' published in Journ. Linn. Soc. Bot. v 128-181 (1861). It records 47 genera and about 160 species; of these, Lepidostemon H.f. et T., Loxostemon H.f. et T. and Eutrema R.Br. do not occur in the present area; Dipterygium Decaisne must be transferred to Capparidaceae; Heldreichia Boiss., Hutchinsia R.Br. and Iberidella Boiss. will have to be eliminated; Alloceratium H.f. et T. is congeneric with Diptychocarpus Trautv. and Raphanus L. and Cheiranthus L. are now known from the cultivated species only. About 35 species will have to be left aside as they do not occur in the present area. Therefore, this paper is only useful for about 40 genera and 125 species, of which about 50% will have to be changed nomenclatorially or taxonomically. This clearly shows that their account is unsatisfactory in the light of the present day knowledge of the Cruciferae of the present area.

Boissier's Flora Orientalis (1867) records about 37 genera and 80 species for Afghanistan and Baluchistan; of these about 34 genera and 70 species are from Afghanistan and only 23 genera and about 43 species from Baluchistan. Similarly here also 50% will have to be changed. To this list about a dozen more species were added to Afghanistan in <sup>the</sup> Supplement <sup>to</sup> Flora Orientalis (1868) from Aitchison's Afghanistan collection.

The Flora of British India (1872) also records only about 40 genera and 120 species for the present area and again about 50% will have to be changed.

I myself find that there are 94 genera and 267 species (including 6 genera and 13 species known from cultivation only) in the present area. These are distributed as follows in the three different parts of the entire area (those in brackets are known from cultivation only):

<u>Area</u>	<u>No. of Genera</u>	<u>No. of species.</u>
<u>Present area</u>	88 + (6)	254 + (13).
1. W. Pakistan	67 + (4)	147 + (9).
2. Afghanistan	59 + (3)	136 + (8).
3. N.W. Himalaya	50 + (6)	140 + (11).

This clearly shows that the number of crucifers, as compared to those given in the above two Floras, or in Hooker f. and Thomson's paper, <sup>have</sup> been more than doubled. Even this is a minimum estimate. More genera and species will come to light, especially from Afghanistan and W. Pakistan, whose Flora is comparatively little known. Chitral (W. Pakistan) shares a lot of Central Asian crucifers - as is revealed by the discovery of genera such as Buchingera, Sophiopsis, Hymenophysa and Didymophysa etc. from this area. It will show the presence of more C. Asian species as the crucifers of this part becomes more familiar to the taxonomists. Similarly Afghanistan and N.W.F.P. of W. Pakistan are bound to come out with more Central and W. Asian, as well as Himalayan species with the increased knowledge of their Flora - as is shown by the presence of genera such as Smelowskia, Sameraria, Stroganovia, Boreava, Winklera, Fibigia, Graellsia and many others.

The present account of Cruciferae is primarily based on the treatment given by O.E. Schulz in Pflanzenfam. (17 b) 1936. Komarov's FL. U.R.S.S. viii (1939) has been of great help in making decisions in certain cases. But these being in German and Russian respectively are of little use for local purposes. Therefore, the present account of Cruciferae will be of some use to our part of the world.

Schulz's monographs, published in Engler's Das Pflanzenreich, include only the following two tribes and part of a third out of the 10 tribes of the Cruciferae in the present area.

1. Cruciferae - Brassicae (70) I-290 (1919) and (84) I-100 (1923).
2. Cruciferae + Sisymbrieae (86) I-388 (1924).
3. Cruciferae - Draba et Erophila (89) I-396 (1927).

Unfortunately Schulz saw only a limited number of specimens from the present area, and therefore, although a fine work, is of little use so far the crucifers of the present area are concerned. His account of the

Cruciferae in Pflanzenfam. (1936) is the only comprehensive account which has to some extent systematized this remarkable family of the flowering plants. The system given in Bentham and Hooker's Genera Plantarum (1862) for the Cruciferae is of little use when compared with that given by Schulz in Pflanzenfam. (1936) in <sup>the</sup> light of present day knowledge. Schulz's classification has its own draw-backs, but at present it is the most widely accepted one. The Cruciferae still await a really natural classification.

Schulz also published several papers concerning the crucifers of the present area. These papers were mostly published in the following three journals during 1927 - 1935 (for details see the list of references).

1. Fedde, Rep.
2. Engler's Bot. Jahrb.
3. Notizblatt.

Schulz [ Notizblatt ix 1057-1095 (1927)] in his paper, 'Beitrage zur Kenntnis der Cruciferen des nordwestlichen Himalaya-Gebirges' describes one new genus, Phaeonychium with one species and 20 other new species of various other genera. Of these the following are conspecific with other previously described species:

1. Aphragmus himalaicus Schulz = Aphragmus obscurus (Dunn) Schulz.
2. Arabis alticola Schulz = Arabis amplexicaulis Edgeworth.
3. A. clarkei Schulz = A. tenuirostris Schulz.
4. A. quinqueloba Schulz = A. tibetica H.f. et T.
5. A. scaposa Schulz = A. saxicola Edgeworth.
6. Cardamine inayatii Schulz = Cardamine flexuosa With.
7. C. loxostemonoides Schulz = C. pratensis L.
8. Christolea incisa Schulz = Christolea crassifolia Cambess.
9. Erysimum cachemiricum Schulz = Erysimum pachycarpum H.f. et T.
10. E. parkerii Schulz = E. melicentae Dunn.
11. Malcolmia toppinii Schulz = Malcolmia cabulica (Boiss.) H.f. et T.

A few other small papers were published on N.W. Himalayan crucifer in addition to the above one.

J.E.T. Aitchison published his accounts in the following papers on the Afghanistan Flora:

1. 'Flora of the Kurrum valley and Afghanistan' in Journ. Linn. Soc. Bot.

xviii 33-35 and xix 152-153 (1881).

2. 'Botany of the Afghanistan Delimitation Commission' in Trans. Linn. Soc. iii 32-38 (1888).

Examination of his material reveals that he made a hurried study of the crucifers and the result was an unsatisfactory account. Several specimens were misidentified and many were left without naming. Some of the wrongly named ones are:

1. "Sisymbrium himalaicum" Aitchison no. 519 is Cryptospora falcata Kar. et Kir. (Plate no. LV).
2. "Isatis Boissieriana" Aitchison no. 227 is Tauscheria lasiocarpa F. et M. (Plate no. XXI).
3. "Malcolmia Bungei" Aitchison no. 177 is Torularia adpressa (Trautv.) Schulz (Sisymbrium adpressum Trautv.). (Plate no. LXIV).

The best example of an unnamed one - although with distinct fruit characters - is that of Isatis emarginata Kar. et Kir. - Aitchison no. 1013 (Plate no. XI).

Thus, the account of Cruciferae from Afghanistan given by Aitchison is very unsatisfactory and, being merely a list, very misleading.

Very few other papers were published during the last fifty years on the Flora of Afghanistan and they added very few crucifers to our knowledge from that part. Recently Rechinger f. published several "new" crucifers from Afghanistan in his paper, 'Cruciferae iranicae novae vel minus coagnitae' [Phyton iii 44-68 (1951)]. The taxa described are mostly based on the Walter Koelz collection from Afghanistan made during 1937. This paper is another misleading one. The type specimens of his new taxa were borrowed from Vienna through the Kew Herbarium. Those specimens which he did not send, saying that he was still working on them, were borrowed from the National Museum of the United States (where the duplicates are kept) through the Edinburgh Herbarium. Most of his new taxa are cases of misidentification, or are described as new apparently not realizing that they were already known. Of the 2 new genera and about 15 new species described all but two species were already known, and therefore his new taxa must be cited as synonyms as follows.

Rechinger's new taxa.

As treated here

- I. Brassica iranica Rechinger f. = Brassica deflexa Boiss.

2. Isatis koelzii Rech. f. = Isatis tinctoria L.
3. Pachypterygium leptoloma Rech. f. = Isatis harsukhii Schulz.
4. P. macranthum Rech. f. = Isatis stocksii Boiss. (Plate no. X).
5. Chrysanthemopsis Rech. f. = Smelowskia C.A.M. (Plate no. LXIX).
6. C. koelzii Rech. f. = S. calycina (Steph.) C.A.M. (Plate no. LXIX).
7. Fibigia membranacea Rech. f. = Fibigia pendula Boiss. (Plate no. XXV).
8. Alyssum nomismocarpum Rech. f. = Alyssum homalocarpum (F. & M.) Boiss.  
(Plate no. XXVII).
9. Koelzia Rech. f. = Christolea Cambess. (Plate no. XXXIX).
10. K. afghanica Rech. f. = C. crassifolia Cambess. (Plate no. XXXIX).
11. Tetracme appressa Rech. f. = Tetracme pamirica Vass. (Plate no. XLIII).
12. Cithareloma gedrosiacum Rech. f. = Eremobium aegyptiacum Boiss.  
(Plate no. LI).
13. Malcolmia koelzii Rech. f. = Malcolmia cabulica (Boiss.) H. f. et T.  
(Plate no. L).

A few papers have been published on the Flora of Baluchistan; especial mention may be made of Lace and Hemsley (1891), Maynard and Prain (1896), and Blatter and Halburg (1919). These papers added very little to our knowledge <sup>of</sup> the Capparidaceae and Cruciferae.

The flora of Chitral is still little known, especially the crucifers. Mention may be made here of the recent paper published by Wendelbo, 'Plants from Tirich Mir - a contribution to the Flora of Hindukush' [Nytt Mag. Bot. i (1952)]. He records only 11 genera and about 15 species of Cruciferae and none for Capparidaceae. From Chitral I find:

- (i) 3 genera and 5 species of Capparidaceae
- and (ii) 34 genera and 60 species of Cruciferae. (see Table B.)

Although I have followed Schulz (1936) for the account of the Cruciferae, I have recognized Rorippa Scop. as a distinct genus from Masturtium R.Br., and have reduced genera recognized by Schulz as follows:

1. Hutchinsiella Schulz = Hymenolobus Nutt.
2. Ermania Cham. = Christolea Cambess.
3. Cardaria Desv. = Lepidium L.

In doing so I have had to make 9 new combinations of species as follows (for details see under the various genera and species concerned):



1. Hymenolobus perpusillus (Hemsl.) Jafri, comb. nov.  
(syn: Hutchinsia perpusilla Hemsl.)
2. Christolea lanuginosa (H.f. et T.) Jafri, comb. nov.  
(syn: Parrya lanuginosa H.f. et T.)
3. C. albiflora (T. And.) Jafri, comb. nov. (syn: Cheiranthus albiflorus T.A.)
4. C. parkerii (Schulz) Jafri, comb. nov. (syn: Ermania parkerii Schulz)
5. C. villosa (Maxim.) Jafri, comb. nov. (syn: Parrya villosa Maxim.) - it  
does not occur in the present area.
6. C. prolifera (Maxim.) Jafri, comb. nov. (syn: Parrya prolifera Maxim.) it  
does not occur in the present area.
7. C. stewartii (T. And.) Jafri, comb. nov. (syn: Cheiranthus stewartii T.A.)
8. C. himalayensis (Cambess.) Jafri, comb. nov. (syn: Ch. himalayensis Cambess.)

In reducing Ermania Cham. to Christolea Cambess. I had also to reduce Melanidion Green (1912) and Arcroschizocarpus Gomb. (1940) to Christolea Cambess., making one more new combination, Christolea borealis (Gr.) Jafri (syn: Melanidion boreale Green) - a species endemic to Alaska. For these reasons a separate paper was written on Christolea Cambess. and is in the press.

For reasons discussed under the various genera concerned the following new combinations are also made in addition to the above mentioned ones:

1. Thlaspi septigerum (Bunge) Jafri, comb. nov. (syn: Eutrema septigerum Bunge)
2. Farsetia incana (Burm.) Jafri, comb. nov. (syn: Heliophila incana Burm.)
3. Aphragmus oxycarpus (H.f. et T.) Jafri, comb. nov. (syn: Braya oxycarpa H.f. et T.)
4. Arabis saxicola Edgew. var. elatior (Schulz) Jafri, comb. nov.  
(syn: Arabis scaposa Schulz var. elatior Schulz)
5. Draba tibetica H.f. et T. var. chitralensis (Schulz) Jafri, comb. nov.  
(syn: D. sikkimensis Pohle var. chitralensis Schulz.)

The following is the list of new combination and changes of taxonomic status which have been made:

1. Moriera spinosa Boiss., subsp. cabulica (Boiss.) Jafri, comb. et stat. nov.  
(syn: M. cabulica Boiss.)
2. Thlaspi cochleariforme DC., subsp. griffithianum (Boiss.) Jafri, comb. et stat. nov. (syn: Carpoceras griffithiana Boiss.)
3. Farsetia incana (Burm.) Jafri, subsp. edgeworthii (H.f. et T.) Jafri, comb. et

stat. nov. (syn: Parsetia edgeworthii H.f. et T.).

4. Draba olgae Regel et Schm., subsp. chitralensis (Schulz) Jafri, stat nov.  
(syn: D. olgae var. chitralensis Schulz )
5. Erysimum pachycarpum H.f. et T., subsp. cachemiricum (Schulz) Jafri, comb.  
et stat nov. (syn: E. cachemiricum Schulz).
6. Torularia humilis (C.A.M.) Schulz, var. piasezkii (Maxim.) Jafri, comb. et  
stat nov. ( Arabis piasezkii Maxim.).

I have been able to add two new species in Capparidaceae and twelve new species, two new subspecies and one new variety in Cruciferae. The following is the list of new taxa added :

A. Capparidaceae

- I. Capparis himalayensis . 2. Cleome makranensis.

B. Cruciferae.

- I. Draba ludlowiana 2. Draba aubrietoides. 3. Arabis brevicaulis.
4. Arabis griffithiana. 5. Christolea scaposa. 6. Parrya chitralensis.
7. Atelantha pentandra 8. Sisymbrium pakistanicum . 9. Microsisymbrium bracteosum. 10. Microsisymbrium angustifolium . 11. Arabidopsis stewartiana. 12. Arabidopsis russelliana.

- I. Parrya stenocarpa Kar. et Kir., subsp. gilgitica Jafri, subsp. nov.
2. Microsisymbrium axillare (H.f. et T.) Schulz, subsp. Brevipedicellatum  
Jafri, subsp. nov.

- I. Erysimum melicentae Dunn, var. falconerianum Jafri, var. nov.

The position of the following two forgotten species which are not mentioned even as synonyms in Fl. Brit. India or Fl. Or. is clarified:

- I. Cleome rupicola Vicary (1848) is conspecific with C. stocksiana Boiss. (1853), but being earlier is the valid specific name. In both the above mentioned Floras C. stocksiana Boiss. is recognized, but now becomes an invalid name. The paper of Vicary [Ann. Nat. Hist. ser. II i 425 (1848)] in which C. rupicola is described was perhaps overlooked by Boissier and by Hooker f.
2. Arabis saxicola Edgeworth (1851) is conspecific with A. scaposa Schulz (1927), but being earlier is the valid name.

These above mentioned changes are some of the important ones in addition to several others which are discussed separately under the various

genera concerned. The present account of the Cruciferae stands quite different from the account given in the Flora of Brit. India and Flora Orientalis.

Adequate descriptions of the two genera, Christolea Cambess. and Atelanthera H.f. et T. are given for the first time.

In Capparidaceae, one genus, Buhsea, and 6 species of other genera are added to the present area (of these two are new to science) in addition to Dipterygium Decne. which was included under Cruciferae in Fl. Brit. India. Cleome griffithiana Rech. f. and C. heratensis Bunge et Bien., which were previously known from Afghanistan only, are recorded from W. Pakistan. C. ornithopodioides L. is recorded for W. Pakistan and N.W. Himalayas. C. burmanni W. & A. and C. hotsonii Blatt. & Hall. have been excluded from the present area.

In Cruciferae, the change is enormous - the number of genera and species for the present area has been more than doubled as compared with the Fl. Orientalis (1867) and Fl. Brit. India (1872). I have been able to add 45 genera to the present area (see Table A). Of these 45 genera, species of the following 23 were previously known under different genera either in one or both the above mentioned Floras:

1. Sinapis L., 2. Douepia Cambess., 3. Coronopus Zinn., 4. Winklera Regel, 5. Hedinia Ost., 6. Hymenolobus Nutt., 7. Ptilotrichum C.A.M., 8. Pegaeophyton Hayek et H.M., 9. Phaeonychium Schulz, 10. Christolea Cambess., 11. Drabopsis C. Koch, 12. Turritis L., 13. Rorippa Scop., 14. Dontostemon Andrz., 15. Pycnoplithus Schulz, 16. Alliaria Scop., 17. Microsisymbrium Schulz, 18. Arcyosperma Schulz, 19. Aphragmus Andrz., 20. Torularia (Coss.) Schulz, 21. Arabidopsis Heynh., 22. Descurainia W. et B., 23. Robeschia Hochst.

The following 20 genera (excluding the two genera, Lunaria L. and Hesperis L. recorded from cultivation only) were not known from the present area in the above two Floras. Those marked with an asterisk are added for the first time to the present area.

1. Erucaria Gaert., 2. Savignya DC., 3. Sameraia Desv., 4. Didymophysa Boiss., 5. Dilophia Thomson, 6. Stroganowia Kar. et Kir., 7. Spirorrhynchus Kar. et Kir., 8. \*Boreava Jaub. et Spach, 9. \*Hymenophysa C.A.M., 10. Fibigia Medik., 11. \*Buchingera Boiss. et Hoh., 12. Graellsia Boiss., 13. Eremobium Boiss., 14. \*Cryptospora Kar. et Kir., 15. Anchonium DC., 16. Streptoloma DC., 17. Cymatocarpus Schulz, 18. Camelina Crantz,

\*19. Sophiopsis Schulz, 20. Smelowskia C.A.M.

The following two genera are recorded for the first time from cultivation: 1. Lunaria L., 2. Hesperis L.

Table B shows all the species. In Cruciferae about 120 species (including the 12 new species) have been added to the present area in addition to about 40 species which were previously known under different genera.

For this revision several thousands of herbarium sheets were examined at the Royal Botanic Garden Edinburgh, Kew Herbarium, and British Museum. Most of the Linnaean types were examined at the Linnaean Society. Specimens were also borrowed from Vienna, U.S.A. and Pakistan.

During these studies I have come across more than 50 good collections from different collectors. This is simply mentioned here to compare with the accounts given in the Fl. Orientalis and Fl. Brit. India which are based on very few collections. Due to taxonomic difficulties, however, especially in Cruciferae, most of these collections were never thoroughly studied. Large numbers of specimens were, therefore, either wrongly named or unidentified. Some of the collections of Crucifers such as that of Ludlow and Sherriff, 1940 (BM!) and R.S. Russell, 1939 (BM!) etc. have been entirely named by me.

The description of genera and species given here are on the same lines as those given by Schulz in his monographs previously mentioned. As many characters as possible are given. These comprehensive descriptions are of great help, especially in Cruciferae, for making 'Keys' of genera and species. Schulz has used as many characters as possible in his keys, and the same is done in the present work.

The description and key for the ten tribes of Cruciferae are mostly according to Schulz [Pflanzenfam. (17 b) 1936]. Keys to the genera and species are mostly my own. Every possible effort has been made to make the keys practical. A key to the subtribes and sections is also given. As the important distinguishing characters are given in the key, no descriptions are included, but full reference is made to descriptions already given. The key characters in the generic and specific descriptions are underlined with other important characters, if any. This practice makes it easier to distinguish genera and species at a glance instead of going through the long descriptions. Generic descriptions are mostly taken from Pflanzenfam. (1936), except

## II

in a few cases such as Christolea Cambess. and Atelanthera H.f. et T. A complete key to all the genera of each tribe is given, and a separate key for the ten tribes is given at the beginning.

The synonyms given here are only the important ones, but every effort has been made to give all the synonyms which are concerned with the present area.

In giving references effort has been made to minimize space. Therefore abbreviations are used. References are arranged in chronological order. In each case the first reference is given in full. The position of genera is clarified by referring <sup>to</sup> Bentham and Hooker [Genera Plantarum. i (1862)], Engler and Prantl [Pflanzenfam. 17 b. (1936)], Komarov [Fl. U.R.S.S. viii (1939)], Boissier [Fl. Gr. i (1867)] and Hooker f. [Fl. Brit. India i (1872)].

Stress has been laid on type specimens in dealing with the plants of the present area. These are quoted below the synonyms, before the descriptions, in all cases in which they can be precisely designated. In doing so I have followed the same practice as done by Burtt and Lewis [Kew Bull. 277 (1949)]. Every effort has been made to examine carefully all the type specimens available in British herbaria. Most of the Linnaean types are not precisely designated, although most of the specimens from which Linnaeus' descriptions were made have been seen at the Linnaean Society. They are simply given here as 'seen at the Linnaean Society' without giving the name of collectors etc. Experts are unable to come to <sup>many</sup> satisfactory conclusion about the selection of Linnaean types. So far as the rest of the types are concerned, especially those from India or the present area, the specimens are fully quoted. Most of the duplicates of Boissier's type specimens are present at Kew- they were also carefully studied and are quoted here.

After giving the full description of a species, the specimens from the present area are cited in detail. In all cases altitudes and measurements have been given according to the metric system.

The present area has been divided into three parts as follows.  
(Map A):

I. West Pakistan: which is further divided into the following five provinces or states:

I. Chitral, 2. North-West Frontier Province,

3. Punjab, 4. Sind and Karachi, 5. Baluchistan.

II. Afghanistan.

III. N.W. Himalayas: No definite boundary is assigned for this part. It includes Karakorum, Kashmir, West Tibet, and Punjab Himalaya to Kumaon.

Under the geographical distribution of species it was impossible to cite all the specimens due to the enormous number of specimens from other regions of the world. Therefore, just regions are given in cases where the distribution is well known (the same can be seen on the table B- where the distribution is given in regions north and west, and south and east of the present area). In cases where the geographical distribution was not fully known but the specimens were many, only one or two specimens are quoted for each region. In cases where the distribution was not clear or the status of a species was changed taxonomically, all the specimens are cited. Specimens from the present area are cited in full with any useful information given by the collectors. The geographical zones and regions followed here are the same as followed by Ch<sup>a</sup>kravarty (1948).

In separating infra specific units more stress is given on geographical isolation. Schulz has described and recognized innumerable infra specific units in Cruciferae of the present area, which in several cases are valueless due to the presence of intermediate forms revealing that they are the part of natural inherited variability and are not constant.

Every effort has been made to give photographs and figures in cases where the taxonomy was confusing. In this respect figures given for the species of Draba L. (fig. no. 17), Erysimum L. (fig. no. 24), Thlaspi L. (fig. no. II), Braya and Aphragmus (fig. no. 25) etc. will prove to be useful.

Discussions are given with almost every genus where some changes in taxonomy has occurred, but especial mention may be made of the following: Capparis L., Cadaba Forsk., Maerua Forsk., Cleome L., Brassica L., Fortuynia Shuttl., Isatis L., Thlaspi L., Spirorrhynchus Kar. et Kir., Farsetia Turra, Draba L., Cardamine L., Arabis L., Christolea Cambess., Malcolmia R.Br., Atelantha H.f. et T., Erysimum L., Sisymbrium L., Arabidopsis Heynh., and Smelowskia C.A.M.

Separate tables are given to show:

- (i). the world geographical distribution of the species of the genera of both the families of the present area (Table A).
- (ii). the geographical distribution of the species of both the families of the present area. (Table B).

Tables A and B also show the distribution of genera and species separately in W. Pakistan, Afghanistan, and N.W. Himalaya. Also in Table B the distribution of species in the five provinces and states of W. Pakistan is shown in separate columns.

Analysis of the genera and species of the present area:

The following is an analysis of the genera and species of the two families within the present area. Tables A and B should be consulted:

I. CAPPARIDACEAE.

Capparidaceae is represented by 8 genera and 23 species in the present area. They are distributed in the three parts as follows:

<u>Area</u>	<u>No. of genera</u>	<u>No. of species</u>
1. <u>W. Pakistan</u>	7	21
2. <u>Afghanistan</u>	4	9
3. <u>N.W. Himalayas</u>	5	9

None of the genera is endemic to the present area. Five species and one variety are endemic as follows:

(i) Species endemic to W. Pakistan:

I. Cadaba heterotricha Stocks (Endemic to Sind).

(ii) Species endemic to W. Pakistan and Afghanistan:

I. Cleome griffithiana Rech, f.

2. C. rupicola Vicary

3. C. heratensis Bunge et Bien.

(iii) Species endemic to N.W. Himalayas:

I. Capparis himalayensis Jafri

(iv) One variety is endemic to Afghanistan:

I. Cleome quinquinervis DC. var. mollis Boiss.

Table A shows the number of species in each genus present in the 3 parts of the present area, and Table B shows the distribution of species in the 3 parts, as well as in the 5 provinces and states of W.

Pakistan. It is clear from the tables that W. Pakistan has the maximum number of genera and species of Capparidaceae in the present area. The distribution of genera and species of this family in the 5 provinces and states of W. Pakistan is as follows:

<u>W. Pakistan</u>	<u>No. of genera</u>	<u>No. of species</u>
1. Chitral	3	5
2. N.W.F.P.	5	9
3. Punjab	7	13
4. Sind and Karachi	5	14
5. Baluchistan	3	9

It is interesting to note that although Baluchistan is in the south and adjacent to Sind, it has much similarity with Chitral- a state in/ <sup>the</sup> extreme north of W. Pakistan. Sind and Karachi have the maximum number of species (14), whilst Punjab has the maximum number of genera (7). The following analysis will reveal that conditions are just the reverse when we see the distribution of Cruciferae, i.e. Sind and Karachi have/ <sup>the</sup> minimum number of genera and species whilst Baluchistan has the maximum number. This distribution reflects the subtropical or tropical nature of the Capparidaceae, in contrast to the temperate nature of the Cruciferae.

The largest genera of Capparidaceae in the present area are Gleome L. and Capparis L. with 9 and 7 species respectively. Cadaba Forsk. and Maerua Forsk. are represented by only 2 species each, while the remaining four genera have only one species each. Of these Dipterygium Decne. and Buhsea Bunge are monotypic genera. Buhsea is recorded from Afghanistan while Dipterygium and Cadaba occur in ~~the~~ W. Pakistan only in the present area.

## II. CRUCIFERAE.

Of the 94 genera of the present area the following 6 are known from cultivation only, with one species each:

1. Raphanus L., 2. Iberis L., 3. Lunaria L., 4. Lobularia Desv. ,
5. Hesperis L., 6. Cheiranthus L.

The following two genera are known from cultivated as well as indigenous species. The following species of these are known from cultivation only in the present area:



- I. Brassica L. .... I. Brassica oleracea L., 2. B. napus L.,  
3. B. rapa L., 4. B. juncea(L.) Czern. et  
Coss., 5. B. nigra(L.) Koch.
2. Matthiola R.Br. .... I. M. incana(L.) R.Br., 2. M. tristis(L.) R.Br.

The distribution of the genera and species in the three parts of the present area is as follows (those in brackets are known from cultivation only):

<u>Area</u>	<u>No. of genera</u>	<u>No. of species</u>
<u>Present area</u>	88+(6)	254+(13).
I. <u>W. Pakistan</u>	67+(4)	147+(9).
2. <u>Afghanistan</u>	59+(3)	136+(8).
3. <u>N.W. Himalayas</u>	50+(6)	140+(11).

The following table lists the genera, out of the 88 in the total area which have not yet been recorded from the particular area under which each is tabulated:

<u>W. Pakistan</u>	<u>Afghanistan</u>	<u>N.W. Himalayas.</u>
1. <u>Savignya</u>	1. <u>Brucaria</u>	1. <u>Diploaxis</u>
2. <u>Sameraria</u>	2. <u>Moricandia</u>	2. <u>Brucaria</u>
3. <u>Megacarpaea</u>	3. <u>Douepia</u>	3. <u>Physorrhynchus</u>
4. <u>Moriera</u>	4. <u>Coronopus</u>	4. <u>Fortuynia</u>
5. <u>Hedinia</u>	5. <u>Didymophysa</u>	5. <u>Savignya</u>
6. <u>Hymenolobus</u>	6. <u>Megacarpaea</u>	6. <u>Moricandia</u>
7. <u>Stroganowia</u>	7. <u>Hedinia</u>	7. <u>Douepia</u>
8. <u>Fibigia</u>	8. <u>Dilophia</u>	8. <u>Pachypterygium</u>
9. <u>Ptilotrichum</u>	9. <u>Cochlearia</u>	9. <u>Sameraria</u>
10. <u>Pegaeophyton</u>	10. <u>Spirorrhynchus</u>	10. <u>Didymophysa</u>
11. <u>Phaeonychium</u>	11. <u>Boreava</u>	11. <u>Moriera</u>
12. <u>Dontostemon</u>	12. <u>Hymenophysa</u>	12. <u>Aethionema</u>
13. <u>Pyramidium</u>	13. <u>Ptilotrichum</u>	13. <u>Stroganowia</u>
14. <u>Atelanthera</u>	14. <u>Buchingera</u>	14. <u>Octoceras</u>
15. <u>Cryptospora</u>	15. <u>Pegaeophyton</u>	15. <u>Spirorrhynchus</u>
16. <u>Pycnoplithus</u>	16. <u>Phaeonychium</u>	16. <u>Boreava</u>
17. <u>Streptoloma</u>	17. <u>Turritis</u>	17. <u>Parsetia</u>
18. <u>Braya</u>	18. <u>Dontostemon</u>	18. <u>Fibigia</u>

<u>W. Pakistan</u>	<u>Afghanistan</u>	<u>N.W. Himalayas</u>
19. <u>Cymatocarpus</u>	19. <u>Cithareloma</u>	19. <u>Buchingera</u>
20. <u>Camelina</u>	20. <u>Eremobium</u>	20. <u>Clypeola</u>
21. <u>Smelowskia</u>	21. <u>Atelanthera</u>	21. <u>Graellsia</u>
	22. <u>Anchonium</u>	22. <u>Turritis</u>
	23. <u>Goldbachia</u>	23. <u>Pyramidium</u>
	24. <u>Pycnoplithus</u>	24. <u>Diptychocarpus</u>
	25. <u>Arcyosperma</u>	25. <u>Cithareloma</u>
	26. <u>Aphragmus</u>	26. <u>Leptaleum</u>
	27. <u>Braya</u>	27. <u>Eremobium</u>
	28. <u>Sophiopsis</u>	28. <u>Cryptospora</u>
	29. <u>Robeschia</u>	29. <u>Anchonium</u>
		30. <u>Goldbachia</u>
		31. <u>Streptoloma</u>
		32. <u>Cymatocarpus</u>
		33. <u>Camelina</u>
		34. <u>Sophiopsis</u>
		35. <u>Smelowskia</u>
		36. <u>Robeschia</u>

From the above list and the table A it is quite clear that from the present area:

(i) 13 genera are recorded from W. Pakistan only:

Erucaria, Moricandia, Douepia, Spirarrhynchus, Boreava, Didymophysa, Buchingera, Turritis, Cithareloma, Eremobium, Goldbachia, Sophiopsis and Robeschia.

(ii) 11 genera are recorded from Afghanistan only:

Savignya, Sameraria, Moriera, Stroganowia, Fibigia, Pyramidium, Cryptospora, Streptoloma, Cymatocarpus, Camelina and Smelowskia.

(iii) 9 genera are recorded from N.W. Himalayas only:

Megacarpaea, Hedinia, Ptilotrichum, Pegaeophyton, Phaeonychium, Dontostemon, Atelanthera, Pycnoplithus and Braya.

(iv) 11 genera are recorded from W. Pakistan and Afghanistan only:

Diploaxis, Physorrhynchus, Fortuynia, Pachypterygium, Aethionema, Octoceras, Farsetia, Clypeola, Graellsia, Diptychocarpus and Leptaleum.

(v) 6 genera are recorded from W.Pakistan and N.W.Himalayas only:

Coronopus, Dilophia, Cochlearia, Hymenophysa, Arcyosperma and Aphragmus.

(vi) One genus, Hymenolobus, is recorded from Afghanistan and N.W.Himalayas only.

From the above analysis it is quite clear that W.Pakistan forms a junction for the Himalayan, and Central and West Asian crucifers, and naturally the number of crucifers is higher in here. Only 21 genera out of 88 do not occur in W.Pakistan, while in Afghanistan 29 genera and in N.W.Himalayas 36 genera are absent. There is every possibility of further genera being recorded from W.Pakistan as well as from other parts, as the crucifers of this part of the world become more familiar.

There are very few endemic genera of crucifers in the present area. Only one genus, Douepia Cambess., is endemic to W.Pakistan, and one, Pyramidium Boiss., to Afghanistan.

Of the 254 species over the present area, 62 are endemic, i.e. about 25%. The following is the list of the 40 species endemic to one of the 3 parts of the present area:

(i) Species endemic to W.Pakistan:

1. Douepia tortuosa Cambess., 2. Draba trinervis Schulz, 3
3. Graellsia chitralensis Schulz, 4. Tetracme stocksii Boiss.
5. Parrya chitralensis Jafri, 6. Leptaleum hamatum Lace et Hemsl.,
7. Erysimum erosum Schulz, 8. Microsisymbrium angustifolium Jafri,
9. Arabidopsis campestris Schulz.

(ii) Species endemic to Afghanistan:

1. Alyssum afghanicum Rech. f., 2. Arabis griffithiana Jafri.
3. Tetracme secunda Boiss., 4. Pyramidium griffithianum Boiss.
5. Parrya minjanensis Rech. f., 6. Erysimum hookeri Boiss.

(iii) Species endemic to N.W.Himalayas:

- I. Megacarpaea polyandra Benth., 2. M. bifida Benth.,
3. Cochlearia conwayi Hemsl., 4. C. minutissima Schulz,
5. Draba setosa Royle, 6. D. radicans Royle, 7. D. amoena Schulz,
8. D. ludlowiana Jafri, 9. D. winterbottomi (H.f. et T.) Pohle,
10. D. tenerrima Schulz, 11. D. subrietioides Jafri,

12. Arabis brevicaulis Jafri, 13. A. tenuirostris Schulz,  
 14. Christolea albiflora(T.And.)Jafri, 15. C. parkeri(Schulz)Jafri,  
 16. C. scaposa Jafri, 17. C. stewartii(T.And.)Jafri,  
 18. Atelantha pentandra Jafri, 19. Erysimum thomsonii H.f.,  
 20. Microsisymbrium duthiei Schulz, 21. M. flaccidum Schulz,  
 22. M. bracteosum Jafri, 23. Braya thomsonii H.f., 24. Arabidopsis  
stewartiana Jafri, 25. A. russelliana jafri.

The following is the list of the 22 species endemic to two or more of the three parts of the present area[P= W.Pakistan; A = Afghanistan; H = N.W.Himalayas]:

- |   |           |
|---|-----------|
| 1. <u>Diploaxis griffithii</u> (H.f.et T.)Boiss. ....                                       | P + A     |
| 2. <u>Physorrhynchus brahuicus</u> H.f. ....  | P + A     |
| 3. <u>Isatis stocksii</u> Boiss. ....   | P + A     |
| 4. <u>Thlaspi cardiocarpum</u> H.f.et T. ....   | P + A + H |
| 5. <u>Hymenlobus perpusillus</u> (Hemsl.)Jafri ....   | A + H     |
| 6. <u>Farsetia incana</u> (Burm.)Jafri, subsp. <u>edgeworthii</u><br>(H.f.et T.)Jafri... .. | P + A     |
| 7. <u>Draba hystrix</u> H.f.et T. ....  | P + A     |
| 8. <u>D. cachemirica</u> Gandoger ....  | P + H     |
| 9. <u>D. affghanica</u> Boiss. ....   | A + H     |
| 10. <u>D. falconeri</u> Schulz ....   | P + H     |
| 11. <u>Arabis taraxacifolia</u> T.Anders. ....  | P + A     |
| 12. <u>A. bijuga</u> Watt ....  | P + H     |
| 13. <u>A. panglensis</u> Watt ....  | P + H     |
| 14. <u>A. amplexicaulis</u> Edgew. ....   | P + A + H |
| 15. <u>A. saxicola</u> Edgew. ....  | A + H     |
| 16. <u>A. saxicola</u> Edgew. var. <u>elatior</u> (Schulz)Jafri ....                        | P + H     |
| 17. <u>Tetracme contorta</u> Boiss. ....  | P + A     |
| 18. <u>Malcolmia cabulica</u> (Boiss.)H.f.et T. ....  | P + A     |
| 19. <u>Erysimum griffithianum</u> Boiss. ....   | P + A     |
| 20. <u>E. stocksianum</u> (Boiss.)Boiss. ....   | P + A     |
| 21. <u>Sisymbrium pakistanicum</u> Jafri ....   | P + A     |
| 22. <u>Aphragmus obscurus</u> (Dunn)Schulz ....   | P + H     |

Of these 11 are endemic to W.Pakistan and Afghanistan, 6 to

W. Pakistan and N.W. Himalayas, 3 to Afghanistan and N.W. Himalayas, and 2 to W. Pakistan, Afghanistan and N.W. Himalayas.

The above lists show that W. Pakistan has about 6%, Afghanistan 5.5% and N.W. Himalayas 18% of the number of species present in only one of the 3 parts, in addition to the 22 species which they share as given above.

The following are the first eleven genera of the present area arranged in order of the number of species in each, and in the 3 parts:

<u>Genera</u>	<u>No. of species in the present area.</u>	<u>No. of spp. in W. Pakistan.</u>	<u>No. of spp. in Afghanis-tan.</u>	<u>No. of spp. in N.W. Himalayas.</u>
1. <u>Draba</u> L.	24	10	3	22
2. <u>Erysimum</u> L.	17	7	10	8
3. <u>Arabis</u> L.	12	9	6	9
4. <u>Lepidium</u> L.	11	6	10	5
5. <u>Arabiopsis</u> Heyn.	11	7	7	9
6. <u>Sisymbrium</u> L.	9	6	8	7
7. <u>Alyssum</u> L.	8	5	7	1
8. <u>Isatis</u> L.	7	6	6	1
9. <u>Thlaspi</u> L.	7	5	4	6
10. <u>Christolea</u> Camb.	7	1	1	7
11. <u>Microsisymbrium</u> Schulz	7	2	2	4

There are:-

- (i) 2 genera, Malcolmia and Parrya, with 6 spp. each.
- (ii) 4 genera, Tetracme, Chorispora, Torularia, and Cardamine with 5 species each.
- (iii) One genus, Conringia, with 4 spp.
- (iv) 5 genera, Cochlearia, Clypeola, Barbarea, Rorippa and Braya with 3 spp. each.
- (v) 13 genera with 2 spp. each.
- (vi) 50 genera with only one species each. Of these the following 16 are monotypic:

Douepia, Hedinia, Octoceras, Spirarrhynchus, Tauscheria, Buchingera,

Phaeonychium, Drabopsis, Notoceras, Pyramidium, Diptychocarpus,  
Eremobium ?, Pycnoplithus, Arcyosperma, Streptoloma and Hobeschia.

Of these monotypic genera, Douepia and Pyramidium are endemic to the present area; Hedinia, Phaeonychium, Pycnoplithus and Arcyosperma are confined to Himalaya; while the remaining 10 are mostly Central and West Asian.

The biggest genus for W.Pakistan (10 spp.) and N.W.Himalayas (22 spp. ), as well as for the whole of the present area (24 spp. ), is Draba L., while on the other hand it is represented by only 3 species in Afghanistan. The biggest genera for Afghanistan are Erysimum L. and Lepidium L. with 10 species each.

Alyssum L. and Isatis L. are represented by only one species each in N.W.Himalayas, while their number of species in W.Pakistan and Afghanistan is 5 - 7.

Christolea Cambess. is represented by only one species each in W.Pakistan and Afghanistan, while there are 7 spp. of it in N.W. Himalayas.

This clearly shows the mixed nature of the crucifers of W.Pakistan, for in some cases it shares almost equally the crucifers in Afghanistan (and other Central and W.Asian parts) and in other cases the Himalayan ones.

The distribution of genera and species in the 5 provinces and states of W.Pakistan is as follows:

<u>Area</u>	<u>No. of genera</u>	<u>No. of species</u>
<u>W.PAKISTAN</u>	67	147
1. Chitral	34	60
2. N.W.F.P.	36	68
3. Punjab	30	46
4. Sind and Karachi	7	8
5. Baluchistan	44	74

Comparing the above figures with those already given for Capparidaceae of W.Pakistan, we find that Sind and Karachi have the minimum number of species (8 spp.) of Cruciferae and the maximum number of Capparides (14 spp.). Just the reverse is true for Baluchistan which has only 9 spp. of Capparidaceae and 74 spp. of Cruciferae.

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Abbreviations used:

- A.H.P. = Acta Horti Petrop. ;  
 B.F.B. = Burkill's List of Flowering Plants of Baluchistan (1909).  
 B.F.O. = Boissier's Fl. Orientalis vol. i (1867).  
 B.F.S. = N. Busch's Fl. Sib. (1913 - 1931).  
 B.H.G.P. = Bentham and Hooker's Genera Plantarum vol. i (1862).  
 B = Herbarium Berlin.  
 BM = Herbarium British Museum.  
 C = Herbarium Copenhagen.  
 E = Herbarium Royal Botanic Garden Edinburgh.  
 F.B.I. = Hooker's Fl. British India vol. i (1872).  
 F.B.P. = Cooke's Fl. Bombay Presidency vol. i (1903).  
 G = Herbarium Geneva.  
 K = Herbarium Kew.  
 K.F.U. = Komarov's Fl. U.R.S.S. vol. viii (1939).  
 L = Herbarium Leningrad.  
 LS = Linnaean Herbarium at the Linnaean Society.  
 N.W.F.P. = North-West Frontier Province of West Pakistan.  
 P = Herbarium Paris.  
 P.E.P. = Pax and Hoffmann's account of the Capparidaceae in Engler and Prantl's Pflanzenfam. (17 b) 1936.  
 R - E! = Specimens borrowed from Dr. R.R. Stewart's Herbarium, Rawalpindi, Pakistan and seen at Edinburgh.  
 R.F.B.P. = Blatter's 'Revision of the Flora of Bombay Presidency' published in Bombay Nat. Hist. Soc. Journal xxxi (1927) and xxxiv (1930).  
 S.P. = Schulz's monographs published in Engler's Pflanzenreich (1919-27).  
 S.E.P. = Schulz's account of the Cruciferae in Engler and Prantl's Pflanzenfam. (17 b) 1936.  
 S.B.S. = Sabnis' Flora of Sind (1924).  
 U - E! = Specimens borrowed from the National Museum United States and seen at Edinburgh.  
 V = Herbarium Vienna.  
 V - K! = Specimens borrowed from the Vienna Herbarium and seen at Kew.

C A P P A R I D A C E A E



## C A P P A R I D A C E A E

Capparidaceae Lindl., Nat. Syst. ii 61 (1836); S.E.P. 146; K.F.U. I.

Capparideae Vent., Tableau du règne végétal iii 118 (1799); B.H.G.P. 103; B.F.O. 410; F.B.I. 167.

Herbs, shrubs (often scandent) or trees, glabrous, pubescent, glandular or scabrid. Leaves alternate, rarely fasciculate, simple or palmately 3 - 7 foliolate (rarely 1 or 9 foliolate) ; stipules 2 or 0, usually spiny, recurved. Inflorescence axillary or terminal, solitary, racemose, corymbose, fasciculated or umbellate, sometimes handsome or showy. Flowers hermaphrodite, rarely dioecious, regular, rarely with unequal sepals, complete, rarely petals wanting, pedicellate. Sepals usually four, free or connate below, equal or unequal, valvate, imbricate or open in aestivation. Petals usually four, sessile or clawed, hypogynous or seated on the disk, mostly imbricate or valvate. Torus short or elongated, rarely with an appendix (appendix linear-oblong or ligulate-tubular). Stamens four to indefinite, inserted upon the torus, alike or unequal (never tetradynamous when six, or didynamous when four); filaments free or adherent to the gynophore, sometimes coherent at the base, never appendaged; anthers oblong, dithecal, dehiscent longitudinally, rarely some of them abortive or deciduous, basifixed. Ovary sessile or supported upon a gynophore of varying length, usually ovoid, globose, oblong or linear, generally one celled, rarely divided by spurious dissepiments into two or more cells; ovules many rarely few (even 1 or 2) on parietal placentas, usually campylotropous with two integuments. Fruits generally capsular or baccate, sometimes torulose. Seeds mostly reniform or angular; albumen absent or thin; embryo usually curved; cotyledons plane, folded or convolute; radicle often conical and incumbent.

A large family with about 45 genera and 600 species mostly in tropical and subtropical regions of the world.

The arrangement of the 8 genera of the present area according to Engler and Prantl's system of classification (with certain emendments) (1936).

Capparidaceae Lindl.

subfamily: I. Capparidoideae Pax in Pflanzenfam. 220 (1891).

Fruits without replum, succulent or dry, indehiscent, not winged; petals not clawed.

tribe i. Capparideae Pax l.c. 225.

Flowers without cup-shaped disk round the floral axis, i.e. calyx not lined by disk; shrubs or trees, also climbers with stellate or simple pubescence, rarely with glandular hairs.

1. Crataeva L.      2. Capparis L.      3. Cadaba Forsk.

tribe ii. Maerueae Baill., Hist. Pl. iii 178 (1872).

Flowers with cup-shaped disk round the floral axis, i.e. calyx tube lined by the disk; mostly shrubs or trees.

4. Maerua Forsk.

subfamily: II. Dipterygioideae Pax l.c. 225.

Fruits one- or up to two-winged nutlet; bushy undershrubs.

5. Dipterygium Decne.

subfamily: III. <sup>+</sup>Cleomoideae Pax l.c. 220 - emended Chiovenda, Fl. Somalia 79 (1929).

Fruits capsular, dehiscent with a replum (rarely indehiscent and without replum - Buhsea); herbs mostly glandular hairy.

tribe i. Buhsieae Chiovenda l.c.

Fruits inflated, indehiscent.

6. Buhsea Bunge.

tribe ii. Cleomeae DC., Prodr. i. 237 (1824)

Fruits dehiscent, not inflated.

7. Cleome L.      8. Gynandropsis DC.

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+ emended. Buhsea is included under a separate subfamily in P.E.P.

The arrangement of the 8 genera of the present area according to Bentham and Hooker's system of classification (1862) would be as follows.

Capparidieae Endl.

Tribe I. Cleomaeae:

Fruits capsular, I-locular, rarely short or didymous; herbs.

1. Buhsea<sup>+</sup> - Torus short, stamens 6; capsule inflated, indehiscent.
2. Cleome - Torus short, stamens 4 - 6 (rarely 10 - 12), free; capsule dehiscent.
3. Gynandropsis - Torus elongated, filaments borne on gynandrophore, stamens 6..

Tribe II. Cappareae:

Fruits baccate or drupe; shrubs or trees.

\*Sepals connate below forming a tube.

4. Maerua - Berries elongate; leaves simple or 1-foliolate.

\*\* Sepals free or slightly connate at the base.

5. Cadaba Two outer sepals valvate; disk-appendix tubular; berries cylindrical.
6. Capparis - Calyx various; petals 4; stamens indefinite, inserted on short expanded torus.
7. Crataeva - sepals 4, imbricate; petals 4, long clawed.

Tribe III. \*Dipterygieae: Boiss, Fl. Or. i 417 (1867).

Fruits small, + slightly winged nutlets.

- ++8. Dipterygium.

+ Included as synonym of Cleome in B.H.G.P.

\* Not in B.H.G.P.

++ Included under Cruciferae in B.H.G.P.

Key to the 8 genera:

- I. Fruits capsular, dehiscent; herbs annual or perennial:
2. Stamens sessile, inserted on the disk.....7. Cleome
2. Stamens inserted on a long gynandrophore .....8. Gynandropsis
- I. Fruits mostly berry/~~or~~various, indehiscent or rarely hardly dehiscent; mostly shrubs or trees:
3. Undershrubs or bushy herbs, erect, 15 - 60 cm. tall:
4. Flowers minute, about 2.5 mm. across; leaves minute, 3 - 10 mm. long, subsessile or very shortly petioled .....5. Dipterygium
4. Flowers medium or large, 7 - 10 mm. across; leaves 2 - 6.5 cm. long(including 1 - 2.5 cm. long petiole).....6. Buhsea
3. Trees or shrubs (mostly climbing or spreading):
5. Sepals fused below forming a distinct tube ....4. Maerua
5. Sepals free or slightly connate below:
6. Sepals biseriate or imbricate:
7. Stamens 4 - 6, inserted + halfway up or irregularly on the gynophore; disk appendix prominent, tubular, about as long as the claw of petals .....3. Cadaba
7. Stamens 8 - indefinite, inserted at the base of the gynophore; disk appendix absent .....2. Capparis
6. Sepals distant, inserted on the edges of the disk, valvate .....1. Crataeva.

I. CRATAEVA L., Sp. Pl. 444 (1753); B.H.G.P. 110; F.B.I. 172; P.E.P. 167.

Syn: Tapia Adans., Fam. ii 407 (1763); Othrys Nor. ex Thou., Gen. Nov. Madag. 13 (1806); Nevosmila Raf., Sylva Tellur. 107 (1838); Triclanthera Raf. l.c. 108; Farquharia Hils. et Boj. in Ann. Sc. Nat. ser.II. xx 57 (1843).

Small or medium sized tree with trifoliate, deciduous leaves, upright dense corymbose racemes and large berries. Flowers sometimes polygamous. Sepals 4, persistent, adnate to the lobed disk. Petals long clawed, usually 4, sometimes wanting. Androphore short, indistinct, with 8 - 50 stamens inserted on it. Gynophore long, slender. Ovary one or nearly two celled; ovules many on 4 or 2 parietal placentas; stigma sessile, depressed.

About 20 species chiefly in the tropics.

Crataeva religiosa Forst., Prodr. 35 (1786); F.B.I. 172(cum var.);  
F.B.P. 42; R.F.B.P. 90I; P.E.P. 168

Syn: C. Roxburghii R.Br. in Denh. and Clapp., Travels App. 224(1826);  
C. Nurvala Ham. in Trans. Linn. Soc. xv 121 (1827); Capparis  
trifoliata Roxb., Fl. Ind. ii 571 (1832).

Type: Not precisely designated.

Small, often spreading, unarmed tree. Leaves trifoliate, deciduous; petioles generally 4 - 10 cm. long; Leaflets 5 - 12 x 2.5 - 6 cm., lanceolate, ovate or obovate oblong, + oblique, acute or acuminate, attenuate at the base, pale beneath, entire, glabrous, shortly stalked (stalk 3 - 5 mm. long). Inflorescence corymbose, ebracteate. Flowers 3 - 6 cm. across, subirregular, greenish white turning yellowish soon after opening; pedicels 2.5 - 4.5 cm. long. Sepals 5 - 10 x 2 - 5 mm., elliptic or ovate, acute, greenish-white, distant. Petals 4 rarely 5, clawed (claw 4 - 8 mm. long); limb 1.5 - 3 x 0.7 - 1 cm., ovate or suborbicular, obtuse or acute, reticulately veined. Stamens usually 20 - 25, exceeding the petals in length, inserted at the base of the gynophore; filaments filiform, pale mauve; anthers 2 - 3 mm. long, oblong, obtuse. Disk hemispherical with incurved margins. Gynophore 3 - 5 cm. long, slender, thickened in fruit. Berries 3 - 5 cm. in diam., globose or ovoid, woody, smooth or scurfy, many seeded. Seeds reniform, 2.5 - 4 x 3 - 5 mm, somewhat smooth, brown.

W. Pakistan:

Punjab : Lahore (garden), Thomson(K!); Multan, Ritchie (E!);  
Karnal, Drummond nos. 20158(K!), and 20159(E!,K!);  
Ambala, Edgeworth(K!); Gurgaon, Drummond no. 20169(K!,E!);  
Without locality, J.L.Stewart(E!).

N.W.Himalayas: I have not seen any specimen from N.W.Himalayas but the following Osmaston's remark shows that it occurs at least in Kumaon: "Occurs in the subhimalayan tract upto 2000 ft, It appears to be rather scarce, and is usually found not far from a water course" -fide Osmaston, A Forest Flora For Kumaon, p.27 (1927).

Geog. Dist; India, Malaya and Trop. Africa.

2. CAPPARIS L., Sp. Pl. 503 (1753); B.H.G.P. 108; B.F.O. 419; F.B.I. 173;  
P.E.P. 172; K.F.U. I.

Syn: Calyptanthus Thou., Obs. 86 (1811); Anisosticte Bartl., Ord. 294 (1830); Intutis Raf., Sylva Tellur. 108 (1838); Marsesina Raf., l.c. 112; Octanema Raf., l.c.; Oligoron Raf., l.c. 109; Olofuton Raf., l.c. 108; Pleuteron Raf., l.c. 109; Holophytum Post et O.Ktze., Lexicon-284 (1904).

Trees or shrubs, erect, straggling or climbing, hairy with simple or branched hairs, sometimes glabrous, unarmed or with stipular thorns. Leaves simple, rarely deciduous, often coriaceous. Flowers often showy, hermaphrodite, solitary, racemose, corymbose or umbellate, axillary or terminal, rarely supra axillary. Sepals generally four, equal or unequal, free, sometimes slightly connate at the base. Petals normally four, imbricate. Stamens eight to indefinite, usually long, inserted on the torus at the base of the gynophore. Gynophore long or short. Ovary 2 - 8 carpellary, one, two or more celled. Fruit mostly baccate, many seeded.

A large genus of about 250 spp. widely spread throughout the tropics and warmer regions of the world.

It is represented by only six species in the present area. Out of these, one is new to science.

The taxonomy of Capparis spinosa L. and the so-called allied species is still not clear. But there can be no doubt that C. cartilaginea Decne. (C. galeata Fres.) is a distinct species: with characteristic fleshy, + squat habit, sturdy, glabrous, glaucous branches, and elongated, deeply galeate anterior sepal. [See fig. I(a)]. It prefers saline coastal regions from Karachi, Sind, Baluchistan, westward to <sup>the</sup> Arabian coast and Sinai. (Map no. I). On the other hand, C. spinosa L. seems to be very variable and widely distributed from S. and S.E. Europe eastward to Australia.

How far C. aegyptiaca Lam., C. sicula DuRoi., C. rupestris Sibth. et Sm., C. leucophylla DC., and C. parviflora Boiss. etc. could form separate taxa remains an open question, and in the absence of experimental work and population analysis nothing can be decided.

So far as the Indo-Pakistan and Afghanistan specimens of C. spinosa are concerned they show quite a good range of morphological variation, and have been given various taxonomic treatments by different authors. De Cando-  
lle's description of all the so-called allied species of C. spinosa are very

vague, and without seeing the types it is impossible, in almost every case, to come to any definite conclusions as to their identity.

Hooker f. and Thomson in Fl. Brit. India (1872) recognize four varieties under C. spinosa, while Blatter [Rev. Fl. Bombay Pres. in Journ. Bombay Nat. Hist. Soc. xxxi 903 (1927)] drops all the varietal distinctions but recognizes C. cartilaginea Decne. (which he calls C. galeata Fres.) as a distinct species.

Boissier [Fl. Or. (1867)] recognized six varieties of C. spinosa. One of these, var. leucophylla (DC.) Boiss. [syn: C. leucophylla DC.] has hitherto been confused in all the Indian Floras. C. leucophylla DC. was originally described from Persia, and Boissier cited his variety for Persia and Mesopotamia, but does not mention its geographical area beyond that. The main character mentioned for this variety is its indumentum - dense, floccose-hairy. One who has not looked into the type specimens would be inclined to assign some of the N.W. Himalayan specimens (as it has been done by most of the authors) to this variety on the indumentum character. But a careful study of the type specimen of C. leucophylla will show that the Himalayan plants actually belong to a different species. The main difference is in the floral characters, but also the degree of pubescence which is not so pronounced as it is in C. leucophylla from Iraq and Iran specimens. The flowers of C. leucophylla are small, very similar to those of C. parviflora Boiss., while in the N.W. Himalayan specimens they are much larger with a deeply galeate anterior sepal like those of C. cartilaginea. Thus, it was a mistake introduced by Hooker f. and Thomson to equate the N.W. Himalayan specimens with the so-called var. leucophylla (DC.) Boiss.; this was carried further by H. Collet [Fl. Simlensis (1902)] when he recognized it as a distinct species but wrongly called it C. leucophylla DC. Therefore, the taxonomic status of these Himalayan specimens has hitherto remained undecided or wrongly determined. Another species, C. nepalensis Wall. (nomen nudum) <sup>quoted</sup> as a synonym of var. "leucophylla" H. f. et T. and C. Napaulensis DC. [Prodr. i 246 (1824)] from Nepal (S.E. Himalaya) is nothing but a state of C. spinosa L. I have not seen any other specimen except the type specimen of C. Napaulensis DC. (BM!) It does not bear any good mature flower and appears to be somewhat densely hairy. De Candolle's description of this 'species' is very vague. I have not seen a single specimen from Nepal which could resemble those N.W. Himalayan specimens with deep<sup>ly</sup> galeate anterior sepal.

These specimens of the so-called var. "leucophylla" H.f. et T. [non (DC.) Boiss.] from N.W. Himalayas are so remarkably distinct from other specimens of the C. spinosa complex of the present area that I cannot force them into C. spinosa as done by Blatter (1927). As it was not possible in the absence of sufficient time and experimental works to treat the entire group of C. spinosa and the so-called allied species of the world statistically, only specimens from the present area and India were studied. I have also included true specimens of C. leucophylla DC. from Iran and Iraq to show that they are associated with C. spinosa, and are quite different from the specimens of the so-called var. "leucophylla" H.f. et T. of the N.W. Himalaya.

The herbarium specimens, although not very good for statistical studies which are mainly designed for 'populations', in the present case have given some good results. On the basis of these results the present new species, Capparis himalayensis Jafri, has been separated.

In all 67 specimen sheets were included for the statistical studies, out of which only 38 had good flowers; the rest were either in the fruiting stage or had flower buds only.

The present analysis is based only on leaf and flowers. Some so-called species like C. parviflora Boiss., C. sicula Duham., C. elliptica Bormm., etc. are primarily based on the size and shape of their leaves and flowers. This study, therefore, gives an idea how far these characters are reliable for separating taxa.

Whatever may be the size of the leaves, their length/breadth ratio (l/b ratio) remains fairly constant on each specimen in the case of the present plants. The same applies to the flowers. As size and shape of the anterior sepal appeared more important in the present case, it was also included under the present studies. Thus all the specimens, from the present area and India, available at Kew, Edinburgh and the British Museum were studied and measurements were taken. One mature leaf and one mature flower (wherever it was present) were measured on each herbarium sheet. Depth of the anterior large sepal was taken from near the apex (see figs. I A and I B).

Table no. I shows the following measurements:

1. Length of the leaf; 2. Breadth of the leaf; 3. l/b ratio of the leaf;
4. Flower diameter; 5. Length of the anterior sepal; 6. Depth of the anterior sepal near the apex



TABLE NO. I.

Specimens.	Length of the leaf in cms.	Breadth of the leaf in cms.	Length Breadth ratio of leaf	Flower diameter in cms.	Length of the anterior sepal in mm.	Depth of the anterior sepal near the apex in mm.
<u>Herb Kew!</u>						
1. Chitral, <u>Toppin No. 360</u>	4	3.5	1.1	4.5	22	3.5
2. Kunawar, <u>Jacquemont</u>	3.2	2.6	1.2	3	17	3
3. Piti valley, <u>Thomson.</u>	2.6	1.7	1.5	2.7	10	3
4. Indus valley, <u>Thomson.</u>	3.8	3	1.3	4	20	4
5. Zaskar, <u>Thomson.</u>	2.8	1.8	1.5	3.5	15	2.8
6. Baltistan, <u>Winterbottom.</u>	2.3	2	1.1	2.8	13	2.6
7. Kashmir, <u>Clarke No. 30039A</u>	2.4	1.6	1.5	2.4	12	2.4
8. Sind, <u>Stocks No. 577</u>	2.5	2	1.5	3	14	2.5
9. " " <u>1201</u>	1.8	1.1	1.6	2.2	12	2.4
10. Afghanistan, <u>W.R.Hay No. 540</u>						
((i))	2.2	1.6	1.4	3	15	3
((ii))	3.5	2.6	1.4	3	15	3
11. Afghanistan, <u>Aitchison</u>	2.8	1.8	1.5	4.4	20	3.6
12. Afghanistan, <u>Aitchison No. 320</u>	2.6	2.1	1.2	3.5	-	-
13. Kashmir, <u>Clifford No. 39</u>	4.9	3.8	1.3	-	-	-
14. " " <u>Osmaston No. 36</u>	3.8	2.4	1.6	-	-	-
15. Ladak, <u>Kohli No. 11</u>	3.2	2	1.6	-	-	-
16. Kunawar, <u>Drummond No. 1045</u>	3.8	2.5	1.5	-	-	-
17. Sutlej valley, <u>Gamble No. 6135A</u>						
((i))	3.3	2.9	1.1	-	-	-
((ii))	2.5	1.9	1.4	-	-	-
18. Kashmir, <u>M.L.Wathen.</u>	2	1.5	1.3	-	-	-
19. Chamba, <u>Gammie No. 18268</u>	3.4	2.2	1.5	-	-	-
20. Kunawar, <u>Drummond No. 20187</u>	2.3	1.6	1.4	-	-	-
21. " " <u>No. 20190</u>	1.8	1.3	1.4	-	-	-
22. Rawalpindi, <u>R.Stewart No. 7039</u>	2	1.6	1.3	-	-	-
23. Chamba, <u>Parker.</u>	3.6	2.6	1.4	-	-	-
24. Bombay, <u>N.A.Dalzell</u>	2	2	1.4	-	-	-
25/	1.2	1	1.2	-	-	-

TABLE NO. I. cont'd.

Specimens.	Length of the leaf in cms.	Breadth of the leaf in cms.	Length Breadth ratio of leaf	Flower diameter in cms.	Length of the anterior sepal in mm.	Depth of the anterior sepal near the apex in mm.
25. Concan, Law	1.8	1.8	1	-	-	-
26. Rawalpindi, Aitchison No. 177	1.8	1.1	1.6	-	-	-
27. Afghanistan, Griffith No. 1431	1.4	1	1.4	-	-	-
28. Salt Range, Fleming No. 90	2.2	1.6	1.4	-	-	-
29. Peshawar, Vicary	2.8	2	1.4	-	-	-
30. Peshawar, H.Deane	2.4	1.8	1.3	-	-	-
31. N.W. Himalayas, Royle	4	2.7	1.5	4.4	20	9
32. " " Edgeworth	2.8	1.8	1.5	5	30	12
33. Sutlej valley, Jacquemont	3	2.5	1.2	4	25	12
34. Tihri-Garhwal, Gamble No. 26702	2.6	2	1.3	4.5	25	12
35. Jannsar, Gamble No. 23504	3	2.5	1.2	4	20	11
36. Tihri-Garhwal, Duthie No. 21050	5.2	2.6	1.2	5	28	12
37. N.W. Himalayas, H.H.Rich No. B224	3.2	2.5	1.3	3.5	20	9
38. Simla, Drummond No. 20186	2.6	2	1.3	4.5	23	13
39. Garhwal, Jacquemont	3.3	2.5	1.3	4	25	10
40. N.W. Himalayas, Falconer	2.6	2	1.3	3.5	20	8
(41. Iraq, Aucher Eloy No. 409 (C. leucophylla DC.)	3	2.8	1.1	2.2	10	3
(42. Iran, A.J.Lee No. 83 (C. leucophylla DC.)	2	1.6	1.2	2.5	10	2.7
<u>Herb. B.M.!</u>						
43. Ladak, Ludlow & Sherriff No. 8385	3.6	2.5	1.4	4.5	19	4
44. Gilgit, Thornley No. 41	2.6	1.7	1.5	3	15	3
45. Ladak, Ludlow No. 532	3	2.5	1.2	4	17	3
46. Baltistan, Ludlow No. 275	3.6	2.5	1.4	5	20	4
47. Simla, Sherriff No. 7317	3.3	2.5	1.3	5.5	18	11
<u>Herb/</u>						

TABLE NO. I. cont'd.

Specimens.	Length of the leaf in cms.	Breadth of the leaf in cms.	Length Breadth ratio of leaf	Flower diameter in cms.	Length of the anterior sepal in mm.	Depth of the anterior sepal near the apex in mm.
<u>Herb. Edin.!</u>						
48. Mahableshwar (Poona), Herb. Poona, Cooke	1.8	1.5	1.2	-	-	-
49. Bashahr State, Lace No. 178	2.1	1.8	1.2	3.5	18	4
	2.7	2.2	1.2	3.5	15	4
50. Kunawar, Drummond No. 1045	3.3	2.5	1.3	-	-	-
51. Quetta, Lace No. 3938	1.7	1.5	1.1	-	-	-
	1.8	1.5	1.2	3	16	4
52. Simla Hills, Kotgarh, Drummond No. 20186	2.8	2	1.4	-	-	-
53. Punjab, Shahpur, Drummond No. 20190	2.5	2.2	1.1	-	-	-
54. Punjab, Salt Range, Fleming	2	1.2	1.7	-	-	-
55. Jhelum, Herb. Dehra Dun No. 27718	3.4	3.2	1.5	-	-	-
56. Rampur on the Sutlej, 900 m., Watt	3.5	3	1.2	4.8	32	14
57. Chamba State, Gutkar to Chandres Khad, 1200 m. Lace No. 1606	3.4	3	1.1	4.8	30	11
	4.2	2.9	1.1	3.5	27	10
58. Wangtu, 1650 m., Watt No. 3254	3.8	3.2	1.2	3.5	22	10
59. (Without locality), Watt No. 10135	3.1	2.2	1.4	5	32	11
60. Simla Hills, Parkinson, No. 7382	4.2	3.1	1.3	-	-	-
61. Bashahr State, 1950 m., M.V. Laurie No. 5418	3.4	3	1.1	4.2	13	9

Figure 2, Histogram shows the frequency distribution<sup>of</sup> length of leaves. It shows a normal curve, showing a continuous range of length of leaves from 1.2 to 4.9 cm.

Figure no.3, Histogram shows the frequency distribution of l/b ratio of leaf— an estimation of shape. It also shows a normal curve and therefore all these specimens included here cannot be separated into different taxa so far as this character is concerned. The l/b ratios range continuously from 1 to 1.7.

Figure no.4, Histogram shows the frequency distribution of flower diametre. It also shows a normal curve. Therefore, all these specimens included here cannot be separated into different taxa so far as the flower size is concerned. The diametre ranges continuously from 2 to 5.5 cm.

Upto this stage Blatter's (1927) treatment of C.spinosa of Indo-Pakistan specimens seems to be justified, although he had not supported his views with any statistical studies. but remarks, "Collett retains C.leucophylla DC. as a distinct species on account of the larger leaves and more pronounced tomentum; but upper Sind specimens show similar variations, and intermediate forms are not wanting. It must, therefore, be dropped, even as a variety." [Journ. Bomb. Nat. Hist. Soc. xxxi (4) 903 (1927)]. This is, therefore, in agreement with his view that the separation of taxa on leaf size and shape (figs. 2 and 3) and degree of pubescens is impossible.

Figure 5, Histogram shows the frequency distribution of depth of the anterior sepal towards the apex. It shows a definite break, and represents two distinct taxonomic groups: one with 2 - 5 mm. depth and the other with 8 - 15 mm. depth. Out of the 38 specimens measured, 21 go into the first group and 17 to the second group, i.e. 55% of the specimens belong to the first and 45% to the second group.

Figure no.6, shows a polygonal graph representing four characters at a time: 1. l/b ratio of leaf, 2. flower diametre, 3. depth of the anterior sepal near the apex, and 4. length of the anterior sepal. Measurements of all the 38 specimens are drawn on this graph. It shows a definite break in the depth character of the anterior sepal, as already shown

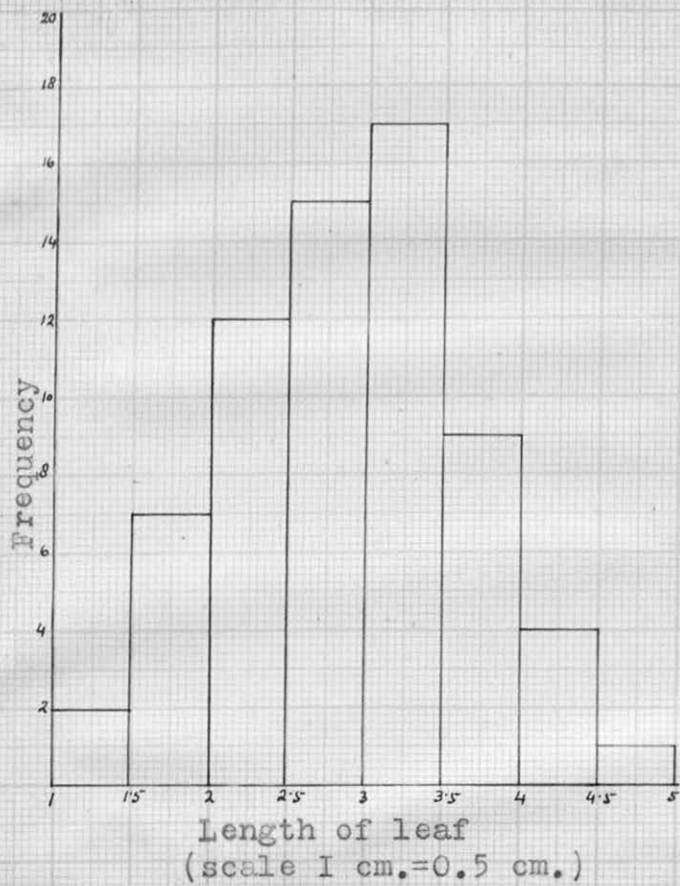


Fig. no. 2

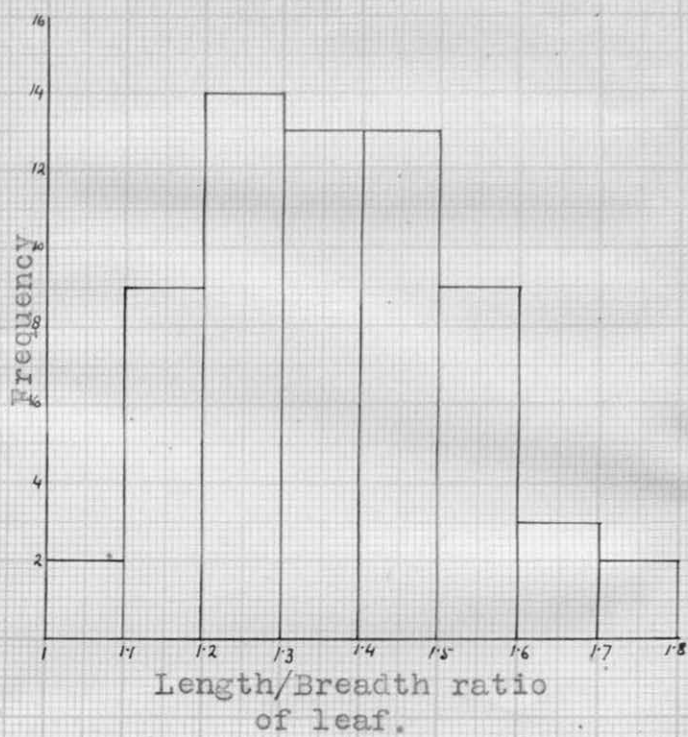


Fig. no. 3

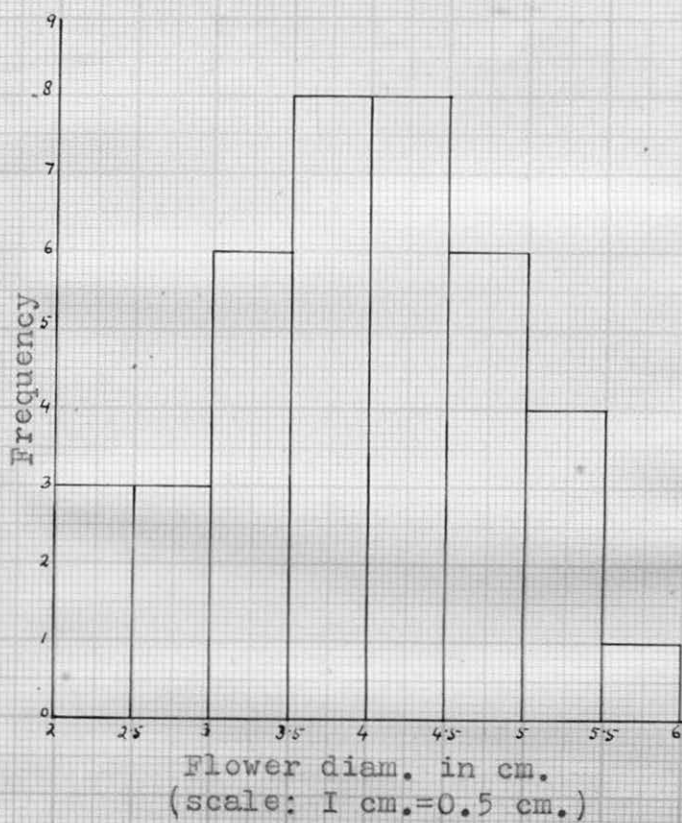


Fig. no. 4

C. spinosa L.

C. himalayensis Jafri

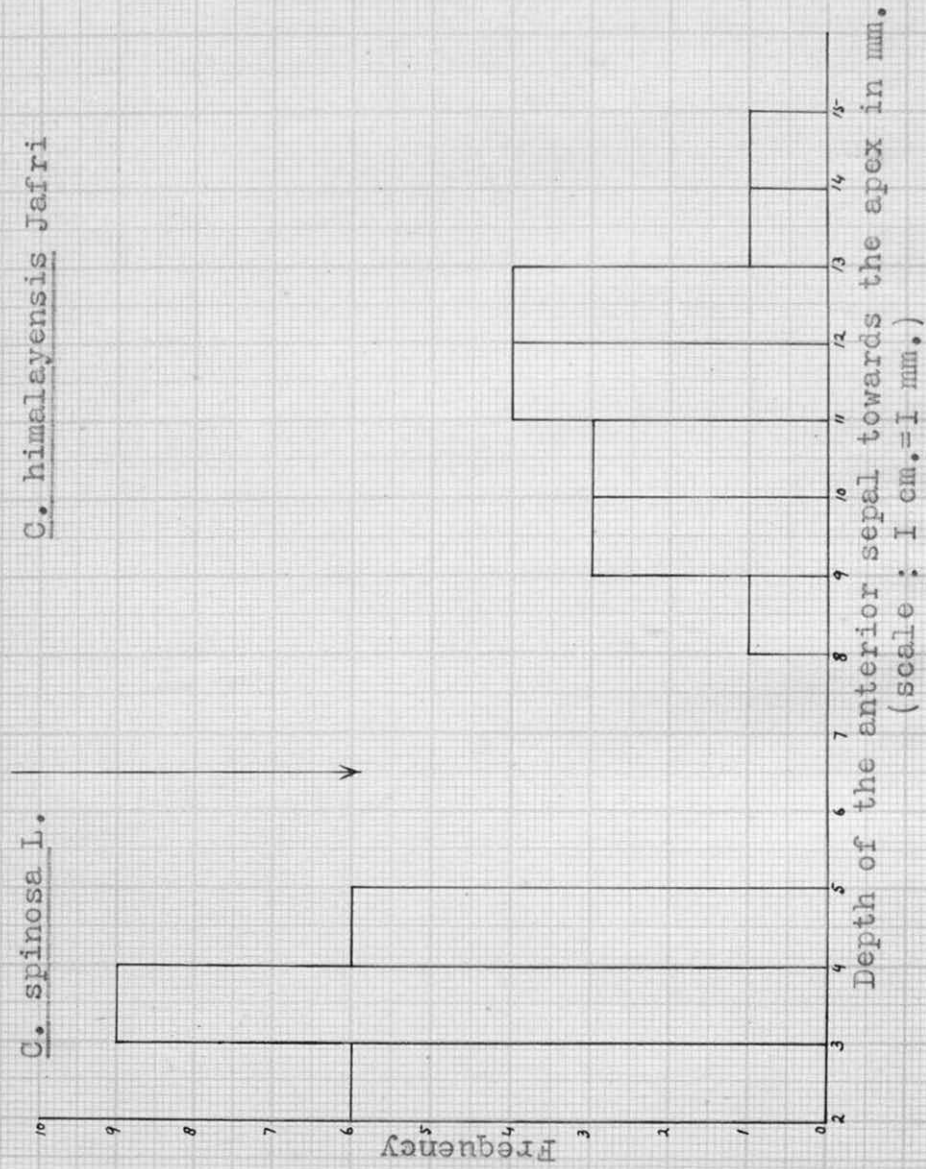
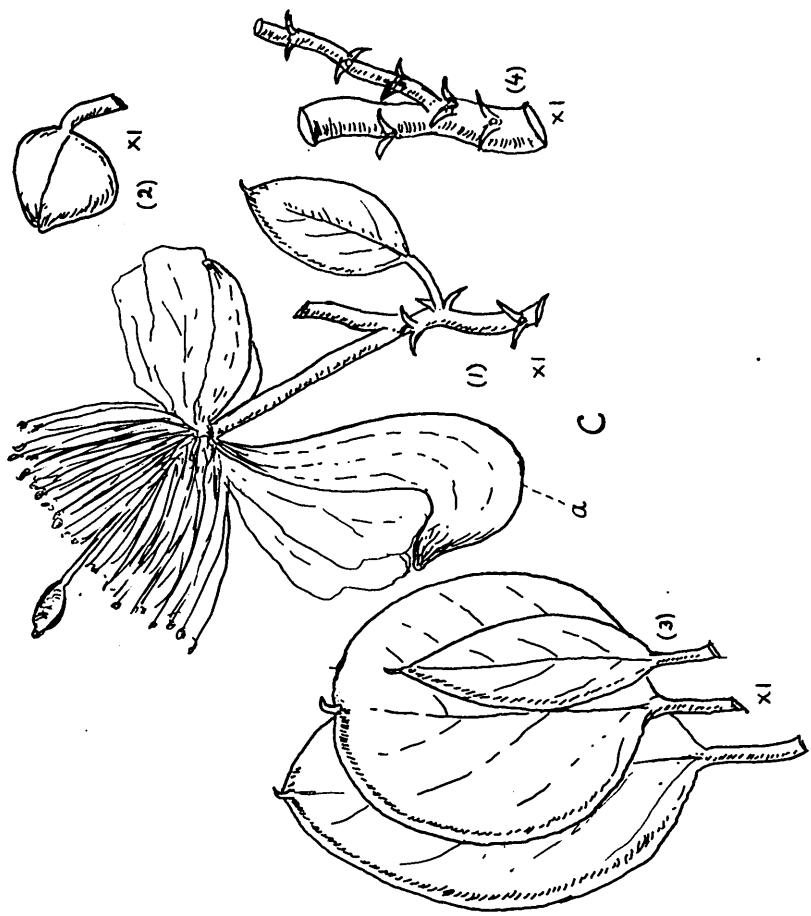
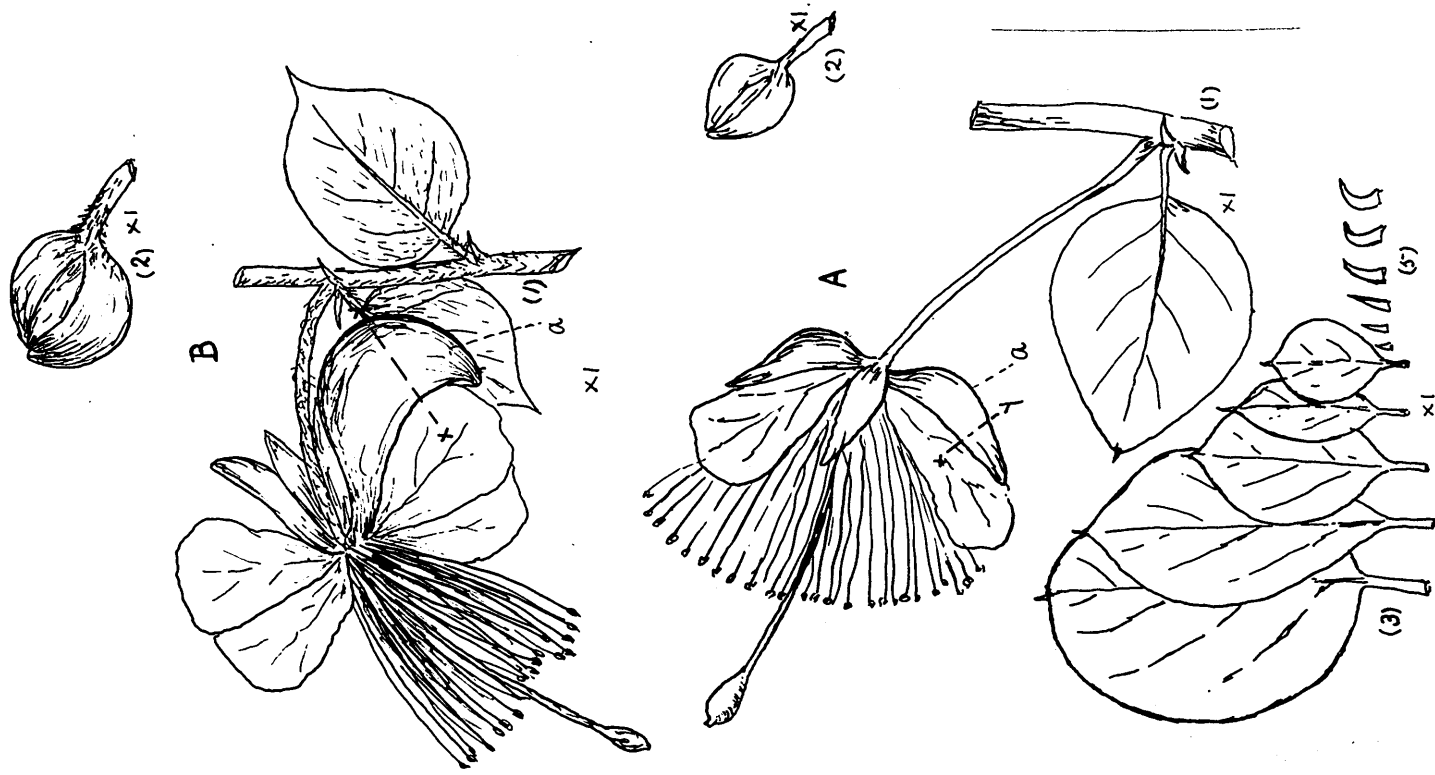


Fig. no. 5

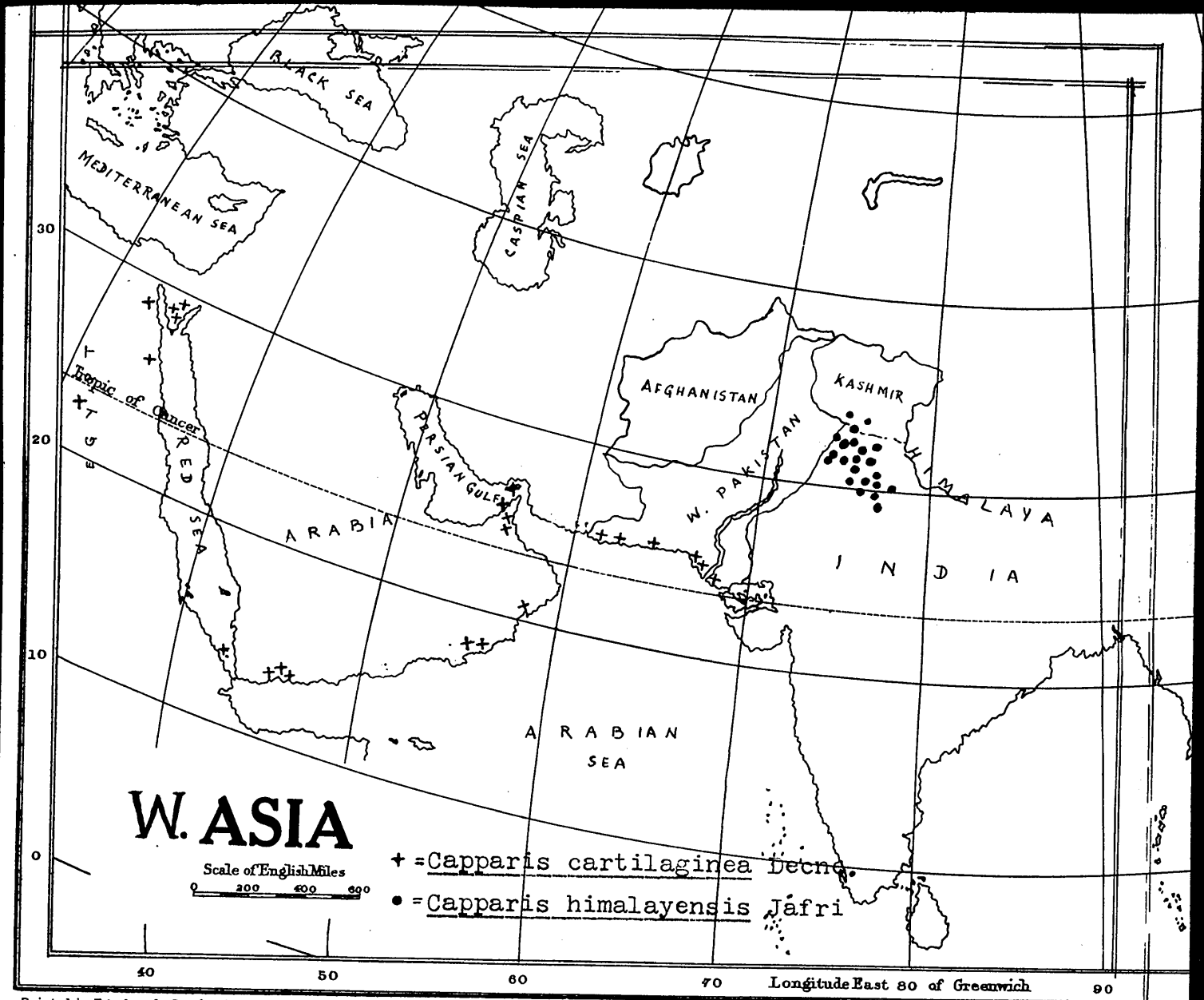


0 1 2  
Scale. CM.

Fig. no. I

A - *Cepperis spinosa* L.; B - *C. himalayensis* Jarrl; C - *C. cartilaginea* Lecaisne.

(1) part of the flowering shoot; (2) flower bud; (3) common variation in size and shape of leaves; (4) part of the stem; (5) variation in size and shape of stipular thorns.



Printed in Edinburgh, Scotland

Map no. I



by fig.5. The specimens belonging to the two groups are plotted with different coloured ink. The depth of the anterior sepal shows to some extent a positive correlation with the length; it becomes deeper towards the apex with the increase in length; the anterior sepal is mostly 20-32 mm. long in the second group, while in the first it is mostly 10 - 20 mm. The same is demonstrated separately by Fig. no.7, Scatter diagram showing the correlation between length and the depth near the apex of the anterior sepal. Flower diameter is 3.5 - 5.5 cm. in the second group, and seems to be less variable than in the first group where it varies from 2.2 - 5 cm. The l/b ratio of leaves vary in the same manner in both groups, showing an almost complete overlap.

Looking into the regional distribution of the two groups in the present area it appears that the first group is widely distributed in the present area while the second is confined to the N.W.Himalayas. As a matter of fact, both the groups occur side by side in the N.W.Himalayas, but still remain quite distinct. The first group undoubtedly belongs to C.spinosa L. The second group I have described as a new species, Capparis himalayensis Jafri, which is very distinct from C.leucophylla DC. as said before ( the same is also clear from the above statistical studies where C.leucophylla DC. goes with C.spinosa L.).

Capparis L. is divided into about 10 sections which are primarily based on sepal characters. The six species of the present area fall into the following two sections:

Section I. Eucapparis DC., Prodr. i 245 (1824); P.E.P.174.  
Sepals concave, large, biseriate, unequal: C.spinosa L., C.himalayensis Jafri (description follows), C. cartilaginea Decaisne, C.zeylanica L., and C.sepiaria L.

Section II. Hombak (Adans.) O.Ktze., Lexic. Gen. Phaner. 98 (1903).  
Syn: Hombak Adans., Fam. ii 408 (1763); Sodada Forsk., Fl. Aegypt-Arab. 81 (1775); B.H.G.P. 109; B.F.O.419.  
Upper sepal more concave; stamens usually 8 - 15: C.decidua (Forsk.) Edgew.

Key to the species:

I. Flowers axillary and solitary or supra-axillary, 1 - 3:

2. Flowers axillary and solitary; plants glabrous or hairy with simple, white hairs:
3. Anterior sepal not deeply galeate .....1.C.spinosa
3. Anterior sepal deeply galeate:
4. Plants glabrous, glaucous; leaves fleshy, cartilaginous .....3. C. cartilaginea
4. Plants + tomentose; leaves not fleshy....2.C.himalayensis
2. Flowers supra-axillary, 1-3; plants pubescent with scarlet-brown, branched hairs .....4. C. zeylanica
- I. Flowers in corymbose, ebracteate racemes or umbels, many:
5. Flowers in corymbose racemes on short lateral, leafless branches; leaves deciduous ..... 6. C. decidua
5. Flowers in umbels, apical on leafy branches; leaves not deciduous .....5. C. sepiaria

I. Capparis spinosa L., Sp. Pl. 503 (1753); B.F.O. 420; F.B.I. 173; R.F.B.P. 903

Syn: C. Napaulensis DC., Prodr. i 246 (1824); C. Murrayana Grah., Catl. 9 (1838); C. spinosa var. vulgaris H.f. et T. in Fl. Brit. Ind. 173 (1872)-excl. syn.; C. spinosa var. Leucophylla H.f. et T. l.c. [non (DC.) Boiss.] -partim: C. spinosa var. parviflora (Boiss.) Boiss., Fl. Or. i (1867) -only Afghanistan plants; C. elliptica Haussk. et Bornm. in Mitt. Thur Bot. Ver. N.F. vi 49 (1904); C. spinosa var. "canescens" and "parviflora" Blatter and Hall. in Journ. Ind. Bot. i 59 (1919) [not Coss. and not Boiss. respectively].

Type: The specimen of C. aculeata in the Hort. Clifford. Herb. (BM!)

Diffuse shrub, prostrate or hanging, glabrous or pubescent. Leaves very variable in size and shape, with a l/b ratio of 1 - 1.7, simple, ovate, orbicular, obovate, elliptic, or suborbicular, entire, acute obtuse, retuse, rarely slightly acuminate; apex mostly spine tipped; petiole 1 - 4 mm. long; stipules of 2 hooked rarely straight, brown or yellow coloured thorns. Flowers axillary and solitary, very variable in

size, 2 - 5 cm. across, sub-irregular, handsome, whitish; pedicels 2 - 6 (-9) cm. long, becoming thickened in fruit. Sepals subequal; anterior sepal not galeate, 1 - 2 cm. long, broadest towards the base and only 3 - 4.5 mm. deep near the apex. Petals 1.4 - 3 x 0.6 - 1.5 (-2) cm., obovate-cuneate, reticulately veined, apex submarginate, exceeding the sepals. Stamens indefinite, filaments exceeding the petals in length, spreading; anthers 1 - 2.5 mm long. Fruits 1.5 - 4.5 x 0.8 - 1.8 cm., ellipsoid or oblong - obovate, often slightly ribbed, red when ripe, often splitting into four parts from the apex when dried and pressed. Gynophore generally 3 - 7 cm. long. Seeds many, globose, 2 - 3 mm. in diam., brown.

W. Pakistan:

Chitral: Shuski nullah, 1800 m., Toppin (K!);

N.W.F.P.: Peshawer, Vicary (K!); Deane (K!).

Punjab: Rawalpindi, R. Stewart (K!); Aitchison no. 177 (K!); Salt Range, Fleming no. 90 (K!); (without locality), J.L. Stewart (E!).

Sind: Hills (without locality), Stocks nos. 1201 (K!) and 577 (K!).

Karachi: Soorjana hills, Tricehurst no. 30885 (ex S.F.S.).

Baluchistan: Quetta, Brewery, 1800 m., under shades in dry nullah, not common, H. Crookshank no. 97 (K!); Pil rift, Lace no. 3938 (K!); (without locality), Aitchison (K!).

Afghanistan: (without locality), Falconer (K!); Badghis, Aitchison (K!); Harirud valley, Aitchison (K!); Common from Thal to Kurrum on conglomerate rocks (from 750 to 1200 m.), Aitchison no. 320 (K!); (without locality), Aitchison (K!); Ghorband valley, 2100 m., W.R. Hay no. 540 (K!); (without locality), Griffith (K!).

N.W. Himalayas: Piti valley, 2100 - 3900 m., Thomson (K!); Indus valley, 2100 m., Thomson (K!); Kunawar, Jacquemont (K!); Drummond nos. 1045 (K!), 20187 (K!), 20190 (K!); Sutlej valley, Gamble no. 6135 (K!); Chamba, Parker (K!), Gammie no. 18268 (K!).

Kashmir: Gilgit, Manggah nala, 2100 - 2400 m., Thornley no. 41 (BM!); Skardo, c. 2400 m., Charken no. 30039 A (K!); Shaksgham valley, Clifford no. 39 (K!); Baltistan, Winter-bottom (K!); Ladak, Lamayuru, 3000 m., Ludlow no. 532 (BM!); Ladak, Kohli no. 11 (K!); Ladak, Indus valley, 3000 m., Osmaston (No) 36 (K!); Baltistan, Chutum, 1800 m., Ludlow no. 275 (BM!); Kashmir, M.L. Wathen (K!).

Geog. Dist: S. Europe eastward to Australia.

2. Capparis himalayensis Jafri, sp. nov.

Syn: "C. spinosa var. leucophylla" H.f. et T. in Fl. Brit. Ind. i 173 (1872) - partim [non (DC.) Boiss. Fl. Or. i 420 (1867)]; "C. leucophylla" Collett, Fl. Simlensis, 38 (1902), non DC., Prodr. i 246 (1824).

Affinis C. spinosae L., sed sepalo anteriore maximo ad apicem valde saccato ad basin angustissimo divergit.

Frustrum diffusum, prostratum vel dependens, + pubescens, pilis simplicibus albis + obsitis. Rami elongati tenuiter foliati. Lamina foliorum ovato-suborbiculata, longitudine 1 - 1.25 (- 1.5) - plo majore quam latitudine, ad apicem + acuminata et pungens, integra + pubescens vel subglabra viridis; petiolus 2 - 4 mm. longus + pubescens; spinae stipulares binae recurvatae aurantiacae. Flores axillares solitarii, 3.5 - 5.5 cm. diam. albi majusculi pulchri asymmetrivi. Pedicelli 4 - 9 cm. longi + pubescentes in fructu incrassati. Sepala inaequalia pubescentia anterius maximum 1.7 - 3 cm. longum galeatum ad apicem valde saccatum 0.9 - 1.5 cm. altum ad basin angustissimum. Petala sepalum anterius aequantia vel sublongiora. Stamina numerosissima valde congesta. Fructus et semina ut in C. spinosa L. (Plate no. I.)

Diffuse shrub, prostrate or hanging, + pubescent with simple, soft, white hairs; branches slender, elongated. Leaves simple; lamina ovate - suborbicular, with a l/b ratio of 1 - 1.25 (- 1.5), apex + acuminate and spiny tipped, entire, + pubescent or subglabrous, green; petiole 2 - 4 mm. long, + pubescent; stipules of two hooked, orange-yellow thorns. Flowers axillary, solitary, 3.5 - 5.5 cm. in diam., white, asymmetrical, large, handsome; pedicels 4-9 cm. long, sturdy, + pubescent, thickened in fruit. Sepals unequal, anterior sepal largest, prominently galeate, 1.7 - 3 cm. long, broadest towards the apex, 9 - 15 mm. deep, very narrowed at the base, + pubescent. Petals about as long or slightly longer than the anterior sepal. Stamens indefinite, very congested. Fruit and seeds as in C. spinosa L.

Distinguished from C. spinosa L. by its large, galeate anterior sepal, broadest and deeply saccate towards the apex and narrowing towards the base. In C. spinosa the anterior sepal is broadest near the base. C. spinosa has a wide geographical distribution, from S. Europe



Plate no. I. Capparis himalayensis Jafri

eastward to Australia, while C. himalayensis Jafri is confined to N.W. Himalayas. Also distinguished from C. cartilaginea Decne. - which it resembles closely in the shape of the anterior galeate sepal - by being + pubescent (often densely so), by its diffuse habit, and by not having fleshy, cartilaginous, glabrous, glaucous leaves. C. cartilaginea is confined to the saline habitat of the coastal areas from Karachi, Sind, and Baluchistan westward to Sinai and Egypt. (Map no. 1)

N.W. Himalayas:

(Without locality), Royle(K!); Edgeworth(K!); Sutlej valley, Jacquemont(K!); Tihri-Garhwal, Arakot, Gamble no. 23504 (K!); Jaunsar, Gamble no. 23504 (K!); Pabar valley, Duthie no. 21050 (K!); (without locality), H. Rich no. B224 (K!); Simla hills, Drummond no. 20186 (E!, K!); Garhwal, Jacquemont (K!); (without locality), Falconer (K!); Simla, Sherriff no. 7317 (BM!); Rampur on Sutlej, 900 m., Watt(E!); Chamba state, Gutkar to Chandres khad, 1200 m., Lace no. I606 (E!); Wangtu, 1650 m., Watt no. 3254(E!); (without locality) Watt no. 10135(E!); Simla hills, Parkinson no. 7382(E!); Bashar state, 1950 m., M.V. Laurie no. 5418(E!).

Geog. Dist: Endemic.

3. C. cartilaginea Decaisne in Ann. Sc. Nat. Ser. II. iii 273 (1835); Burt and Lewis in Kew Bull. 299(1949).

Syn: C. galeata Fresen., Beitr. Fl. Abyss. in Mus. Senkenb. ii III (1837 - 1845); B.F.O. 421; R.F.B.P. 903; C. uncinata Edgew. in Journ. Asiatic Soc. Bengal, xvi 1213 (1847); C. spinosa var. galeata (Fres.) H.f. et T. in Fl. Brit. India, i 173 (1872).

Type: Sinai, Bové no. 148 (P, K!).

Prostrate, straggling shrubs, glabrous, glaucous, + fleshy with short, zigzag often twisted branches with short internodes. Leaves ovate, elliptic or orbicular, entire, fleshy or cartilaginous, coriaceous, 2 - 5(-6) x 1 - 5 cm. (excluding 0.5 - 2.5 cm. long petioles), apex entire to subretuse with a strong, usually hooked, yellowish brown spine; stipules spiny, two, hooked. Flowers axillary and solitary, asymmetrical, large, white; pedicels 4-5 cm. long, increasing upto 7 cm. in fruit and becoming thickened, spreading or ascending. Sepals asymmetrical, anterior one about twice as large as the rest, broadest towards the apex, 9 - 16 mm. deep, galeate, very glabrous, often finely striated. Petals almost equal,

usually not exceeding in length the anterior sepal. Stamens very crowded, numerous. Fruits and seeds as in C. spinosa L. (Fig. I. )

W. Pakistan:

Karachi: Rock by sea - salt creeks, Stocks no. 561(K!); (without locality), Vicary (K!).

Sind: (without locality), N.E. Dalzell no. 33(K!);

Baluchistan: Lower Baluchistan, Vicary(K!).

Geog. Dist:

Persian gulf, Quoin island, Cheeseman(K!).

Arabia: Aden, Goldnora valley, W. Lunt no. 297(BM!); Mt. Convallis, Hilderbrandt(BM!); near sea, W. Barbey(BM!); On dry slopes, (without locality), Grüttwell & Soustes no. 41(K!); (without locality), Harland no. 849(BM!); Thomson (K!); S.E. Arabia; Dohfar mts., Th. Bent(K!); Oman, Jayakar no. 16(BM!); Guy Pilgrim (K!); near Zamuk, 1200 m., Popov, Tillin, & Gilliland no. 4226(K!).

Sinai: deserts, Bové no. 148(K!); (without locality), N.A. Dalzell (K!); Shabetai(K!); McDonald(K!);

Red Sea: Haish island, St. Slade(K!).

Egypt: Wadi Halfa, R. Muschler(K!); Balal, R. Muschler(K!); (without locality), Schweinfurth no. 171(K!).

4. C. zeylanica L., Sp. Pl. 2 ed. 720 (1762); Dunn in Kew Bull. 62 (1916); R.F.B.P. 906; Santapau in Rec. Bot. Survey India, II (1953).

excl. syn.

Syn: C. horrida L. f., Suppl. 264 (1781); F.B.I. 178; F.B.P. 48; P.E.P. 176.

Type: Ceylon, Hermann (BM!).

Climbing shrub, generally 6 - 12 ft. high; branches terete, young parts clothed with scarlet-brown rufous tomentum; hairs irregularly branched. Leaves simple, elliptic-oblong, sometimes ovate or obovate, 2.5 - 12 x 1.8 - 7 cm. (incl. 0.5 - 1.5 cm. long petioles), entire, obtuse, acute or mucronate, often  $\pm$  retuse; stipules recurved, about 4 mm. long, yellowish-brown. Flowers supra-axillary, two, sometimes one or three, 1.5 - 2.5 cm. across, usually in a vertical row, the upper most largest and oldest; pedicels 1.5 - 3.5 cm. long, tomentose. Sepals 8-12 x 5-8 mm., subequal, tomentose. Petals 12 - 18 x 5 - 12 mm.,  $\pm$  hairy on the outer surface. Stamens indefinite, filaments about twice as long as the petals;

anthers 1 - 1.5 mm. long. Gynophore 3 - 4.5 cm. long, thickened in fruit. Fruit 2 - 4 cm. in diam., globose, indehiscent, walls thick and strong. seeds many, globose.

W. Pakistan:

Punjab: Karnal, Drummond no. 20201(E!,K!); Khargali, Drummond no. 20202(E!,K!); Indri, Drummond no. 20199(K!); Kalram, Drummond no. 20200(K!); (without locality), J.L. Stewart (E!); Royle (K!).

Sind: Nawabshah, Sabnis no. B56I(ex S.F.S.)

N.W. Himalayas:

Kalesar, c.350 m., Lace no. I2(E!); Kumaon, Bhabar, Strachey & Winterbottom(K!); Dehradun, Gamble no. 26528(K!); and no. 29463(K!); Anderson (E!);

Geog. Dist: India, eastward to Java and Phillipines.

5. C. sepiaria L., Syst. 10 ed. 1071 (1759); F.B.I. 177; F.B.P. 48; R.F. B.P. 906; P.E.P. 176.

Syn: C. incanescens DC., Prodr. i 247 (1824);

Type: India, Koenig ? (LS!).

Climbing, woody, much branched shrub, sometimes forming a dense thorny bush, + pubescent with ashy gray/simple hairs. Leaves simple, elliptic-oblong to ovate, 1.5 - 4(-6) x 1 - 2(-3) cm., obtuse or acute, often retuse, softly pubescent to glabrous; petioles 2 - 5 mm. long, pubescent; stipular thorns 2 - 5 mm. long, hooked brown-black. Umbellate inflorescence 3 - 4 cm. across, 15 - 30 - flowered. Flowers 5 - 10 mm. across; pedicels 1 - 2 cm. long, not thickened in fruit, pubescent. Sepals 3 - 4 x 2.5 - 3.5 mm., subequal, apex rounded. Petals 3.5 - 4.5 x 2 - 2.5 mm., oblong-cuneate, + hairy at the base. Stamens 20 - 30; filaments 5-7 mm. long; anthers about 1 mm. long. Gynophore 6 - 10 mm. long, filiform. Fruit 5 - 10 mm. in diam., globose, smooth, dark coloured when ripe. Seeds few, 1.5 - 2 mm. in diam., dark-brown.

W. Pakistan:

Punjab: Punjab plains (without locality), Watt nos. 423(E!); and 200(E!); J.L. Stewart(E!); Royle (K!); Edgeworth (K!); Madden(K!); Karnal, Drummond nos. 20162(K!), and 20203(K!); Sirsa, Drummond no. 20182(K!); Pathankot, Watt(E!); Ludhiana, Thomson(K!).



Sind : (ex F.B.I.).

Geog. Distt India and Malaya.

Its occurrence in Sind is doubtful. I have not seen any specimen from Sind .

6. C. decidua (Forsk.) Edgeworth in Journ. Linn. Soc. vi 184 (1862);

Muschler, Man. Fl. Egypt i 390 (1912); P.E.P. 180.

Syn: Sodada decidua Forsk., Fl. Aegypt-Arab. 81 (1775); C. aphy-

-lla Roth., Nov. Pl. Sp. 238 (1821); F.B.I. 174; F.B.P. 46;

C. Sodada R.Br. in Oudn. et Clapp 17 (1826); B.F.O. 419;

C. decidua Pax in E.P., Pflanzenfam. (3) 230 (1891); R.F.B.

P. 904.

Type: Arabia, Yemen, Forskhal (C- not seen).

Shrub, often straggling, rarely attaining the size of a small tree upto 10 ft. high; branches smooth, glabrous, green, ending into a sharp end. Leaves present only on young plants or young branches, soon falling off, simple, 4 - 20 x 0.5 - 3 mm. , linear-oblong, acute, usually spiny tipped, subsessile or sessile; stipules 1 - 6 mm. long, straight or slightly curved thorns, yellow or brown. Inflorescence few to many flowered, ebracteate corymbs on short lateral shoots, 1 - 2 cm. long (rarely upto 6 cm. long). Flowers 1 - 2 cm. across, deep red; pedicels 1 - 1.5 cm. long, slender; flower buds pubescent. Sepals petaloid, upper one distinctly saccate, 3 - 6 x 2 - 5 mm. ovate-oblong, concave. + pubescent at the back. Petals about as long as the sepals, anterior ones slightly bigger. Stamens indefinite; filaments 1 - 1.8 cm. long, red coloured; anthers 7 - 1 mm. long. Gynophore 1.5 - 2 cm. long, slender. Fruit subglobose, 1-1.5 x 0.8 - 1.2 cm., slightly beaked, glabrous, smooth, deep red when ripe. Seeds reniform, 2 - 2.5 x 1.5 - 2 mm., brown.

W. Pakistan:

N.W.F.P.: Peshawer, J.L. Stewart (K!); Deane (K!).

Punjab: Lahore, Thomson (K!); (without locality), Jameson (E!); Karnal, Drummond no. 20204 (E!, K!); Hissar, Drummond no. 20188 (E!, K!); and no. 20189 (E!, K!); Kohat, Falconer (K!); Ferozepur, Thomson (K!); Rawalpindi, Aitchison no. 328 (K!); T.A. Sprague no. 70 (K!); near Rawalpindi, Pinfold no. 2 (BM!);

Sind; (ex S.F.S.).

Karachi: Jamadar ka Landa, Stocks (K!); Drig Road waste grounds,

Jafri(E!); Karachi proper, Jafri(E!).

Baluchistan: Sibi, Lace no. 3607(K!); Bugti, W.M. Jeffrey no. 17(K!).

Afghanistan: (without locality), Griffith no. 1432(K!).

Geog. Dist: N. Africa & Orient, India and Trop. Africa.

3. CADABA Forsk., Fl. Aegypt-Arab. 67 (1775); B.H.G.F. 108; B.F.O. 417; F.B.I. 172; P.E.P. 185.

Syn: Stroemia Vahl, Symb. Bot. i 19 (1790); Macromerum Burch., Trav. Afr. i 388 (1822); Stroemia Roxb., Fl. Ind. ii 78 (1832); Mozambe Raf., Sylva Tellur. II2 (1838).

Shrubs, often spreading or climbing, rarely small trees, often branches with sharp apices. Leaves simple or trifoliate. Flowers axillary, solitary, racemose or corymbose, sometimes caducous, pedicellate. Sepals 4, unequal, biseriate, free. Petals 4 rarely 2 or 0, long clawed. Disk-appendix about as long as the petal claw, tubular, often trumpet-shaped, apex + toothed. Stamens 4 - 8, exserted, spreading; filaments on a short androphore or irregularly fused below with the gynophore; anthers oblong, obtuse. Ovary 1-celled, with many ovules on 2 - 4 parietal placentas; gynophore long. Fruit oblong, cylindrical or torulose, coriaceous, indehiscent. Seeds subglobose.

About 30 species mostly in Africa, some in Arabia and Indo-Pakistan sub-continent.

Cadaba, a small genus of about 30 spp., is represented by only two species in the present area. C. fruticosa(L.) Druce is common in the Indo-Pak subcontinent, while C. heterotricha Stocks is known from Sind (W. Pakistan) only. The treatment given to the Cadaba species in the Indian Floras needs a word. Hooker f. and Thomson in Fl. Brit. India (1872) recognized 4 species: the distinction between their C. farinosa and C. indica remained vague, and superficial. They distinguished the two by regarding 5 stamens in C. farinosa and 4 in C. indica. In their note under C. farinosa they mention "Delessert's Icones represents 6 stamens, we find 5 only". Cadaba farinosa Forsk was originally described from Arabia, and I have seen myself six stamens in several Arabian and African specimens, although it varies from 6 - 5, but I have not seen a single flower in Indo-Pak specimens with 6 stamens, although 5 - 4 stamens

have been seen even on the same plant. T. Cooke (F.B.P., 1903) uses the 5 and 4 stamen character in his key to distinguish C. farinosa and C. indica respectively. This key character becomes useless when we find 5 and 4 stamens in flowers of the same plant. Blatter (R.F.B.P. 1927), therefore, merged C. indica and C. farinosa together but wrongly called it C. farinosa. No doubt they all belong to one taxon, but the name given to it was not correct. C. farinosa Forsk. does not occur in the Indo-Pak subcontinent and is centred in Arabia, extending westward to Africa. C. indica Lam. is an invalid name and should be replaced by C. fruticosa (L.) Druce. Filaments in Cadaba usually fuse below with the gynophore in various degrees, and perhaps the variation in number of stamens, 4 - 5, in Indo-Pak specimens and 5 - 6 in Arabian-African specimens may be due to the complete fusion of one of the stamens with the gynophore. It, therefore, appears likely that the Indo-Pak specimens basically have 5 stamens and the Arabian-African specimens 6, - thus the two are no doubt distinct taxa. The other distinguishing character between the two noticed here is the difference in their hairs : C. fruticosa (L.) Druce, the Indo-Pak species, bears one kind of hairs - filamentous ~~and discoid~~, while C. farinosa Forsk., the Arabian-African species, bears two kinds of hairs - filamentous and discoid. This view is also supported by a break in <sup>the</sup> geographical distribution of the above two species. There is no record of any of these two from Baluchistan or Persia, the connecting areas between Indo-Pak subcontinent and Arabia and Africa.

C. heterotricha Stocks is the other species, probably, endemic to Sind (W. Pakistan). This species, which is a tree, is very distinct from C. fruticosa (L.) Druce which is a climbing or spreading shrub. The only record of this species from the present area is Stocks' original collection from Sind (Cape Monze) - a coastal region of W. Pakistan. There is no valid record of it from Baluchistan or Persia, although Boissier (Fl. Or. 1867), and Parsa (Fl. d'Iran, 1952) quote the above mentioned Stocks specimen wrongly under Baluchistan.

In his original description Stocks describes it as, " a small tree 12 - 20 ft. high". Baker [Kew Bull. 329 (1894)] records it from Arabia and the collector's note shows that <sup>the</sup> Arabian plant (W. Lunt no. 74, K!) is a " dense bush , 4 ft. high". For another Arabian plant Popov, Tillin and Gilliland (no. 4216, K!) give the following remarks, " small tree of

about 10 ft. with 6 inches trunk; flowers with 4 white petals, and one yellow." This statement is partly erroneous, because the fifth petal mentioned by them is actually the disk-appendix.

It appears from the above statements that the Sind plants are trees 12 - 20 ft. high, while Arabian plants are bushes about 4 ft. high or attaining the size of small trees about 10 ft. high. I have not seen any living plant, and therefore, it is difficult to say whether the above statements could be of any value or not in distinguishing the plant of Arabia from those of Sind, but certainly the break in their geographical distribution from the connecting regions of Baluchistan and Persia encourages me to keep them as two different taxa until their nature is fully understood. We know that there <sup>are</sup> certain species of plants known which can scarcely be distinguished except <sup>in</sup> the field and with reference to the type of habitat they prefer. The Sind plants are no doubt from saline habitats of the coastal regions of W. Pakistan; while the Arabian specimens do not appear to be confined to the coastal regions

Another interesting character which is noticed for distinguishing the Sind and Arabian plants is their flower and fruit character: in Sind specimens the flowers seem to be very caducous, and the fruits are still unknown, while on the Arabian specimens the flowers seem to be somewhat persistent and fruits have been seen in several cases.

Cadaba is divided into three sections primarily on petals and stamens character. The two species of the present area, C. heterotricha Stocks and C. fruticosa (L.) Druce, fall under one section, Eucadaba Endl., Gen. 892 (1839), and distinguished by its simple leaves, 4 - 6 stamens, and 4, often caducous petals

Key to the species:

- I.(a). Trees; leaves suborbicular ..... I. C. heterotricha  
 I.(b). Shrubs, straggling; leaves oblong, ovate or  
 elliptic ..... 2. C. fruticosa

I. Cadaba heterotricha Stocks in Hooker's Icon. Pl. v. 9. t. 839 (1852); F.B.I. 173; B.F.O. 418; F.B.P. 43.

Type: Sind (W. Pakistan), Stocks (K!).

A small tree, 12 - 20 ft. high, glaucous and pulverulent; branches hoary. Leaves 1.5 - 4 x 1 - 3 cm. (excl. 5 - 10 mm. long petioles), suborbicular, entire, pubescent with minute soft, glandular or branched hairs, apex rounded or slightly retuse. Inflorescence 15 - 30-flowered, ebracteate, corymbose racemes. Flower buds 4 - 6 mm. long, flowers caducous; pedicels 5 - 10 mm. long. Sepals 4 - 6 x 1.8 - 2.5 mm., elliptic-oblong acute. Petals about as long or slightly longer than the sepals, long clawed; limb + orbicular, about as long as the claw. Disk-appendix about 1 cm. long, bilabiate, lower lip truncate, upper elongate, reflexed, 2-3 toothed. Stamens 5; filaments about 1.5 cm. long; anthers 1 - 1.5 mm. long, acute. Ovary ellipsoid, about 3 - 4 x 1 mm.; gynophore 1.5 - 1.8 cm. long; stigma sessile, depressed. Fruits not definitely known.

Known from the type locality only.

2. C. fruticosa (L.) Druce in Rep. Bot. Exch. Club iii @15 (1914); P.E.P. 187.

Syn: Cleome fruticosa L., Sp. Pl. 671 (1753); C. indica Lam., Ency. v (i) 544 (1783); F.B.I. 172; "C. farinosa" H. & A. et T. in F.B.I. 173, and Blatter in R.F.B.P. 901 (non Forsk.); C. farinosa var. dubia Boiss. in Fl. Or. i 418 (1867).

Type: India, ? (LS!)

Shrub, much branched, straggling; branches elongated, smooth, + hairy rarely glabrous; hairs simple, short, multicellular, sometimes gland tipped. Leaves simple, oblong-ovate or elliptic, 2 - 7 x 0.5 - 2 cm. (incl. 3 - 6 mm. long petioles), often conspicuously pubescent below, apex rounded, often retuse, or slightly mucronate. Inflorescence mostly terminal, corymbose racemes. Flowers 1 - 1.7 cm. across; pedicels 1 - 1.8 cm. long, + hairy. Sepals 8 - 12 x 3 - 5 mm., oblong-ovate, acute, + hairy. Petals 10 - 14 x 3 - 4 mm., lamina broadly elliptic or suborbicular, claw 4 - 5 mm. long. Disk-appendix 5 - 8 mm. long, fimbriate. Stamens 5 or 4; filaments + fused below, free and spreading above; anthers about 2 mm. long, deciduous. Gynophore about 15 mm. long. Fruit cylindrical, 2.5 - 6 x 0.2 - 0.3 cm, subindehiscent, slightly torulose, + glandular pubescent. Seeds many, about 2 mm. in diam., sub-globose, brown.

W. Pakistan:

Punjab: (without locality), J.L.Stewart(K!); Sangla hill desert, R.Stewart no. 1465(K!); Hissar, Tusham hills, Drummond nos. 20174(E!,K!); 20173(E!,K!), and 20168(E!,K!).

Sind: (without locality), Stocks no. 590(K!); N.E.Dalzell no. 35(K!).

Geog. Dist:

India: (without locality), Jacquemont(K!); Burhanpur, Duthie no. 10305(K!); Sambalpur, Mooney no. 2330(K!); Bombay, Stocks(K!); (without locality), N.A.Dalzell(K!); Concam, Law (K!); Madras, Griffith(K!); Carnatic, G.Thomson(K!); Kondapolle, Gamble no. 18577(K!); Coimbatore, Wight no. 80(E!); Madras, Wight nos. 58(E!), and 81(E!); Fondichery, Perrottet(E!); Roxburgh (E!); Mysore, Macbold no. 9436(E!); Bombay, V.M.Tilak(E!); Ritchie (E!);

4. MAERUA Forsk., Fl. Aegypt-Arab. 104 (1775); B.H.G.P. 108; B.F.O. 419; F.B.I. 171; P.E.P. 195.

Syn: Niebuhria sect. Crataevaeformes DC., Prodr., i 243 (1824) et sect. Capparaideae DC., l.c. 244; Streblocarpus Arn. in Ann. Sc. Nat. Ser. II 235 (1834); Wiegmannia Hochst. et Steud. ex Steud., Nom. 2 ed. 787 (1841).

Shrubs, climbing or spreading. Leaves simple, usually entire; stipules indistinct or minute. Flowers axillary or terminal, corymbose or racemose. Sepals 4, united at the base into a persistent tube lined by the disk; lobes four, valvate, often deciduous. Petals 0 or 1, caducous, much smaller than the calyx, inserted at the edges of the calyx tube on the disk lining. Torus about as long as the calyx tube, slender. Stamens indefinite, inserted on the torus; filaments often connate at the base, filiform; anthers oblong, obtuse. Gynophore long, slender. Ovary many ovuled, slender; ovules seated on 2 - 4 parietal placentas. Fruit 1 - many seeded, + torulose. Seeds large, subglobose.

About 80 species mostly in Trop. Africa.

It is represented by only two species in the present area. M.arenaria (DC.)H.f. et T., the only species recorded in Fl.Brit. India is confined to the Indo-Pak subcontinent. The other species, M. crassifolia Forsk was recorded from S.W. Baluchistan by Hotson (1918).

Key to the species:

- I.(a). Inflorescence a short, corymbose raceme .....1.M.arenaria  
 I.(b). Inflorescence only one-flowered .....2.M.crassifolia.

I. M.arenaria (DC.) H.f. et T. in Fl. Brit. India i 171 (1872) {cum var.};  
 R.F.B.P. 900; P.E.P. 199.

Syn: Niebuhrria arenaria DC., Prodr. i 244 (1824); N. oblongi-  
-folia Royle, Illust. Bot. Himal. 73 (1839); M.scabra Camb.  
 in Jacq., Voy. Bot. 22 (1844); M. ovalifolia Camb., l.c.22;  
 F.B.P. 41

Type: Peninsula Ind. Or., Wight no. 85(G,K!)

Shrubs, climbing; branches divaricate, glabrous to scabrous  
 with short, simple hairs. Leaves oblong-ovate, 2 - 4.5(-9) x 0.7 - 2.5  
 (-4) cm., entire, apex obtuse, retuse, often slightly mucronate, glabrous  
 or pubescent; petiole 2 - 8 mm. long. Inflorescence corymbose raceme.  
 Flowers greenish-white; flower buds 1 - 2 cm. long, pubescent or glabrous;  
 pedicels (0.5) 1 - 1.5(-2) cm. long, slender, somewhat thickened in fruit.  
 Calyx tube 3 - 8 mm. long; lobes 8 - 14 x 3 - 7 mm., ovate-elliptic,  
 apex acute or slightly acuminate, margin white, pubescent. Petals 4,  
 elliptic, variable in size, 3 - 8 x 2 - 5 mm., acute or slightly acumin-  
 -ate, margin somewhat undulate. Torus about as long or slightly exceed-  
 -ing the calyx tube. Stamens many, inserted on the torus. Gynophore 1.5 -  
 2.5 cm. long. Ovary 3 - 4 x 1 mm., cylindrical, many ovuled; stigma large,  
 sessile, depressed. Fruit 3 - 8 x 1 - 2.5 cm., torulose or irregularly  
 many knotted, pale brown, often twisted. Seeds 5 - 8 mm. in diam., globose,  
 echinate.

W. Pakistan:

N.W.F.P.: Waziristan, J.L. Stewart (K!).

Punjab: Lahore, Changa Manga, Parker no. 3291(K!); Sirsa,  
Drummond no. 20185(K!); Kaithal, Drummond nos. 20163  
 (K!), and 20164(K!); Rewari, Drummond nos. 20191(K!),  
 and 20193 (E!,K!); Gurgaon, Drummond no. 20192(E!,K!);  
 S.E. Punjab, Drummond nos. 20170(E!,K!), and 20171(E!,  
 K!).

Sind: Indus delta, Gulamullah limestone hills, Blatter and  
 McCann nos. D700 to D706 (Herb. St. Xavier's College,  
 Bombay)

Geog. Dist;

India: Rajputana, Marwar, Duthie no. 4513(K!); Agra, Gamble no. 27590(K!); Concan, Law (K!); Otacmund, Wight no. 60(K!); Madras, Gamble nos. I5875(K!), and I8571(K!); Tuticorin, J. Campbell no. 955(E!); Gapa hills, Ritchie (E!); Madras, Gamble nos. I8611(K!), and III07(K!); Vizianagram, J. Campbell (E!); Carnatic, Hooker f. and Thomson (E!,K!).  
Ceylon, Thwaites no. CPI064(K!).

A very variable species. H.f. and Thomson (1872) recognize two varieties under it while Blatter (1927) dropped the idea of varietal differences due the presence of intermediate forms. I have followed Blatter in regarding it as one taxon, except that in my opinion, there is one variety under it - var. Heteroclita (Roxb.) Jafri, vomb. et stat. nov. [Syn; Capparis heteroclita Roxb., Fl. Ind. ii 570 (1832)] in the Circar mts. with narrowly elongated petals and suborbicular leaves. It does not occur in the present area.

Pax and Hoffmann (Pflanzenfam. 1936) give the geog. range for this species as India and Arabia, while Blatter (1927), has rightly excluded the Arabian plants from it. In the absence of any record of it from Baluchistan and Persia I would prefer to follow Blatter.

\*2. M. crassifolia Forsk., Fl. Aegypt-Arab. pages cxiii and I04 (I775); Blatter and Hall. in Journ. Ind. Bot. i 58 (1919); P.E.P. 199. Syn: M. uniflora Vahl; Symb. 361 (1790); B.F.O. 419.

Type: Arabia, Yemen, Forskhal (C - not seen).

Small tree, about 10 ft. high; branches smooth, somewhat virgate, glaucous, often densely leaved. Leaves oblong-ovate, 5 - 15 x 2 - 8 mm., shortly stalked, entire, apex rounded or slightly mucronate, somewhat thick, glabrous or minutely hairy. Peduncles one flowered. Flower bud 7 - 10 mm. long, ovoid, cuneate; pedicels 5 - 8 mm. long. Calyx tube about 4 mm. long, lobes 5 - 6 x 3 mm., oblong-ovate, apex rounded or obtuse, minutely hairy. Petals absent. Stamens many, inserted on the torus. Torus about as long as the calyx tube. Filaments about 1 cm. long, free;



anthers about 1 mm. long, deciduous. Fruits 1 - 6 x 0.6 - 1 cm. lomentose, 1 - 10 seeded, minutely pubescent. Gynophore about 1 cm. long, increasing upto 1.5 cm. in fruit and becoming thickened.

W. Pakistan:

Baluchistan: Nasirabad, W. of Turbat, Hotson no. MI5B (ex Blatter & Hall, l.c.- Herb. St. Xavier's College, Bombay); Hodal pass, S. of Panjgur, Hotson no. MI5B (ex Blatter & Hall. ).

Geog. Dist:

Egypt: Gebel Elba, Shabetai (K!).

Arabia: Omen, Fernandez no. 2435(K!); Aden, M. Defflers no. 64(K!); Mascat, Aucher Eloy no. 4186(K!); Ein Jidi, (Dead sea), Gabrielith no. 2(K!); Hadramaut, W. Lunt no. 16(K!); Rabal Khali, Popov, Tillin & Gilliland no. 4191(K!); Saudi Arabia, N. Buraiman, Trott (K!); Wadi Irma, Popov, Tillin & Gilliland no. 4167(K!).

Palestine: Ghamr-us-Safiyah, J. E. Dinsmore no. 9187(K!).

5. DIFTERYGIUM Decaisne in Ann. Sc. Nat. ser. II iv 66 t. 3 (1835); B.H.G.P. 95; B.F.O. 417; F.B.I. 164; P.E.P. 208.

Syn: Pteroloma Hochst. et Steud. ex Steud., Nom. 2 ed. 343 (1841).

Shrubby with slender bushy branches terminating in short, lax, bracteate racemes, glabrous, glaucous or rarely glandular. Leaves small, somewhat fleshy, shortly petioled or sessile. Flowers minute. Sepals 4, cuneate or abruptly short-clawed. Androphore and gynophore very short, indistinct. Stamens 6, alike (not tetradynamous). Ovary + four winged, the wings + disappearing in fruit, one celled with 1-2 ovules; style elongated, stigma capitate. Fruit indehiscent, small, ellipsoid, often slightly winged, subcoriaceous, 1 - 2 -seeded; seeds not winged.

A monotypic genus with one species in N. Africa & Orient eastward to W. Pakistan.

It was originally described under Cruciferae and the same treatment was given by Bentham and Hooker (Gen. Pl. 1862) and Hooker f. & Thomson (Fl. Brit. India 1872). Boissier (Fl. Cr. 1867) transferred it to Capparidaceae giving the following remarks: "Genus hucusque Cruciferis adnumeratum sed ex observatione amic Prof. a Bunge in Litt. Capparides ob

calycem basi monosepalum, formam et nervationem petalorum, stamina aequalia, albumen tenue, embryonem ut in *Cleome farinoso-oleaceum* adnumeratum, indumentum var. *B. Cleomes* nonnullus refert."

Thus, its *Cleome*-like habit with eglandular or glandular branches, six alike (not tetradynamous) stamens, seed and embryo characters leave no doubt that it belongs to *Capparidaceae*. The same treatment has been given by E.P., *Pflanzenfam.* (1891 and 1936), T. Cooke (F.B. P., 1903), and Muschler (*Fl. Egypt*, 1912) etc. Its fruit superficially resembles ~~more to~~ some of the crucifers/<sup>rather</sup> than any of the *Capparidæ*.

Boissier included it under a separate Tribe- *Dipterygieae*, while Pax (in *Pflanzenfam.* 1891) keeps it under a separate sub-family- *Dipterygioideae*.

*Dipterygium glaucum* Decaisne in *Ann. Sc. Nat. ser. II* iv 67 (1835); B.F.O. 417 (cum var.); F.B.I. 164; P.E.P. 208.

Syn: *Pteroloma Arabicum* Hochst. et Steud. in *Flora*, xxiv I (1841); et Steud., *Nom.* 2 ed. ii 413 (1841);

Type: Arabia, Jidda, Bové (P - not seen).

Shrubs, 15 - 60 cm. tall, glabrous or glandular; branches slender, terete, apparently leafless. Leaves elliptic-oblong, 3 - 10 x 1.5 - 3 mm. (incl. 0.5 - 1 mm. long petioles), sub-fleshy. Flowers minute, on lax, ebracteate racemes. Pedicels 2 - 3 mm. long, filiform. Sepals 1 - 1.5 x 0.5 mm., ovate-oblong, acute, equal. Petals 3 - 4 x 1.5 - 2 mm., ovate, cuneate at the base, apex obtuse or rounded. Stamens 6, alike, about as long as the petals; filaments simple, linear; anthers about 1 mm. long, ovoid. Fruits ellipsoid, 3 - 4 x 2.5 - 3 mm., often slightly winged, subcompressed, indehiscent, mostly one seeded, somewhat crustaceous.

W. Pakistan:

N.W.F.P: near Peshawar, J.L. Stewart (E!, K!).

Punjab: Multan, between Beas and Sutlej, Edgeworth no. 1047 (K!).

Geog. Dist: Arabia, Egypt, Nubia, Eritrea, and Somaliland.

6. \*BUHSEA Bunge in Del. Sem. Hort. Dorpat. 4 (1859); et in Linnaea xxx 752 (1859); B.F.O. 416; P.E.P. 209; Chiovenda, Fl. Somala 79 (1929).

Syn: Cleome sect. Buhsia Baill., Hist. Pl. iii 149 (1872).

Undershrubs, glandular, sticky, with slender erect branches, 20 - 50 cm. tall. Leaves simple, elliptic-oblong to suborbicular, petiolate, glandular. Inflorescence corymbose when young, becoming lax in fruit, + bracteate. Flowers 7 - 10 mm. across, pedicellate. Sepals 4, connate at the base, glandular. Petals 4, clawed with ovate or suborbicular limb. Stamens 6, alike; anthers small, often caducous. Disk short, inconspicuous. Gynophore short. Fruits capsular, indehiscent or rarely slightly dehiscent, unilocular, few seeded; valves very inflated, membranous, glabrous, glandular when young. Seeds large, subglobose or reniform, asperous with short, whitish, simple hairs.

A monotypic genus with one species in W. Asia. Distinguished from Cleome by its very inflated fruits without replum.

Pax and Hoffmann (Pflanzenfam. 1936) include it under a separate sub-family, Buhsioideae. Earlier Boissier (Fl. Or. 1867) included it under the tribe Cleomae. No doubt it is very closely allied to Cleome and comes very near to some species like C. glauca DC. in its habit, asperous seeds, membranous valves and to some extent fruit and flower characters. In this respect Boissier's treatment seems to be justified but the absence of replum in Buhsea keeps it quite distinct from Cleome. Chiovenda (Fl. Somala, 1929) treats Buhsea under a separate tribe of the sub-family Cleomoideae. He divides this subfamily into two tribes- 1. Cleomeae and 2. Buhsieae. The same treatment is given here.

\*Buhsea trinervia (DC.) Stapf in Pol. Exped. ii 38 (1886); P.E.P. 209.

Syn: Cadaba trinervia DC., Prodr., i 244 (1824); Cleome coluteoides Boiss., Diagn. ser. I. 3 (1842); B. coluteoides (Boiss) Bunge in Del. Sem. Hort. Dorpat. 4 (1859); B.F.O. 416; J.E.T. Aitchison in Trans. Linn. Soc. ser. II iii 38 (1888); K.F.U. 13.

Type: Persia, Ispahan, ? (P- not seen).



Under shrubs or large perennial herbs, 30 - 60 cm. tall, erect, glandular; branches short, erect, not spreading. Leaves simple, suborbicular to elliptic-oblong, glandular, 2 - 6.5 x 0.8 - 3.5 cm. (incl. 1 - 2.5 cm. long petioles). Inflorescence bracteate raceme, corymbose above, increasing upto 30 cm. in fruit. Bracts leafy. Flowers about 1cm. across, white or pinkish; pedicels 1 - 1.3 cm. long, glandular. Sepals 3 - 4 x 1 mm., elliptic, acute, glandular. Petals 9 - 10 x 4 - 5 mm., long clawed, limb ovate or orbicular, reticulately veined. Stamens 5 - 7 mm. long; anthers about 0.7 mm. long, oblong, often caducous. Fruits capsular, indehiscent, rarely slightly dehiscent, very inflated, 3 - 5 x 1.5 - 3 cm., shortly stipitate; valves membranous, glandular when young. Seeds 10 - 15, about 3 mm. in diam., subglobose or reniform, dark-brown, asperous with short, whitish hairs. (Plate no. II.).

Afghanistan:

Harirud valley: A perennial with large under-ground root-stock ..... An exceedingly nasty odour is given out from the crushed leaves, Aitchison no. 165 (K!).

Geog. Dist:

Persia: Khorassan, Rechinger f. no. 1366(K!); Keredj, Rechinger f. no. 1171(K!); Between Pescht and Kaswin, Bornmuller no. 6309(K!); Lauristan, M. Bell(K!); Kerman, Bornmuller no. 2039(K!); Yezd, Bornmuller no. 2038(K!); Khorassan, Sykes(K!); N. of Tabriz, Cowan & Darlington no. 791(K!); Between Astrabad and Scahrud, Bunge (K!); Tehran, Kotschy (E!).

Iraq: Baghdad, Aucher Eloy no. 418(K!).

Transcaaspicum region: Aschabad, P. Sintenis no. 92(E!,K!).

7. CLEOME L., Sp. Pl. 671 (1753); B.H.G.P. 105; B.F.O. 410; F.B.I. 168; P.E.P. 210.

Syn: Miambe Adans., Fam. ii 407 (1763); Aleome Neck., Elem., iii 68 (1790); Hemiscola Raf., Sylva Tellur. iii (1838); Stylista Raf., l.c. ii2; Oncufis Raf., l.c. 114.

Herbs or undershrubs, glabrous, glandular, scabrous or aculeolate. Leaves simple or palmately 3 - 9 foliolate; leaflets entire or serrulate. Racemes short or long, bracteate or ebracteate. Flowers small or medio-cre, yellow, white or pink, pedicellate. Sepals 4, free or coherent below, deciduous or persistent, ± spreading, equal. Petals 4, equal or subequal, clawed or sessile, usually entire, imbricate, ± spreading. Torus short, disk-shaped. Androphore very short or absent. Stamens 4 - 12 (rarely more), all or two or more fertile, often subequal, ± declinate, inserted on the torus, free or slightly coherent at the base. Gynophore short or elongated. Ovary one celled with many ovules on two parietal placentas; style present or absent. Capsules usually elongated, linear or elliptic rarely ovate-oblong, sessile or stipitate, one celled, dehiscent with a replum, glabrous or glandular hairy; hairs rarely eglandular; valves membranous or coriaceous; seeds indefinite, reniform to subglobose, glabrous or asperous, smooth or variously rugose.

A large genus with about 200 species in the tropical and subtropical regions throughout the world.

It is represented by only 9 species in the present area. Of these, one is new to science. Two species included under the present area by the previous authors are excluded here for reasons discussed below. Two species, C. rupicola Vicary and C. fimbriata Vicary described by Vicary [Ann. Nat. Hist. ser. II i 425 (1848)] from Sind (W. Pakistan) and also recorded in Index Kewensis, seem to have been overlooked by the authors of Indian Floras. No mention of these species, even as synonyms, is made in any local Floras. C. Rupicola Vicary is conspecific with C. Stock-siana Boiss., but being earlier is the valid name according to the international rules. C. fimbriata Vicary is conspecific with C. quinquenervia DC.

C. Ornithopodioides L. is an addition to the Fl. Brit. India, while C. griffithiana Rechinger f., ~~and~~ C. makranensis Jafri and C. heratensis Bunge et Bien. are added for the first time to the Flora of W. Pakistan.

Hooker f. and Thomson (Fl. Brit. India 1872) include C. noeana Boiss. as a synonym of C. quinquenervia DC., but there is no doubt they

are distinct species, the former having <sup>6</sup>much elongated many - flowered, bracteate raceme. Other characters like the short style (2 + 4 mm. long), and short fruits are more or less similar in both the species. Bracts in both the species show a wide range of variation: from leafy to reduced or almost rudimentary condition; sometimes they may be altogether suppressed. C. noeana has not yet been recorded from the present area. Griffith's specimens from Afghanistan (Herb. East India Co. no. 166), included under C. quinquenervia by Hooker f. and Thomson in Fl. Brit. India, has now been separated as a separate species, C. griffithiana Rechinger f., by Rechinger f. Rechinger's type specimen of this species is in a bad state (Plate no. IV). I have found some more Griffith's specimens from Afghanistan which are better than Rechinger's type specimen. Rechinger's description of the species is incomplete. An adequate description of C. griffithiana is given here from better specimens (plate no. V). This species is distinguished from C. quinquenervia DC. by its robust habit, with an inflorescence 20 - 40 cm. long, fruits elongated and upcurved, pedicels short and thickened. Thus they also differ from C. noeana Boiss. by having robust habit and elongated fruits with thickened, short pedicels. Plate nos. III, IV, V and VI clearly show the differences in the three species, C. quinquenervia, C. griffithiana (plate nos. IV and V) and C. makranensis of the present area. C. makranensis is distinguished from the above two and also from C. noeana by its much elongated style and seems to be confined to the coastal areas of Baluchistan.

Boissier (Fl. Or., 1867) recognizes a var. mollis of C. quinquenervia from Afghanistan. It appears that this variety could form a good species in having soft white hairs. I have not seen any such specimen from Afghanistan and it appears that there is only one record of it in Boiss. Herb. - that of Bunge's original collection on which the variety is based. In the absence of more information it has been included here as a variety only as treated in Fl. Or. (1867).

C. burmanni W. & A. and C. hotsonii Blatter & Hall. are excluded here from the present area.

Whether C. burmanni could form a distinct species from C. aspera N. Gen. or not is an open question. This is distinguished from the latter

mainly on a single character: presence of stipitate fruits. Trimen [Fl. Ceyl. v 56 (1894)] considers it doubtfully distinct from C. aspera, while Blatter (1927) recognizes it as a distinct species. How far the stipitate and the sessile character of the fruit is reliable in Cleome species will be evident from conditions observed in C. ornithopodioides L. Boissier recognized two varieties of C. ornithopodioides : var. a. stipitata and var. B. sessilis, but under the second variety he remarks, "siliqua sessilis vel subsessilis" and further in a note he mentions "formis intermediis transit ad varietatem a." I have seen several intermediate conditions between the two varieties of Boiss. , sometimes even on the same plant ( for example P.H.Davis no.19535 (E!) from Turkey]. In my opinion such varietal distinctions are useless unless they are constant. However this was simply quoted to justify the status of C. burmanni and C. aspera. Regardless of their taxonomic status, these are central and south Indian species. C. burmanni was recorded from Sind by W.Strachan and was reported by Woodrow in 1897 (Journ. Bombay Nat. Hist. Soc. v 123). No one else seem to have seen Strachan's specimen except Woodrow, and the same is evident from Blatter's remark, " I doubt the occurrence of C. burmanni in Sind" (1927). All the local Floras quote Woodrow without having seen the Strachan's specimen. Woodrow merely published a list of Sind and Bombay plants. I have not seen any specimen of C. burmanni from Sind and we really do not know the exact nature of Strachan's specimen which seems to have disappeared from the herbaria, Therefore, under the present circumstances I would prefer to exclude it from the present area.

Another species, C. hotsonii , which is excluded here, was collected from the western extremity of S. Persia (Ispahan hills near Mand) by Hotson during 1918 and was described by Blatter and Hall. (Journ. Indian Botany, 1919) on a single specimen. The taxonomic status of this species is also doubtful. It has been distinguished from C. glauca DC. in having long and narrow fruits (6.5 x 0.25 cm.). This figure is perhaps of one fruit only, but we really do not know the range of variation of fruit size and shape. " Specimens of C. glauca and other allied species are fragmentary in Kew herbarium" [Burt & Lewis in Kew Bull. 300 (1949)]. This remark was made by Burt & Lewis while discussing the problem of C. glauca and the other three allied species- C. oxypetala Boiss., C. stocksiana Boiss. and C. kotschyana Boiss. They suggest that all these might turn out to be one

taxon but due to the fragmentary nature of the herbarium specimens it was difficult to decide. They do not include C. Hotsonii and C. rupicola, which are so closely allied to C. glauca. However, this problem can only be settled when we have sufficient material to study the range of variation. The place 'Mand' from where C. Hotsonii was described is far away from the Baluchistan of W. Pakistan. In the absence of any further records of this species from the intermediate area, I would prefer to exclude it.

Cleome is divided into two sections primarily on the stamen characters and leaves. All the nine species of the present area fall under one section which is further divided into 4 subsections and several series. The present species may be classified under this section as follows:

Sect. Eucleome O.Ktze., Lex. Gen. Phaner. 129(1903); P.E.P. 211.

Stamens all fertile; usually 6 only.

Subsect. 1. Simplicifoliae Pax and Hoffmann l.c. 211

Leaves simple.

1. C. scaposa DC.; 2. C. quinquenervia DC.; 3. C. griffithiana Rechinger f.; 4. C. makramensis Jafri; and
5. C. rupicola Vicary.

Subsect. 2. Foliolosae Pax and Hoffmann l.c. 212.

Leaves palmately compound.

6. C. viscosa L.; 7. C. brachycarpa Vahl.; 8. C. ornithopodioides L., and 9. C. heratensis Bunge & Bien.

Key to the species:

I. Leaves simple:

2. Seeds puberulous ..... 5. C. rupicola

2. Seeds glabrous:

3. Siliquae about 1 mm. broad ..... I. C. scaposa

3. Siliquae 4 - 5 mm. broad:

4. Style 2 - 4 mm. long:

5. Plants about 60 cm. tall; branches elongated, erect, strict; inflorescence 20 - 40 cm. long in fruits; siliquae elongated, tapering towards the apex and attenuated at the base ..... 3. C. griffithiana

5. Plants 15 - 30 cm. tall; branches short, ± spreading;



- inflorescence about 10 cm. long in fruits; siliquae + blunt at the apex and not attenuated .....2. C. quinquenervia
4. Style 9 - 12 mm. long .....4. C. makranensis
- I. Leaves compound, 3 - 5 - foliolate, (uppermost sometimes simple):
6. Stamens 10 or more .....6. C. viscosa
6. Stamens 6 :
7. Annuals:
8. Branches filiform; flowers about 3.5 mm. across; pedicels about 10 mm. long in fruit ..... 8. C. ornithopodioides
8. Branches stout; flowers about 5 mm. across; pedicels 5-6 mm. long in fruits .....9. C. heratensis
7. Perennials .....7. C. brachycarpa.

I. Cleome scaposa DC., Prodr. i 239 (1824); P.E.P. 211.

Syn: C. papillosa Steud., Nom. 2 ed. i 382 (1840); F.B.I. 168; B.F.O. 413; R.F.B.P. 396; C. gacilis Edgew. in Journ. Asiatic Soc. Bengal xvi 1212 (1847); C. linearis Stocks ex T. Anders. in Journ. Linn. Soc. v Suppl. i 3 (1860).

Type: Egypt, ? (G - not seen).

Annual, 10 - 30 cm. tall, erect or suberect, branched mostly from the base, glandular or hairy with glandular or eglandular hairs; branches filiform and slender. Leaves simple, suborbicular to ovate-elliptic, 1.2 - 3.5 x 0.5 - 2 cm. (incl. 0.2 - 2.5 cm. long petioles), papillose, apex obtuse, acute or rounded; lower leaves long petioled; bracts subsessile or sessile. Racemes elongated, lax, bracteate below, increasing upto 20 cm. in fruits. Flowers 3 - 4.5 mm. across, white turning yellowish rarely pinkish; pedicels 2.5 - 4.5 mm. long filiform, sparsely glandular but becoming smooth and elongated upto 10 mm. in fruits. Sepals about 2 x 0.7 mm., elliptic or lanceolate, papillose. Petals 3 - 4 x 0.6 - 1.2 mm., oblong-obovate, clawed. Stamens 6, about 3 - 4 mm. long; anthers about 1 mm. long. Fruits 2 - 3.5 x 0.1 cm., linear, slender, often curved sessile, glabrous or slightly papillose, finely striated, many seeded; style minute; seeds 30 - 65; globose, 0.5 - 0.8 mm. in diam., granulate, glabrous brown-black.

W. Pakistan:

N.W.F.P.: Khairabad, H. Deane no. 61(K!); Peshawar, J.L. Stewart(K!).

Punjab: Kiri golewala, Drummond no. 14590(E!); Tasham, Drummond nos. 20181(E!,K!); 20178(K!), and 20195(K!); Hissar, Nagiana hills, Drummond nos. 20176(E!,K!), 20175(E!,K!), 20179(K!); Kheora, Drummond no. 14632(K!); Ravine below Sakeer, Drummond no. 14507(K!); Attock, Hasan Abdal, Drummond no. 15076(K!); (without locality), J.L. Stewart (E!,K!); Attock, Falconer's collector no. 583/2(K!); (without locality), Edgeworth no. 1007(K!); Rawalpindi, Aitchison no. 573(K!); Sangla hills near Lahore, R.R. Stewart no. 1401(K!); Multan, Edgeworth (K!).

Sind : Boogta hills, Vicary(K!); N.E. Dalzell no. 34(K!);

Karachi : Drig Road, Jafri (E!).

Baluchistan: Lower Baluchistan, J.E. Stocks no. 470(K!).

Geog. Dist: N. Africa, Arabia and Rajputana (India).

2. C. quinquenervia DC., Prodr. i 239 (1824); B.F.O. 415; F.BP.37 and R.F.P. B.P. (excl. geog. dist. to Afghanistan); P.E.P. 211; K.F.U. 16.

Syn: C. fimbriata Vicary in Ann. Nat. Hist. ser. II i 425 (1848); C. pentanervia Aitchison, Catl. Punjab and Sind Plants 9 (1869).

Type: Persia, ? (G - not seen).

Perennial, 15 - 30 cm. tall, branched mostly from the base, suberect or subspreading, hairy with glandular and eglandular hairs; branches short. Leaves simple, ovate, subcordate or suborbicular, 1.2 - 6.5 x 0.6 - 3 cm. (incl. 0.5 - 2 cm. long petioles), glandular, apex obtuse or rounded, palmately 5 - 7 - nerved, entire. Racemes short, about 10 - flowered, increasing upto 10 cm. in fruit, often bracteate. Flowers 5 - 7 mm. across, pale pink; pedicels 2 - 3 mm. long increasing upto 6 mm. in fruit (rarely upto 10 mm.), hardly thickened. Sepals 3 - 4 x 1 - 2 mm., linear, acute, densely glandular. Petals 4 - 6 x 1.5 - 2 mm. oblong, cuneate, acute. Stamens 4, about 6 - 7 mm. long; anthers about

I mm. long. Fruits 1.8 - 2.5 x 0.4-0.5 cm. (excl. 2 - 4 mm. long style), oblong, ellipsoid, apex obtuse, straight or slightly curved; valves rough, glandular hairy. Seeds indefinite about 0.7 - 0.9 mm. in diam., glabrous, finely granulate. (Plate no. III).

W. Pakistan:

Chitral: Reshun, 1950 m. , Toppin no. 670(K!).

Punjab: ?

Sind : Lower hills, Vicary(K!).

N.W. Himalayas:

Kashmir: Gilgit, Roshan, 2100 m. , Giles no. 496(K!).

Geog. Dist:

Persia: Kerman, Bornmuller no. 2036(E!,K!); Between Isfahan and Tehran, Bunge(K!); Isfahan, Aucher Eloy no. 4183 (K!).

Arabia: Aden, J. Ball(E!); Oman, J. Fernandez no. 799(K!).

Var. Mollis Boiss., Fl. Or. i 411 (1867).

Type: Afghanistan, between Tebbes and Herat, Bunge (G- not seen).

Plants softly woolly

Known from the type locality only.

3.\*C. griffithiana Rechinger f. in Ost. Akad. Wissen. nr. II, p.2 (1950).

Type: Afghanistan, Griffith, Herb. East India Co. no. 166 (V - K!).

Perennial, about 60 cm. tall, erect, strict, distantly leaved, pale green, glandular hairy. Leaves + similar as in C. quinque-nervia DC. Racemes 30 - 50 - flowered, ebracteate, increasing upto 40 cm. in fruit. Pedicels short, 3 - 7 mm. long , thickened, subspreading, glandular. Fruits 2' - 3 x 0.4 - 0.5 cm. , linear-oblong, attenuated towards both the ends, curved, apex acute, glandular; gynophore about 1mm. long, thickened; style about 2 mm. long; seeds reniform, brown, 0.6 - 0.8 mm. in diam. (Plate no. IV & V.)

W. Pakistan:

N.W.F.P: Peshawar, J.L. Stewart(K!).

Afghanistan: Khyber pass, 540 m., between Baghon and Barisoat, Griffith no. 1428 (Herb. East India Co. no. 166)(K!);



Plate no. II.

*Buhsea trinervia* (DC.) Stapf



Plate no. III. *Cleome quinquenervia* DC.



Plate no. V.

*Cleome griffithiana* Rech. fil.

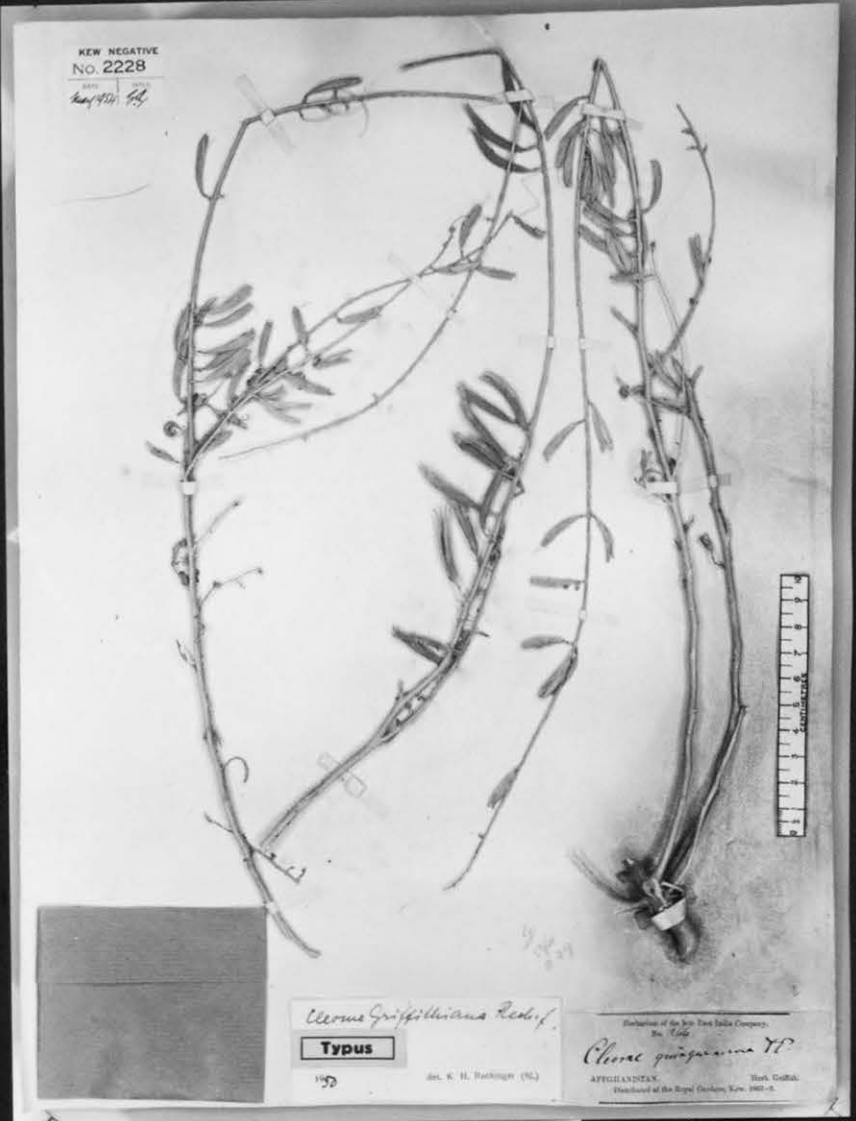


Plate no. IV.

*Cleome griffithiana* Rech. fil.



Plate no. VI. Cleome makranensis Jeffry



Plate no. VII. Cleome heratensis Bunge

Manoo, Griffith, Herb. East India Co. no. 134(K!).

Geog. Dist: Endemic.

4. Cleome makranensis Jafri , sp. nov.

Affinis C. noeanae Boiss., sed styla valde longiore sepalis  
 † persistentibus divergit.

Herba perennis, 15 - 30 cm. alta, erecta, ad basin sparsim  
 ramosa; pilis simplicibus glandulosis et eglandulosis obsita. Folia simp-  
 -licia, inferiora suborbicularia, 2 - 4.5 x 1 - 2.5 cm. (petiolo circa  
 1 cm. longo incluso), 5 - 7 - palmato nervosa, ad apicem rotundata, super-  
 -iora bracteiformia. Racemus 15 - 30 - florus, laxis, elongatus, in fructu  
 15 - 25 cm. longus, bracteatus; bractee † orbiculatae, inferiores brevi-  
 -ter petiolatae vel subsessiles; superiores sessiles vel subsessiles.  
 Flores circa 5 mm. diam., pallide lilacini; pedicelli 3 - 6 mm. longi,  
 in fructu circa 10 mm. longi, divaricati. Sepala 3 - 4 x 1 - 2 mm. ,  
 linearia, acuta, † persistentia. Petala 4 - 6 x 1.5 - 2 mm., oblonga, ad  
 basin cuneata, ad apicem acuta. Stamina quatuor, 5 - 7 mm. longa; antherae  
 circa 1 mm. longae. Fructus 18 - 25 x 4 mm. (stylis 9 - 12 mm. excluso),  
 oblongo - ellipsoideae, acutae vel subobtusae, sub divaricatae plerumque  
 arcuatae; valvae pilis glandulosis vestitae. Semina numerosa, suborbiculata  
 circa 0.7 - 0.9 mm. diam. brunea subgranulata glabra.

Perennial, 15 - 30 cm. tall, erect, sparsely branched below,  
 hairy with glandular and eglandular hairs. Leaves simple, lower ones  
 suborbicular, 2 - 4.5 x 1 - 2.5 cm. (including about 1 cm. long petioles),  
 palmately 5 - 7 - nerved, apex rounded, upper ones bract-like. Racemes  
 15 - 30 - flowered, lax, elongated, increasing upto 15 - 25 cm. in fruit,  
 bracteate; bracts † orbicular, lower ones shortly petiolate or subsessile,  
 upper ones sessile or subsessile. Flowers about 5 mm. in diam., pale  
 lilac; pedicels 3 - 6 mm. long, increasing upto 10 mm. in fruit, spread-  
 -ing. Sepals 3 - 4 x 1 - 2 mm., linear, acute, † persistent. Petals  
 4 - 6 x 1.5 - 2 mm., oblong, cuneate at the base, apex acute. Stamens  
 four, about 5 - 7 mm. long; anthers about 1 mm. long. Fruits 18 - 25  
 x 4 mm. (excluding 9 - 12 mm. long styles), oblong - ellipsoid, acute or  
 subobtuse, subspreading, often upcurved; valves rough and glandular  
 hairy. Seeds numerous, about 0.7 - 0.9 mm. in diam. , suborbicular, brown,

subgranular, glabrous. (Plate no. VI).

W. Pakistan:

Baluchistan: Coast of Baluchistan (Makran), Pierce (K!).

Geog. Dist: Makran,

Persian Baluchistan: Makran, Masjid-e-Sulaiman, A.J.Lee (K!).

Distinguished from C. noeana Boiss. by its very long style (not 2 - 4 mm.) and + persistent sepals.

5. C. rupicola Vicary in Ann. Nat. Hist. ser. II.i 425 (1848); Index Kewensis, fasc. I.560 (1893).

Syn: C. Stocksiana Boiss., Diagn. ser. II i 47 (1853); B.F.O. 414; F.B.I. 169; Index Kewensis, fasc.I 560 (1893); F.B. P. 37; R.F.B.P. 898; P.E.P. 2II.

Type: Sind (W. Pakistan), lower hills, Vicary (K!).

Perennial, 20 - 50 cm. tall, erect or suberect, rigid with woody rootstock; branches spreading from the base, rough, densely glandular especially towards the apex, subglabrous below; glands sessile or subsessile. Leaves simple, broadly elliptic, ovate or obovate, apex obtuse, acute or rounded; lamina 1 - 4 x 0.7 - 2 cm., glandular, usually 3 - nerved, fleshy; petioles upto 4 cm. long; lower leaves long petioled, upper most subsessile. Raceme bracteate below, corymbose above, 15 - 30-flowered, increasing upto 30 cm. in fruit. Flowers 6 - 7 mm. across, pale purple; pedicels 1 - 1.5 cm. long, filiform, glandular. Sepals 1 - 1.5 x 0.5 - 0.7 mm., oblong-elliptic, densely papillose. Petals 4 - 7 x 1 - 1.5 mm., obovate, clawed, often dark veined. Stamens 6, about 4 - 5 mm. long; anthers less than a mm. long. Fruits: 3 - 4 x 0.5 - 0.8 cm., broadly line-ear, flattened, papillose, pendulous, shortly stipitate (stipe about 1 mm. long); valves submembranous, reticulately veined; style short, slightly curved; seeds 20 - 30, about 1.2 - 1.4 mm. in diam., brown, asperous with dense woolly, about 0.5 mm. long, simple hairs (hairs soon falling off or easily removed).

W. Pakistan:

Punjab: Bannu, Drummond no. 15085(K!); Mt. Shaikh Boodeen (near Boodeen), 600 m., J.L.Stewart (K!).

Sind: Boogta hills, Vicary (K!); (without locality), N.A.Dalzell (K!).

Baluchistan: Sibi, Lace (E!); Zahree, Stocks no. 1110(K!).

Afghanistan:

Bolan pass, on limestone rocks, Griffith no. 1426(K!).

Geog. Dist: Endemic

6. C. viscosa L., Sp. Pl. 672 (1753); F.B.I. 170; F.B.P. 39: R.F.B.P.899; P.E.P. 213.

Syn: Polanisia viscosa DC., Prodr. i 242 (1824); C. icosandra L.

l.c. 938; Lagansa alba Rumph. in Herb. Amb. v 180 (1747).

Type: Ceylon, Burmann ? (LS!)

Annual, 10 - 90 cm. tall, branched mostly from the base, hairy with glandular or eglandular hairs rarely subglabrous. Leaves 3 - 5-foliolate, lower ones long petioled, upper most sessile; leaflets elliptic-oblong or elliptic-ovate, very variable in size, usually 2 - 4 x 1.5 - 2.5 cm., acute or obtuse, middle one largest; petioles upto 5 cm. long. Racemes elongated, bracteate. Flowers 0.8 - 1.5 cm. across, white or yellowish; pedicels 0.6 - 2 cm. long. Sepals 2 - 4 x 0.8 - 2 mm., oblong-lanceolate, glandular. Petals 8 - 15 x 2 - 4 mm., Oblong-obovate, reticulate-ly veined. Stamens 12 (rarely more), 5 - 8 mm. long; anthers 1 - 1.2 mm. long. Fruits 3 - 6 x 0.3 - 0.5 cm., erect, linear-oblong, obliquely striated, tapering towards both the ends, + pubescent, slender; style 2 - 5 mm. long; seeds indefinite, about 1 mm. in diam., subglobose, glabrous, transversely striated, ridged, brown-black.

W. Pakistan:

Chitral: Drosh, 1350 m., Cornfields, Toppin no. 631(K!).

N.W.F.P.: Hazara, in fields, H. Deane(K!).

Punjab: Lahore, Hooker f. & Thomson(K!); Karnal, Drummond no. 20167(K!); (without locality), J.L. Stewart(K!).

Sind: (ex S.F.S.)

Karachi: Drig Road, Jafri(E!);

N.W. Himalayas:

Simla, 1800 m., Watt(E!); Hooker f. & Thomson (K!); Collett no. 306(K!); Chamba state, 1500 m., Lace no. 1974(E!); Bash-hr state, 1800 m., Lace no. 1188(E!); Ushan valley, 1050 m., Watt(E!); Dehra Dun, Gamble no. 27034(K!); Kumaon, Sarjo river banks, Strachey & Winterbottom(K!); Kalidongi, Hooker f. & Thomson(K!); Tihri-garhwal, Hooker f & Thomson(K!). Kashmir, Gilgit, Winterbottom(K!); Tawi valley, 900 m., Gammie(K!).



Geog. Dist: Almost throughout the tropical regions of the world.

7. C. brachycarpa Vahl ex DC., Prodr. i 240 (1824); B.F.O. 412; F.B.I. 169; F.B.P. 38; R.F.B.P. 899; F.E.P. 213.

Syn: C. Vahliana Fresen. in Mus. Senckenb. v (2) 110 (1834);  
C. diversifolia Hochst. et Steud in Shed. Ann. (1837);  
C. ruta Camb. in Jacquemont, Voy. Bot. 19 (1844);  
C. moschata Stocks ex T. Anders. in Journ. Linn. Soc. suppl. V. i 5 (1860); C. brachycarpa var. longipetio-  
-lata Sabnis, Fl. Sind in Journ. Ind. Bot. Soc. 4  
 (1924), et var. glauca Blatter & Hall. in Journ. Bomb. Nat. Hist. Soc. xxvi 221 (1918); R.F.B.P. 899.

Type: Arabia, ? (G - not seen).

Perennial, 5 - 50 cm. tall, suberect or erect, viscid-pubescent, rough, sometimes subglabrous or glaucous, branched mostly from below. Leaves 3 - 5 - foliolate, lower long petioled, upper most ternate to simple and subsessile; leaflets 0.5 - 2 x 0.4 - 0.8 cm., oblong, ob-ovate or suborbicular; petiole upto 2.5 cm. long (rarely upto 3.5 cm. long). Racemes lax, bracteate. Flowers 6 - 8 mm. across, yellow; pedicels 1 - 1.5 cm. long, filiform, smooth. Sepals 1.5 - 2 x 0.6 - 0.8 mm., ovate-lanceolate, + glandular. Petals 6 - 8 x 2 - 2.5 mm., ovate-oblong, having a scale-like appendage towards the inner side at the base. Stamens six, 4 - 5 mm. long; anthers about 2 mm. long. Fruits 8 - 10 x 2.5 - 3 mm., oblong, densely glandular with sessile and subsessile glands; style persistent, 2 - 3 mm. long; seeds 20 - 40, about 0.6 - 0.8 mm. in diam., reniform or globose, glabrous, brown-black, finely reticulated.

W. Pakistan:

N.W.F.P.: Peshawar, J.L. Stewart (K!); near Burj Hari Singh, H. Deane no. 87 (K!).

Punjab: Multan, Edgeworth no. 1006 (K!); Lahore, Thomson (K!); Jhelum, Gilla Rahtas, Drummond no. 20197 (K!); Bannu, Drummond no. 15083 (K!); Gujranwala, R.R. Stewart no. 1475 (K!); Ludhiana, Edgeworth no. 125 (K!); Kiri Gole-wala, Drummond no. 14514 (K!); Below Serai S.R., Drummond no. 14577 (E!, K!); Hissar, Drummond nos. 20180 (K!); 20194 (K!), 20196 (E!, K!) and 20198 (K!).

Sind: Hills (without locality), Stocks no. 456 (K!); (without locality), N.A. Dalzell (K!); Boogta hills, Vicary (K!).

Karachi: Hawk's bay, in sands, Jafri(E!); Manora island, Jafri(E!).  
Baluchistan: Coast of Baluchistan, Pierce(K!); (without locality),  
Frere(K!).

Geog. Dist: N.Africa and Arabia. Also in Rajputana (India)..

8. \*C. ornithopodioides L., Sp. Pl. 672(1753); B.F.O. 4II.

Syn: C. iberica DC., Prodr. i 240 (1824); J.E.T.Aitchison in  
 Journ. Linn. Soc. xviii 35 (1880); C. ornithopodioides  
 var. a.stipitata and var. B.sessilis Boiss., Fl. Or. i  
 4II (1867).

Type: Not precisely designated, no. 6 (LS!).

Annual, 20 - 40 cm. or more tall, branched mostly from the base,  
 glandular hairy; branches filiform. Leaves 3-foliate, lower long petiol-  
 -ed, upper most sessile; leaflets 5 - 15 x 3 - 5 mm. , elliptic-oblong,  
 obtuse or acute, sessile, glandular; petioles upto 1.5 cm. long, fili-  
 -form, glandular. Racemes corymbose, becoming lax in fruit, bracteate  
 below; bracts ternate to simple. Flowers 3 - 4 mm. across, white or pink-  
 -ish; pedicels about 1 cm. long, filiform, often violet coloured, smooth.  
 Sepals 0.8 - 1 x 0.4 - 0.5 mm., ovate or suborbicular, acute, slightly  
 connate at the base, glandular. Petals 2.5 - 3 x 0.8 - 1 mm., long clawed,  
 obovate or suborbicular. Stamens six, 3 - 4 mm. long, filaments often  
 violet coloured; anthers about 0.6 mm. long. Fruits 1.8 - 2.5 x 0.15 -  
 0.2 cm. , linear, torulose, finely striated, papillose, ± stipitate,  
 rarely sessile (stipitate 1 - 6 mm. long); seeds 10 - 15, about 1 mm. in diam.,  
 subglobose, finely granulate, brown.

W. Pakistan:

Chitral: Utzum, 1650 m, Toppin no. 747(K!).

N.W.F.P.: Waziristan, J.L.Stewart (K!).

Afghanistan:

N.of Hindukush, Giles no. 185(E!,K!); Kabul, stony hills,  
Collett no.73(K!); (without locality), Griffith no. 1425  
 (K!); Kurrum valley, Harsukh no. 15530(K!); On dry stony  
 hot soil near Shalizan, Aitchison no. 637(K!); Kabul,  
 rocky slopes, 1800 m., W.R.Hay no. 310(K!).

N.W.Himalayas:

Kashmir, Gilgit, Shogot, 1800 m., Giles no. 166(K!);

Bernais, 1800 m. , Giles no. 386(K!).

Geog. Dist: N.Africa, Turkey, Cyprus, Persia and Armenia.

9. C. heratensis Bunge et Bien. ex Boiss., Fl. Or. i 412 (1867); P.E.P. 214.

Type: Afghanistan, Herat, Bunge(G,K!).

Annual, tall, stout herbs, erect, branched, glandular, distantly leaved. Leaves 3 - foliate, lower leaves shortly stalked; upper subsessile; leaflets upto 1 cm. long, obovate or suborbicular, apex rounded, subfleshy, entire, glandular, middle one largest. Racemes 6 - 12-flowered, ebracteate, cymbose. Flowers about 5 mm. across, white or pinkish; pedicels 1.5 - 3 mm. long, increasing upto 6 mm. in fruit. Sepals 2.5 - 3 x 1 mm. , oblong, obtuse. Petals about 5 x 1.5 mm., oblong-lanceolate, acute. Stamens six, 7 - 8 mm. long; anthers about 1 mm. long. Fruits 2.5 - 4.5 x 0.15 cm. , linear-oblong, stipitate (stipe 2 - 3 mm. long); style 1.5 - 2 mm. long; valves finely striated, glandular; seeds many, 1-1.5 mm. in diam., reniform, light brown. (Plate no. VII.).

W. Pakistan:

Baluchistan: Ahmadwal, V.P. Dutta no.5(R - E!).

Afghanistan:

Herat, Bunge(K!).

8. GYNANDROPSIS DC., Prodr. i 237 (1824); B.H.G.P. 106: F.B.I. 170; F.B.P. 40; P.E.P. 217.

Syn: Pedicellaria Schrank in Roem. et Usteri, Mag. 8 Stük.

(1790) (non DC.); Cleome subgen. Gymnogonia et Gynandropsis R.Br. in Obs. Pl. 222 (1826) app.; Podogyne Hoomsgg., Verz. Pfl. 185 (1840); Cleome sect. Gynandropsis Boiss., Fl.Or. i 410 (1867); Cleome sect. Sinapistrum O.Ktze., Lex. Gen. Phaner. 129 (1903).

Annuals, glabrous or pubescent with glandular or eglandular hairs. Leaves 3 - 7 - foliolate, palmate. Racemes bracteate, elongating conspicuously in fruit. Flowers white or purple, pedicellate. Sepals usually four, free, spreading, often deciduous. Petals usually four, imbricate, obovate, clawed. Torus hemispherical or elongated. Stamens six, normally all fertile; filaments long, inserted on a long or short

androphore, coherent at the base, subequal. Gynophore present, usually short. Ovary many ovuled; style short or long with capitate, + bilobed stigma. Fruit capsular, elongated, linear, subcompressed, bivalved, dehiscent. Seeds reniform or suborbicular, rugose or tuberculated, brown.

About 20 species in the tropical regions throughout the world but chiefly in S. America.

Gynandropsis gynandra (L.) Briq. in Ann. Cons. Jard. Bot. Geneva xvii 382 (1914); P.E.P 218; Y.S. Murty in Journ. Ind. Bot. Soc. xxxii (3) 108 (1953).

Syn: Cleome gynandra L., Sp. Pl. 671 (1753); C. pentaphylla L., Sp. Pl. 2 ed. 938 (1762); B.F.O. 410; G. Pentaphylla (L.) DC., Prodr. i 238 (1824); F.B.I. 171; F.B.P. 40; R.F.B.P. 900.

Type: Not precisely designated.

Annual, 10 - 80 cm. tall, erect or suberect, branched, + hairy with glandular or eglandular hairs, sometimes subglabrous. Leaves 3 - 5 - foliolate, very variable in size, petiolate; leaflets 1 - 5 x 0.5 - 3 cm., lanceolate or elliptic-ovate, obtuse, acute or slightly acuminate, hairs prominent on veins, margin finely crenate to subentire; petioles 1 - 10 cm. long. Racemes bracteate, increasing considerably in length in fruits, corymbose above. Flowers 1-2 cm. across, mostly white; pedicels 0.5 - 2 cm. long; bracts mostly 3 - foliolate, shortly stalked or sessile. Sepals 2 - 5 x 1 - 1.2 mm., lanceolate, glandular. Petals 9 - 20 x 4 - 10 mm., obovate, long clawed. Stamens usually about 10, very variable in size, 5 - 15 mm. long; filaments inserted on a long gynandrophore (5 - 20 mm. long), often purple coloured; anthers 1.5 - 2 mm. long. Gynophore short in flower, increasing upto 2 cm. in fruit. Fruits 1.5 - 6.5 x 0.15 - 0.4 cm., linear, narrowed towards both the ends, viscid-pubescent, finely and obliquely striated; seeds many, about 1 - 1.2 mm. in diam., muricate, dark-brown.

W. Pakistan:

N.W.F.P.: Hazara, Hilkota, Saran range, Inayat (K!); Hazara, H. Deane (K!);

Punjab: Lahore, Thomson (K!); Rawalpindi, Fattahjung, Aitchison no. 327 (K!); Karnal, Drummond nos. 20160 (K!); 20166 (K!); and 20165 (K!); S.E. Punjab,

Drummond no. 20172(K!); (without locality), Royl(K!);  
Watt(E!); Rawalpindi, Schlagintweit (BM!);(without loca-  
-lity), J.L.Stewart(E!).

Sind:(ex S.F.S.)

Karachi: Drig Road, Jafri(E!); Karachi proper, Jafri(E!).

Afghanistan:

Bolan pass, Griffith no. I429(K!).

N.W.Himakayas:

Simla, Drummond no. 20183(K!); Barogh, H.Rich no. 402(K!);  
(without locality), Lace no. 962(E!).

Geog. Dist: A common weed in the tropics.

C R U C I F E R A E

## C R U C I F E R A E

Cruciferae B. Jussieu in Hort. Trianon (1759) et ex A. L. Juss.,  
Gen. page lxvii et 237 (1789); Adans., Fam. ii 409 (1763).

Annual to perennial herbs, rarely woody. Leaves spirally arranged, exstipulate, basal often rosulate. Hairs various to absent. Inflorescence usually corymbose. Flowers hermaphrodite, hypogynous, usually actinomorphic, pedicellate. Sepals 4, erect-closed to spreading-open, in two decussate pairs. Petals 4 (rarely suppressed), alternating with the sepals, free, often distinctly clawed, white, lilac, yellow or purple. Stamens 6 (sometimes 4 or 2 or even 1 due to suppression) rarely more; outer pair short and inner four long; filaments sometimes toothed or appendaged; anthers short or long, usually ditheous and fertile. Lateral nectariferous glands (at the base of the two outer, short stamens) almost always present, various; median present or absent. Ovary syncarpous, usually 1-2-celled or with 2 - many superimposed cells, 1-many ovuled on two parietal placentae; septum false being formed by the placental outgrowths; style single, short or long, sometimes absent; stigma often capitate, entire to bilobed. Fruits short or long (generally called siliqua or silicula), dehiscent or indehiscent, usually opening from below by two valves which leave the seeds attached to a frame work consisting of placentae and adjacent wall tissue (replum) and the false septum, sometimes breaking transversely into one to few seeded cells, rarely seeds also developing in an indehiscent beak below the style or stigma. Valves membranous to coriaceous and thick, plane or inflated, sometimes keeled, winged or appendaged, glabrous or hairy, with 1-many parallel veins. Seeds 1 - many in 1-2 rows in each cell, sometimes winged, smooth to granular or reticulated, rarely longitudinally striated, sometimes mucous when wet, non endospermic. Radicle accumbent (when it is bent round so as to lie along the edges of the cotyledons) or incumbent (when it lies on the face of one cotyledon); cotyledons narrowly linear to spatulate, sessile or stalked.

About 350 genera with about 2500 species, mostly in temperate regions.

Key to the 10 tribes

1. Fruits + beaked or biarticulated .....Tribe.I. Brassicaceae
1. Fruits neither beaked nor biarticulated(rarely with false beak-like apex):
  2. Fruits laterally compressed contrary to the septum (angustiseptate) (globose or ellipsoid and many seeds in Cochlearia) .....  
 .....Tribe.II. Lepidicaceae
  2. Fruits broadly septate(latiseptate) not <sup>compressed</sup> contrary to the septum:
    3. Fruits nut-like, indehiscent; valves spongy or thick .....  
 .....Tribe.III. Euclidicaceae
    3. Fruits dehiscent or transversely breaking:
      4. Radicle accumbent:
        5. Fruits short, siliculae( sometimes long siliqua-like in Lunaria, Ferretia and Draba ) :
          6. Septum cells with parallel walls(+ rectangular):
            7. Hairs simple or absent.....Tribe.IV. Lunariaceae
            7. Hairs stellate.....Tribe.V. Alysicaceae
          6. Septum cells not with parallel walls (+ polygonal)...  
 .....Tribe.VI. Drabaceae
        5. Fruits long, siliquae ( sometimes short in Rorippa ) :
          8. Sepals + spreading, open .....Tribe.VII. Arabicaceae
          8. Sepals erect, closed .....Tribe.VIII. Matthiolicaceae
  4. Radicle incumbent(sometimes accumbent in Cheiranthus, Erysimum and Camelina):
    9. Sepals erect; siliquae often quadrangular, sometimes breaking transversely .....Tribe.IX. Hesperidaceae
    9. Sepals + spreading or suberect; fruits(mostly siliquae) always dehiscent .....Tribe. X. Sisymbriaceae.



Tribe I. Brassicae Hayek in Beih. Bot. Centralbl. xxvii, 254  
(1911); S.P. (70) 1919, et (84) 1923; S.E.P. 320

Lateral nectariferous glands cubical or subprismatic, apex truncate, sometimes subbilobed or orbicular; median often long, subglobose or stalk-like, rarely abortive. Hairs simple or absent. Stamen filaments very rarely appendaged (Crambe). Stigma capitate or bi-lobed, rarely with long decurrent lobes. Fruit commonly a siliqua usually with a distinct closed beak containing one or more seeds; pods usually <sup>†</sup> biarticulated with upper and lower parts dissimilar, indehiscent or dehiscent, very variable; cotyledons longitudinally folded or bent round the incumbent or accumbent radicle.

Key to the subtribes:

1. Median nectariferous glands always present, often elongated, laterals subcubical or abruptly conical or bilobed. Upper part of the fruit (and often beak) seed bearing. Seeds often reticulately alveolate, or granulate, not winged:
  2. Fruits (Siliquae) elongated, hardly (not) biarticulated .....  
..... 1. Brassicinae.
  2. Fruits often short, usually distinctly biarticulated:
    3. Stigma depressed - capitate. Anthers obtuse:
      4. Cotyledons longitudinally conduplicate, cordate, reniform or broadly oblong ..... 2. Raphaninae.
      4. Cotyledons bent round the incumbent or accumbent radicle, oblong or linear, often replicate ..... 3. Cakilinae.
    3. Stigma <sup>†</sup> - conical with two decurrent lobes. Anthers acute or/

- or acuminate ..... 4. Zillinae.
1. Median nectariferous glands usually absent, laterals semi-circular. Upper part of the fruit (represented by a short beak only) sterile. Seeds often winged or granulate:
5. Seeds broadly winged ..... 5. Savignyinae.
5. Seeds usually very narrowly winged (rarely neither winged nor granulate) ..... 6. Moricandiinae.

The 13 genera of the present area belonging to the tribe Brassicaceae are classified as follows under the 6 subtribes:

Subtribe (a) Brassicinae Hayek, Fl. Steirermark i, 548 (1909) et in Beih. Bot. Centralbl. xxvii, 256 (1911); S.P. (70) 20 (1919); S.E.P. 320.

1. Brassica L.; 2. Sinapis L.; 3. Diplosaxis DC.;  
4. Eruca Mill.

Subtribe (b) Raphaninae Hayek, Fl. Steirermark i, 555 (1909) et l.c. 260; S.P. (70) 190 (1919), S.E.P. 346.

5. Raphanus L.; 6. Crambe L.

Subtribe (c) Cakilinae DC. emend. O.E. Schulz in Pflanzenreich (84) 7.(1923); S.E.P. 366.

7. Erucaria Gaert.

Subtribe (d) Zillinae DC. emend. O.E. Schulz in Pflanzenreich (84) 29 (1923); S.E.P. 371.

8. Physorrhynchus Hooker f.; 9. Fortuynia Shutt.

Subtribe (e) Savignyinae Hayek in Beih. Bot. Centralbl. xxvii, 277 (1911); S.P. (84) 56 (1923); S.E.P. 383.

10. Savignya DC.

Subtribe/

Subtribe (f) Moricandiinae Hayek, Fl. Steiermark, 1. 547 (1909),  
et in Beih. Bot. Centralbl. xxvii, 279 (1911); S.P.  
(84) 63 (1923); S.E.P. 387.

11. Moricandia DC.; 12. Douepia Camb.;  
13. Conringia Adamson.

Key to the 13 genera of the tribe I. Brassicae:

1. Fruits distinctly biarticulated, usually indehiscent:
  2. Only upper part of the fruit seed-bearing:
    3. Upper part of the fruit unilocular, 1 - seeded ...6. Crambe
    3. Upper part of the fruit bilocular, 2 - many seeded:
      4. Fruit (upper part) elongated, siliqua - like; 2 - many  
seeded, seeds 1 - seriate ..... 5. Raphanus
      4. Fruit (upper part) broad, silicula - like 2 - 4 seeded;  
seeds 2 - seriate:
        5. Upper part of the fruit globose, not winged 8. Physorrhynchus
        5. Upper part of the fruit flattened, broadly winged .....  
..... 9. Fortuynia
  2. Both upper and lower parts of the fruit seed-bearing .....  
..... 7. Erucaria
1. Fruits obscurely (or not) biarticulated (simply <sup>†</sup> beaked):
  6. Fruit silicula; seeds broadly winged .... 10. Savignya
  6. Fruit siliqua; seeds obscurely or not winged:
    7. Seeds biseriate in fruit:
      8. Siliquae tetragonal; beak prominent, flat, sabre  
shaped ..... 4. ErUCA
      8. Siliquae compressed; beak slender ... 3. DipLOTaxis
    7. Seeds uniseriate in fruit (rarely 1 - 2 - seriate in  
Moricandia)/

Moricandia)

9. Siliquae subcylindrical; beak distinct, often elongated, 0 - 3 - seeded:

10. Valves with 1 mid-vein ..... 1. Brassica

10. Valves with 3 - 7 - parallel veins .....

..... 2. Sinapis

9. Siliquae compressed - tetragonal; beak short (style-like) sterile:

11. Stigma large, conical, bilobed with

decurrent lobes ..... 12. Doenepia

11. Stigma short, capitate or sub<sup>b</sup>bilobed:

12. Annuals or biennials; ovary 12-30 (50)

-ovuled ..... 13. Conringia

12. Perennials; ovary 40-200 ovuled .....

..... 11. Moricandia

BRASSICA L., Sp. Pl. ii, 666 (1753); B.F.O. 390; S.P. (70), 21 (1919); S.E.P. 321; K.F.U. 459.

syn: Rapa Miller, Dict. ed. 8. n. 3. (1768);

Mutarda Bern., Syst. Verz. Pfl. Erfurt, i. 184 (1800);

Guenthera Andr. in Besser; Enum. Pl. Volhyn. 83 (1822);

Melanosinapis Schimper et Spenner in Spenner, Fl. Feiburg.

iii. 944 (1829); Brassicastrum Link, Handle ii. 318 (1831);

Brassicaria Pomel, Mater. Fl. Atlant. 15 (1860); Nasturtiopsis

Pomel, l.c.

Annual, biennial or perennating; glabrous or hairy with simple, often setaceous hairs. Root slender or tuberous: Branches erect or sub-erect/

sub-erect. Leaves alternate, lower rarely rosulate, petiolate or sessile, lyrate, cuneate or amplexicaule. Racemes usually short corymbose. Flowers mediocre, yellow rarely white; pedicels increasing in length in fruit, often slightly thickened and spreading. Sepals subequal; outer oblong obtuse; inner ovate, saccate at the base, sub obtuse. Stamens 6; filaments simple, narrowly linear; anthers ovate-oblong, obtuse or acute. Nectariferous glands green in colour, laterals abruptly prismatic, often small; median sub-globose, oblong, filiform, sometimes large up to 0.75 mm. long. Gynophore present or absent in fruit. Ovary cylindrical, 5 - 45 - ovuled. Siliquae linear or oblong, cylindrical, rarely subcompressed, often torulose, beak usually conical, rarely cylindrical or filiform, 0 - 3 seeded; valves with a prominent mid-vein; style long or short with a prominent capitate, sub-bilobed stigma; seeds uniseriate, globose or rarely ovoid, brown, finely alveolate; septum complete, hyaline, often somewhat thickened between the seeds.

About 40 species mostly in the Mediterranean region; usually calcicolous.

Out of the seven species of Brassica of the present area only two, B. tournefortii Gouan, and B. deflexa Boiss. are found wild, while the remaining five, B. napus L., B. rapa L., B. oleracea L., B. juncea (L.) Czern. et Coss. and B. nigra (L.) Koch., are cultivated though some of them are sometimes found as escapes.

The following statement clearly shows the taxonomic difficulties encountered in dealing the the infra specific races of the species of Brassica/

Brassica: "An important genus including many vegetables and crop plants and taxonomically very difficult because of the multitude of closely related races." (Clapham et al, Fl. Brit. Isles 147 (1952)).

The taxonomy of B. napus L. and B. rapa L. and B. campestris L. has always been confusing, especially with the earlier taxonomists from whom they received different treatments. In most of the Indian Floras only one species, B. campestris L., was recognized while the other two B. rapa and B. napus were given infra-specific ranks, either as varieties or sub-species. With the increased knowledge of cytology and experimental taxonomy, the modern taxonomist is inclined to recognize B. napus L. and B. rapa L. (including B. campestris L.) as distinct species; the former with  $2x = 38$  (57 and 76 in other cultivated races) as the somatic chromosome numbers and the latter with  $2x = 20$  (and 40).

The taxonomic status of B. rapa L. and B. campestris L. is still not very clear. Boissier's Fl. Orientalis, although published in 1867, treats B. rapa L. and B. napus L. as distinct species and includes B. campestris L. as the synonym of the former - this view is still the most modern view except that B. campestris L. is usually regarded as a sub-species or variety of B. rapa L.

O.E. Schulz [Pflanzenreich (70) 45 (1919); and Pflanzenfam. (17b) 327 (1936)] recognizes B. campestris L. as the specific name instead of B. rapa L., and treats the latter as a variety of the former. It is beyond the scope of the present work to decide which one of the two specific names should be given to the components of this group which have similar chromosome numbers and resemble each other in other characters except that B. campestris L. has a non-tuberous root.

It/

It is perhaps due to agricultural convenience that the name B. rapa L. is commonly recognized by the modern taxonomists to distinguish the turnips from B. napus L. which represents the rape group: the former with tuberous roots and the latter with non-tuberous roots, with certain exceptions in each case, in addition to the other distinguishing characters. I have, therefore, preferred to recognize the name B. rapa L. (Komarov's Fl. U.R.S.S. viii (1939) recognizes all the above three <sup>n</sup>Linean species as distinct.)

B. napus L. has a variety napobrassica (L.) Rechb., commonly known as 'Swede', which may sometimes be confused with B. rapa, but a careful observation will easily distinguish it by the presence of a tuberized stem base - the epicotyledonary neck. Similarly B. rapa L. has a variety campestris (L.) Peterm. (syn: B. campestris L.) with a non-tuberous root, but a slightly distinct inflorescence, different chromosome numbers (than in B. napus L.) and certain other characters to distinguish it from B. napus L. with which it may be confused apparently.

No attempt has been made here to separate all the infra-specific races of the above two species cultivated in the present area, primarily due to the lack of enough herbarium specimens. B. trilocularis (Roxb.) H. f. et T. and B. quadrivalvis H. f. et T. (Journ. Linn. Soc. Bot. v. 17 (1861); and Fl. Brit. India, i. 156 (1872)) are nothing but monstrous varieties of B. napus L.

Another species, B. deflexa Boiss., badly needs a word. It was described by Boissier in Ann. Sc. Nat. p. 87 (1842) when he quoted only one specimen (the type: Ancher Eloy no. 229 from Syria) under it. At the same time he described another new species, B. tigridis/

B. tigridis from Mesopotamia based also on a single specimen (Ancher Eloy no. 227), but later on in Fl. Orientalis he reduced it to the varietal rank of B. deflexa Boiss. Boissier and Haussknecht in Boissier's Fl. Orientalis (p. 389) doubtfully described a species as Erucastrum? lasiocalycinum based on one gathering collected by Haussknecht from Aleppo (Syria) and primarily distinguished it by its long siliquae and thickened pedicels and short beak. Schulz (Pflanzenreich (70) 64 (1919)) reduced it to the varietal rank of Brassica deflexa Boiss. At the same time he also regarded B. tigridis Boiss. as conspecific with B. deflexa Boiss. Recently Rechinger fil. et al. (Phyton. iii. 44 (1951)) described a new species B. iranica, distinguishing it from B. deflexa Boiss. by its short thickened pedicels and shorter fruits.

Careful examination of all the specimens accumulated at Kew of B. deflexa Boiss. and the other so-called allied taxa mentioned above, reveal that they are nothing but states of a single species, B. deflexa Boiss.

Herbarium specimens of fourteen different gatherings present at Kew were examined carefully. This also included all the above mentioned so-called allied taxa of B. deflexa Boiss. Table No. II shows the variation range of all the characters recognized by other authors to distinguish their so called taxa from B. deflexa Boiss:

1. Length of siliquae; 2. length of pedicels; 3. pedicels thickened;
4. pedicels not thickened, and 5. pedicels slightly or doubtfully thickened.

In several specimens the fruits and pedicels are immature, and it is therefore difficult to say whether they are going/



TABLE NO. II

B. deflexa Boiss., showing the intraspecific variation in the size of siliquae, length and thickness of pedicels.

Specimen (Herb. Kew!).	Length of Siliquae in cm.	Length of Pedicels in mm.	Pedicels thickened	Pedicels not thickened	Pedicels slightly or doubt- fully thickened
<b>A. Syria:</b>					
1. <u>Aucher Eloy</u> No. 229.-	4.5-5.2	12-20	-	+	-
2. <u>Gaillardot</u> No. 1989.-	-	6-8	-	-	?
3. <u>Montbret</u> - (i)	5.2	12-20	-	-	+
(ii)	6.5	18	-	-	+
(iii)	7.2	20	-	-	+
4. <u>Hausknecht</u> -	4.8-6.4	7-12	+	-	-
<b>B. Arabia:</b>					
5. <u>Dickson</u> No. 407 -	-	8?	-	-	?
6. <u>Dickson</u> No. 179 -	-	8?	-	-	?
<b>C. Iraq (Mesopotamia):</b>					
7. <u>Aucher Eloy</u> No. 227 -					
(i)	3.5-5	10	-	-	+
(ii)	3.5-5	15	+	-	-
<b>D. Iran (Persia):</b>					
8. <u>J. Bornmüller</u>					
No. 2236 (i)	5?	5?	-	-	?
(ii)	5?	10?	+	-	-
9. <u>Stapf</u> -	3.5	5-10	-	-	?
10. <u>A.C. Trott</u> No. 1147	3.5?	6-10	-	-	?
<b>E. Afghanistan:</b>					
11. <u>Griffith</u> -	3-3.5?	10-14	-	-	+
<b>F. Baluchistan:</b>					
12. <u>Stocks</u> No. 745 -	4-6.5	4-12	-	-	+
13. <u>Stocks</u> No. 834	4?	4-14	+	-	-
<b>G. Parsian - Baluchistan</b>					
14. K. H. <u>Rechinger</u> F. No. 4065	3.8-5	6.12	+	-	-

going to have thickened or not-thickened pedicels, long or short fruits, but from the above table it is quite evident that there is almost continuous range of variation in all these characters and none of the characters is correlated with any of the geographical regions. Therefore, separation of even infra-specific divisions can serve no useful purpose.

Brassica L. is divided into three sections (Pflanzenf. 322 (1936)). The seven present species fall into the following two sections:

Sect. Brassicotypus Dumortier, Fl. Berg. 122 (1827); S.P. (70) 22 (1919); S.E.P. 322 - Ovary 9 - 45 - ovuled. Siliquae large; beak short or long, conical, often about as thick as the pod:

1. B. oleracea L; 2. B. napus L., 3. B. rapa L., 4. B. juncea (L.) Czern. et Coss. ; 5. B. tournefortii Gouan; 6. B. deflexa Boiss.

Sect. Melanosinapis (DC.) Boiss. Fl. Or. i. 390 (1867); S.P. (70) 75. (1919); S.E.P. 330. Ovary 5 - 11 (rarely 16) ovuled; Siliquae minute; beak minute: 7. B. nigra (L.) Koch.

Key to the species:

1. Upper stem-leaves stalked or narrowed into a stalk-like base:
  2. Flower-stalks usually equal or shorter than the sepals; beak of the siliquae 3 - 4 (5) mm. long
    3. Pedicels in fruit erect,  $\pm$  appressed ..... 7. B. nigra
    3. Pedicels in fruit spreading, often deflexed .. 6. B. deflexa
  2. Flower-stalks longer than the sepals; beak of the siliquae 6 - 16 mm. long (rarely shorter):
    4. Lower leaves lyrate - pinnatifid, sparsely bristly; beak

- 6-10 mm. (rarely 4-5 mm.) long, narrower than the stigma at its tip ..... 4. B. juncea
4. Lower leaves runcinate - pinnatifid, ciliate and densely bristly beneath; beak 10-16 mm. long, as wide as the stigma at its tip ..... 5. B. tournefortii
1. Upper stem-leaves rounded or deeply cordate at the base, often broadened and <sup>+</sup> claspig the stem, sometimes narrowed at the base but with convex margin:
5. All leaves glabrous; middle and upper stem-leaves never clasping more than 1/3 of the stem; filaments of all stamens erect ..... 1. B. oleracea
5. Lowest leaves always <sup>+</sup> bristly or ciliate hairy; middle and upper stem leaves at least clasping 1/2 of the stem; filaments of outer stamens curved at the base:
6. All leaves glaucous; buds slightly overtopping the the open flowers; petals pale yellow or buff .....  
..... 2. B. napus
6. Lowest leaves green; open flowers overtopping the buds; petals bright yellow ..... 3. B. rapa

1. B. oleracea L., Sp. Pl. ii. 667 (1753); S.P. (70) 27 (1919); R.F.B.P. 297; K.F.U. 460.

syn: Napus oleracea Schimp. et Spenn., Fl. Friburg. iii. 939 (1829); Crucifera brassica Krause in Sturm. Fl. Deutschl. ed. 2. vi. 135 (1902).

Type: Not precisely designated.

Key to the varieties:

1. Racemes congested, fleshy and abbreviated, <sup>+</sup> covered with leaves/

leaves ..... 2. botrytis

2. Racemes elongated, not fleshy or covered with leaves:

3. Stem subglobosely thickened at the base of the lower leaves

..... 4. gongyloides

3. Stem not subglobosely thickened:

4. Stem abbreviated, erect with a dense head of leaves

before flowering ..... 3. Capitata

4. Stem <sup>†</sup> decumbent, without a dense head of leaves .....

..... 1. oleracea

Var. 1. oleracea

Biennial or perennial, 60-150 cm. tall with a strong but not tuberous tap root and a thick <sup>†</sup> decumbent stem with conspicuous leaf scars below. Lower leaves large up to 40 cm., stalked, lyrate - pinnatipartite, strongly white veined; terminal lobe very large, suborbicular or ovate, often obscurely 5-lobed, apex rounded margin crennate and undulate, base <sup>†</sup> obliquely cordate; lateral lobes 3-5-paired, much smaller, obovate, recurved; middle cauline leaves amplexicaule, oblong - obovate, obtuse, broadly denticulate; upper leaves oblong - linear, subentire or entire, clasping about 1/3 of the stem; all leaves fleshy, glabrous, glaucous. Racemes 20-40-flowered, ebracteate, sub-corymbose with buds overtopping the opened flowers, increasing up to 30 cm. (or more) in fruits. Flowers 10-16 mm. across, pale yellow; pedicels 6-8 mm. long, increasing up to 20 mm. in fruit. Sepals 8-11 x 2-3 mm., erect oblong, subequal, obtuse. Petals 15-20 x 4-6 mm., obvate, clawed, apex/

apex rounded. Stamens 10-11.5: 12-13 mm.; anthers 3-3.5 mm., oblong - linear, sub-obtuse. Siliquae 5-10 x 0.4-0.5 cm., linear subtetragonal sessile or on 1-3 mm. long gynophore; beak with 4-6 (-10) mm. long, 1-seeded; valves firm, with a prominent midrib, and faint reticulate venation, glabrous; seeds 15-20 in each loculus; about 1.5-2.5 mm. in diameter globose, grey-brown, finely alveolate; septum not veined. "2n = 18 (18,36,72 in cultivated races)."

There are several cultivated races of this species which agree with the wild species (probably native of Europe) in flowers and fruit character but vary widely in vegetative morphology. The following varieties are commonly cultivated almost throughout the present area:

Var. 2 botrytis L. subvar. cauliflora (Gars.) DC., Syst. Nat. ii 586. (1821).

Syn: B. Cauliflora Gars., Fig. Pl. Anim. Med. t. 179 (1764).

Type: not precisely designated.

Popular name:- Cauliflower.

vern. name, "Phul Gobhi"

Stems annual. Leaves oblong-ovate, light grey, often simple. Axes of racemes corymbosely congested before flowering, very fleshy and abbreviated, - covered with leaves.

Var 3. capitata L., Sp. Pl. ii. 667 (1753).

Type: not precisely designated.

Popular name:- Red and white cabbage

vern. name, "Karm Kalla", or "Pat-Gobhi."

Leaves concave, not blistered, forming dense heads before flowering; stem abbreviated.

Var./

Var. 4 gongylodes L., Sp. Pl. ii. 667 (1753).

Type: not precisely designated.

Popular name:- Knol-Khol, Kohl-Rabi.

vern. name:- "Ol-Gobhi" or "Ganth-gobhi."

Stem short, swollen and subglobosely thickened and fleshy at the base of the lower leaves.

2. B. napus L., Sp. Pl. ii. 666 (1753) B.F.O. 392; S.P. (70) 39 (1919);

Syn: B. campestris L. subsp. campestris et ssp. napus H. f. et T. Anderson in Fl. Brit. India i. 156 (1872).

Type: Not precisely designated. (LS!)

Key to the varieties:

1. Stem base and root tuberous ..... 4. napobrassica  
 1. Stem base and root not tuberous:  
 2. Siliquae bilocular ..... 1. napus  
 2. Siliquae 3 or 4 locular:  
 3. Siliquae 3 - locular ..... 3. trilocularis  
 4. Siliquae 4 - locular ..... 2. quadrivalvis

Var. 1. napus

Annual or biennial, 30-150 cm. tall, erect, branched, <sup>+</sup> glabrous glaucous; tap root about as thick as the stem, slender. Lower leaves often lyrate - pinnatisect, 5 - 25 x 2 - 6 cm. (rarely larger than this), subbijugate, stalked; terminal lobe largest, ovate, rounded at the apex, repando- crenate or dentate, subtruncate at the base; lateral lobes smaller, ovate; middle and upper leaves becoming gradually lanceolate, <sup>+</sup> entire with a broadened cordate base/

base clasping at least half of the stem, apex acute; all leaves glaucous. Racemes 25-40- flowered, laxly corymbose, with buds overtopping the opened flowers. Flowers 8-14 mm. across, pale yellow; pedicels 6-12 mm. long, filiform, increasing up to 30 cm. in fruit. Sepals 5-8 x 1.6-2 mm., erect, glabrous, subequal. Petals 8-15 x 3.5-5 mm. (about twice as long as the sepals) obovate, cuneate at the base, apex subrounded. Stamens 5-7: 6.5-9 mm.; anthers 1.7-2.8 mm. long. Siliquae 4-10 x 0.25-0.4 cm., linear, often somewhat curved, subtorulose, glabrous, including beak about  $\frac{1}{2}$  as long as the length of the entire pod and 0 - 1 (-2) seeded; valves with a prominent mid-vein; seeds 10-20 in each loculus, globose, 1.2-2.0 mm. in diameter, obscurely purple-brown, black near the hilum, finely reticulate-alveolate; septum membranous, not veined. "2n = 38 (38,57,76 in other cultivated races)".

W. Pakistan:

Chitral: Drosh, fields, 1350 m., Toppin No. 123 (K!);

Punjab: Khangah Dogran, R. Stewart (K!); Rawalpindi; R. Stewart No. 420 (K!); (without locality), Edgeworth (K!); Royle (K!); Lahore, Thomson (K!); Punjab plains, J.R. Reid (E!);

Baluchistan: Quetta, J.F. Duthie No. 8595 (K!); Gunadva, in garden, Stocks No. 825 (K!).

Sind: (without locality), N.A. Dalzell (K!)

Afghanistan:

Harirud Valley, cultivated, Aitchison No. 1010 (K!)

N.W. Himalaya:

Bashahr State, near Chil, 600-2100 m., Lace No. 1919 (E!); Simla, Alog, 1590 m., Watt No. 9710 (E!); Pangi, 2550 m., Watt No. 894 (E!); Kumaon, Herb. Bot. Garden Saharanpur Nos. 10977 (E!), 10983 (E!), and 10980 (E!); Simla, Jakko, H.H. Rich No. 97 (K!); Almora, 1650 m., Strachey and Winterbottom (K!); Melam, Strachey and Winterbottom (K!);

Kashmir: Baltistan, 2980 m., Winterbottom (K!); Patam, 1500 m., Winterbottom (K!); Kashmir, A.P. Young (BM!); Badwan, R. Stewart No. 1935 (R)E!)

Geog. Dist: Widespread throughout the temperate regions of the world/

world. Introduced elsewhere. Original home not definitely known.

Var. 2 quadrivalvis (H. F. et T.) O.E. Schulz in Pflanzenreich (70) 42 (1919).

Syn: B. quadrivalvis H. f. et T. in Journ. Linn, Soc. Bot. v. 170 (1861); F.B.I. 156.

Type: India (Soane), J.D. Hooker (K!)

A mononstrous variety with 4- celled and valved pods; beaks flattened.

India: Behar, Soane, J.D. Hooker (K!); Gorakhpur, Herb. Bot. Garden Saharanpur No. 10979 (E!); Bengal, Silipur, Prain (K!); Partapgarh, Duthie (K!); Lucknow, Duthie (K!).

Geog. Dist: India. It is most probably not cultivated in the present area.

Var. 3 trilocularis (Roxb.) O.E. Schulz l.c.

Syn: Sinapis trilocularis Roxb. Hort. Beng. 48 (1814) (nomen) et Fl. Ind. iii. 121 (1832); Brassica trilocularis (Roxb.) H. f. et T. in Journ. Linn. Soc. Bot. v. 170 (1861); F.B.I. 156.

Type: Nepal, Buchanan? (Herb. Calcutta - not seen).

A monstrous variety with usually 3 locules.

India: Sillim, J.D. Hooker (K!); Bengal, Sibpur, Prain (K!); Badaun, Herb. Bot. Garden Saharanpur No. 10981 (E!).

Geog. Dist: India.

Roxburgh in his note mentions: "From Nepal, where the plant is cultivated, Dr. Buchanan sent seeds to the Botanic Garden at Calcutta in 1802, where the plants thrive luxuriantly...."

I am not sure about the type specimen because Roxburgh's note clearly shows that Buchanan sent only seeds of these which were cultivated at Calcutta. And therefore, the type specimen might be/



be from these plants grown at Calcutta. This variety is also not cultivated in the present area.

Var. 4 napobrassica (L.) Reichb. in Mossler, Handb. Gewachsk.

3 ed. ii. 1220 (1833); S.P. (70) 44 (1919).

Syn: B. oleracea L. var.  $\alpha$ . napobrassica L., Sp. Pl. ii. 667 (1753).

Type: Not precisely designated.

Biennial with tuberized stem base and tap-root.

N.W. Himalaya:

(without locality), Thomson (K!); Simla, Cliff end, H.H. Rich No. 808 (K!).

Geog. Dist.: Europe. Introduced elsewhere.

3. B. rapa L., Sp. Pl. ii. 666 (1753); B.F.O. 391; Clapham et al, Fl. Brit. Isles, 153 (1952).

Syn: B. campestris L. var. rapa (L) Hartm., Handb. Skand.

Fl. ed. 6. 110 (1854); S.P. (70) 49 (1919); B. campestris L. subsp. rapa H. f. et T. Anderson in Fl. Brit. India i. 156 (1872).

Type: Not precisely designated.

Key to the varieties:

1. (a). Roots tuberous ..... 1. rapa  
 1. (b). Roots non-tuberous ..... 2. campestris.

Var. 1. rapa

Annual or biennial, 30-100 cm. tall, branched <sup>†</sup> bristly below, glabrous above; tap root  $\pm$  tuberous, much thicker than the stem.

Lower leaves grass-green, lyrate-pinnatifid, usually 5-jugate,

10-30 x 4-8 cm., stalked,  $\pm$  bristly; middle and upper stem leaves glaucous, sessile, oblong-lanceolate,  $\pm$  completely or at least  $\frac{1}{2}$  clasping the stem with broadened, cordate base,  $\pm$  glabrous.

Racemes 30-40 flowered, corymbose, lengthening late so that the opened flowers overtop the buds. Flowers 6-10 mm. across, yellow ebracteate; pedicels 6-15 mm. long, filiform, increasing up to 30 mm. in fruit. Sepals 4-6 x 1.6-2 mm.,  $\pm$  erect, glabrous, subequal. Petals 6-10 x 3.5-5 mm. (about  $1\frac{1}{2}$  times as long as the sepals), obovate, cuneate at the base, apex subemarginate. Stamens about 4:6 mm., anthers about 1.4 mm. long. Siliquae 3.5-8 x 0.2-0.3 cm. linear, subcompressed, subtorulose, including 10-20 mm. long, tapering, 0-1 seeded beak; valves membranous, yellowish, glabrous, with a prominent mid-vein; seeds 8-12 in each loculus, globose, 1.2-1.8 mm. in diameter, pale purple-brown, black near the hilum, reticulate - alveolate; septum membranous, not veined. "2x = 20 (or 40)".

W. Pakistan:

Punjab: Multan, D. Ritchie (E!); (without locality), J. L. Stewart (E!).

Afghanistan:

Harirud Valley, cultivated, Aitchison No. 244 (K!)

N.W. Himalayas:

Lahul, Pangl, 2400 m., G. Watt No. 2273 (E!)

Var. 2. Campestris (L) Peterm., Fl. Lips. 491 (1838).

Syn; B. campestris L., Sp. Pl. ii. 666 (1753).

Type: Not precisely designated.

Tap root non-tuberous.

W. Pakistan:

Baluchistan: Sibi, J.H. Lace (E!);

Afghanistan: Khyllur pass, 510 m., MacDonald (G. Watt No. 4750) (E!); N. of Hindukush, Giles No. 124 (K!).

N.W. Himalayas:

Chamba State, near Chil, 600-2100 m., Lace No. 1919 (E!);

Bashahr State, Lippla, 2700 m., Lace No. 527 (E!);

Chamba/

Chamba State, 1200 m., Watt No. 709 (E!); Kashmir, Jhelum river banks, 1560 m., Johnston No. 99 (E!); Yarkand Valley, 3600 m., Clifford No. 24 (K!).

Geog. Dist.: Original home of the species is possibly in N. and C. Europe. Widespread throughout Europe, N. Africa and Orient eastward up to China. Introduced elsewhere.

4. B. juncea (L.) Czern. et Coss. in Czern., Cōnspect. Pl. Chark. 8. (1859); H. f. et T. in Journ. Linn. Soc. Bot. v. 170 (1861); F.B.I. 157.; K.F.U. 465.

Syn: Sinapis juncea L., Sp. Pl. ii 668 (1753) (excl. syn. Herm.)

Type: Not precisely designated.

Annual, 25-90 cm. tall, erect, branched,  $\pm$  sparsely hairy below, glabrous above, with simple hairs. Lower leaves distinctly stalked lyrate-pinnatifid, 2-3 jugate; terminal lobe largest, ovate,  $\pm$  truncate at the base, margin irregularly and coarsely dentate; lateral lobes ovate, dentate. Middle leaves  $\pm$  simple, oblong-ovate, dentate. Upper leaves oblong-linear, acute, narrowed at the base into a short stalk, entire or subentire. Racemes 20-40 - flowered, lax increasing up to 30 cm. in fruit. Flowers 6-7 mm. across, yellow; pedicels 5-8 mm. long, filiform, glabrous, ascending, increasing up to 15 mm. in fruit. Sepals 4-6 x 1-1.3 mm., oblong, suberect, subequal, apex rounded or obtuse, yellowish glabrous. Petals 6-9 x 2.5-3 mm., obovate, clawed, apex rounded. Stamens 4-6.5: 5-8 mm.; anthers about 2 mm., oblong, obtuse, apex often curved. Siliquae 2.6 - 5 x 0.2 - 0.3 cm., subtetragonous, suberect, linear,  $\pm$  torulose, narrowed into a 5-10 mm. long beak, glabrous; valve with a prominent mid-rib, yellowish; style 1.5 -

2.5 mm. long with short stigma; seeds 10-20, about 1 mm. in diameter, globose, reddish-brown; septum white membranous.

W. Pakistan:

Punjab: Lahore, Thomson (K!); Rawalpindi, Aitchison No. 320 (K!); (without locality), Royle (K!), Edgeworth (K!); Rawalpindi, R. Stewart No. 19369 (R-E!)

Baluchistan: Quetta, Duthie No. 8595 (BM!).

N.W. Himalayas:

Kumaon, Duthie (K!);

Kashmir, Islamahad, Fuller No. 883 (K!).

Geog. Dist.: Cultivated throughout Asia. Introduced in most other parts of the world. Often found as an escape from cultivation.

About 3 varieties are cultivated in the Indo-Pak subcontinent. The distinguishing characters of these three varieties are: glabrous, sparsely hispid, and hispid, as recognized by Blatter in Journ. Bomb. Nat. Hist. Soc. xxxiv. (3) 299 (1930). These are of doubtful taxonomic value as it is almost impossible to draw a definite line between these indumentum characters. Due to lack of enough specimens from the present area no attempt has been made to settle their status.

5. B. tournefortii Gouan, Illustr. Obs. Bot. 44, t. xxA (1773);

B.F.O. 393; F.B.I. 156; S.P. (70) 67 (1919); S.E.P. 327.

Syn: B. stocksii H. f. et T. in Journ. Linn. Soc. Bot. v. 171 (1861).

Type: Cult. at Montpellier (not seen).

Annual 10-60 cm. tall, branched above, erect, hairy below with long ciliate white hairs; branches almost aphyllous. Basal leaves resulate, runcinate-pinnatifid, 4-12- jugate, shortly petioled, hispid; terminal lobe ovate - orbicular rarely ovate-oblong, often small, obliquely cordate, sinuate-dentate, often † trilobulate; lateral lobes narrow, † oblong, often subrecurved, dentate to entire. Upper leaves much smaller, few, oblong or linear, 1-3 x 0.4-0.8 cm., dentate or entire/

entire, acute, † hairy. Racemes 10-20- flowered, lax, increasing up to 30 cm. in fruit. Flowers 4-7 mm. across, pale yellow; pedicels 2-6 (-9) mm. long, increasing up to 20 mm. (rarely 30 mm.) in fruit, spreading, glabrous or hairy. Sepals 2.8-3 x 1.2-1.8 mm., oblong, suberect, obtuse, glabrous or sparsely hairy, sometimes violet coloured. Petals 4.5-6.5 x 1.2-1.5 mm., oblong-obovate, apex rounded, veins somewhat purple. Stamens 2.5-3: 4-4.5 mm., anthers about 1 mm. Siliquae 3.5-6.5 x 0.2-0.3 cm., linear-oblong, including 8-20 mm. long, smooth usually 1-seeded beak often slightly curved at the apex, † glabrous, subtorulose; valve with a prominent mid-vein; stigma sessile, depressed - capitate, subemarginate; seeds uniseriate, many, about 1 mm. in diam., globose, dark-brown, finely tuberculated.

W. Pakistan:

Punjab: (without locality), Thomson (K!); Jhung, Edgeworth (K!); Drummond No. 118 (K!)

Baluchistan: (without locality), Stocks No. 706 (K!).

Geog. Dist.: Europe, N. Africa and Orient, W. India, Tropical Africa, and S. Africa. Introduced in Australia and other places.

6. B. deflexa Boiss. in Ann Sc. Nat. Bot. Ser II. (17) 87 (1842);

H. f. et T. in Journ. Linn. Soc. Bot. v. 170 (1861); S.P. (70).

63 (1919); S.E.P. 328.

Syn: B. tigridis Boiss., l.c. ; B. deflexa var. tigridis (Boiss.)

Fl. Or. i. 393 (1867); Erucastrum? lasiocalycinum Boiss.

et Hausskn. in Boiss. Fl. Or. i. 389 (1867); B. deflexa

var. lasiocalycina (Boiss. et Haussk.) O.E. Schulz in

Pflanzenreich (70) 64. (1919). B. deflexa var. mollis

O. E. Schulz and var. glabrescens O.E.Schulz. l.c. 64-

65. B. iranica Rech. f. et al. in Phyton. iii. 44.  
(1951).

Type: Syria, Aleppo, Aucher Eloy No. 229 (G,K!).

Annual, 20-60 cm. tall, erect, branched, hispid or subhispid below with 1-2 mm. long usually deflexed hairs, subglabrous or glabrous above. Lower leaves subrosulate, 6-10 x 1.5-3.8 cm. including 2.5-3.5 cm. long petioles; lamina sublyrate to oblong-ovate, irregularly dentate or sinuate dentate, apex rounded; middle leaves shortly petioled, † ovate, sinuate dentate, acute; upper leaves much smaller, 1-2 x 0.2-0.8 cm., oblong subsessile, cuneate, † dentate. Racemes 20-40- flowered, lax, increasing up to 30 cm. in fruit. Flowers 7-12 mm. across, yellow; pedicels 3-8 mm. long, increasing up to 20 mm. in fruit, thickened or not, often † deflexed, especially the lower ones. Sepals 4-5.5 x 1.2-1.8 mm., subequal, apex rounded or sub-obtuse, inner two sacate at the base. Petals 9-12 x 3.5-4 mm., obovate, clawed (claw 3-4 mm. long), apex rounded or subemarginate. Stamens 5-6: 6-8 mm.; anthers 1.8-2.2 mm., oblong-ovate, apex subobtuse often † curved. Siliquae 3.5-9 x 0.15-0.25 cm., oblong, usually straight, sub-cylindrical, glabrous; † torulose; valve with a distinct mid-vein; beak 3-5 mm. long, 0-1- seeded; seeds 10-25 in each loculus, uniseriate, about 0.8 mm. in diam., globose, light brown; septum hyaline.

W. Pakistan:

Baluchistan: (without locality) Stocks Nos. 745 (K!) and 834 (K!).

Afghanistan: Kandahar, Griffith (K!) (mixed).

Geog. Dist.: Syria, Iraq, Iran and Arabia.

7. B. nigra (L.) Koch in Rohling, Deutschl. Fl. ed. 3. iv. 713 (1833); B.F.O. 390; F.B.I. 156; S.P. (70) 75(1919); S.E.P. 350; K.F.U. 466.

Syn: Sinapis nigra L., Sp. Pl. ii. 668. (1753); Sisymbrium nigrum Prantl, Exkurs. Fl. Bayern. 222. (1884);

Type: Not precisely designated.

Annual, 30-100 cm. tall, erect, usually bristly below, glabrous and glaucous above; tap root slender; branches ascending, often many. Leaves all stalked; lower leaves grass green, lyrate, deeply pinnatifid or pinnatisect, 6-25 x 3-12 cm., 1-3- jugate, with a large ovate terminal lobe, and much smaller ovate-oblong lateral lobes; middle leaves short stalked, sinuate - dentate, acute, unijugate; upper leaves much smaller, lanceolate or narrowly elliptic, short stalked, glabrous, glaucous, acute,  $\pm$  entire. Racemes 40-60- flowered, ebracteate, corymbose above, increasing up-to 30 cm. in fruit. Flowers 5-8 mm. across, bright yellow; pedicels 2-3 mm. long, about as long as the sepals in fruit otherwise shorter, subappressed or appressed, not thickened. Sepals 3-5 x 1-1.2 mm., oblong, obtuse, suberect, yellowish, glabrous, subequal. Petals 7-9 x 2.8-3.5 mm., obovate, clawed, apex  $\pm$  rounded. Stamens 4-5: 5.6 mm., anthers about 1 mm. Siliquae 1-2 x 0.16-0.22 (-0.3) cm., oblong, sub-quadrangular with a seedless beak (1.5-3 mm. long, including about 1 mm. long style and capitate stigma); valves with a strong midrib, glabrous, obscurely torulose; seeds 3-6 in each loculus, about 1 mm. in diam., dark brown, coarsely reticulated; septum not veined.

W. Pakistan:

N./

N.W.F.P.: Peshawar, H. Deane No. 69 (K!), Dera Ismail Khan, Herb. Dept. Bot. N. India No. 7103 (E!),  
Punjab: Aliabad Serai, Drummond No. 13925 (E!); Blaspur, Watt No. 2872 (W!);  
Baluchistan: (without locality) J.E. Stocks (K!).  
Afghanistan: (without locality), Griffith (K!).  
N.W. Himalayas: Kumaon, Almorah, 1650 m., Strachey and Winterbottom (K!); Madden (E!); Kashmir, Bagh, R. Stewart No. 23698 (R-E!).

Geog. Dist.: Original home of the species is unknown. Probably native of Europe. Widespread in most regions with temperate climate. Widely cultivated for its oil seeds.

2. SINAPIS L., Sp. Pl. ii. 668 (1753); B.F.C. 394; S.P. (70) 117. (1919); S.E.P. 535; K.F.U. 467.

Syn: Rhamospermum Andrz. ex Besser, Enum. Pl. Volthyn. 83 (1822); Bonannia Presl, Fl. Sic. i. 99 (1826); Sinapistrum Chevall, Fl. Par. ii. 869 (1836); Leucosinapis Spach, Hist. Nat. Veget. vi. 348 (1838); Fourreau in Ann. Soc. Linn. Lyon N.S. xvi. 329 (1868).

Herbs annual rarely perennial, usually hairy with simple hairs, erect, branched; tap root slender. Lower leaves shortly petioled, upper <sup>+</sup> sessile, lyrate or dissected. Racemes often many flowered, bracteate below, increasing in length in fruit. Flowers usually large, yellow, pedicellate. Sepals oblong, sub-spreading, sub-equal not saccate, somewhat yellowish. Petals usually broadly obovate, clawed (claw shorter than the limb.) Stamens 6, not appendaged. Lateral nectariferous glands abruptly prismatic, often bilobed, median semiglobose. Ovary cylindrical, short, 4-17-ovuled; style about as long or longer and usually equally thickened as the ovary; stigma large, subbilobed. Siliquae sub-cylindrical with convex valves having 3-7 parallel veins; beak long with 0-9-seeds/



seeds, glabrous or hairy; seeds uniseriate, spherical, usually brown; septum hyaline.

About 10 species chiefly in Mediterranean region.

Best distinguished from Brassica by its 3-7 parallel-veined valves. Sinapis arvensis L. and S. alba L. are included under Brassica by Hooker and Thomson (1861) and H. f. and T. Anderson (1872), while Boissier (1867) recognized both the species under Sinapis.

The two present species fall into two different sections:

Sect. 1. Ceratosinapis DC. Syst. ii. 607 (1821); S.E.P. 337.

Ovary 8-13- ovuled; beak of the siliqua straight, 1 - 2 - erect seeded. S. arvensis L.

Sect. 2. Leucosinapis DC., l.c. ; S.E.P. 337.

Ovary 4-8- ovuled; beak of the siliqua very compressed, sabre-shaped, 1-2- pendulous seeded. S. alba L.

Key to the species:

1(a). Beak much shorter than the valves of the siliqua; seeds 6-12 in each loculus ..... S. arvensis

1(b). Beak equal or longer than the valves of the siliqua; seeds 1-4 in each loculus ..... S. alba

1. S. arvensis L., Sp. Pl. ii. 668 (1753); B.F.O. 394; S.P. (70) 119 (1919); S.E.P. 337; K.F.U. 467.

Syn: B. arvensis auct, non Linn., Mant. i. 95 (1767);

B. sinapis Vis., Fl. Dalmat. iii. 136 (1852); B. sinapistrum Boiss., Voy. Bot. Midi de l'Esp. ii. 39 (1839-45).

Type:/

Type: Not precisely designated. (LS!).

Annual, 10-70 cm. tall, erect, branched, usually stiffly hairy. Lower leaves lyrate - pinnatifid, up to 20 cm. long, 1-3- jugate, stalked, roughly hispid; terminal lobe large obovate, coarsely toothed; upper leaves sessile, oblong-obovate or lanceolate, acute, dentate,  $\pm$  hairy. Racemes 20-40 (-60) - flowered, ebracteate, corymbose, increasing up to 30 cm. in fruit. Flowers 10-12 mm. across, yellow; pedicels 3-4 mm. long, increasing up to 6 mm. in fruit, thickened, ascending, straight. Sepals 4-5.5 x 1-1.5 mm., oblong, yellowish, glabrous. Petals 7-12 x 3.5-5 mm., obovate, clawed, claw longer than the limb. Stamens 3.5-5: 5.5-7.5 mm., anthers about 1.5 mm. Siliquae 2.5-4.5 x 0.25-0.3 cm. (including beak about 1/3 of the entire length of the siliquae and 1-2 seeded), sub-cylindrical, spreading, glabrous or sometimes sparsely stiffly hairy; valves 3-5- parallel veined; seeds 6-12 in each loculus, about 1-1.5 mm. in diam., dark purple brown, finely alveolate.

W. Pakistan:

Baluchistan: Quetta, cultivated ground, Duthie No. 8594 (K!).

Afghanistan: Kandahar, Griffith (K!); Karubagh, Griffith (K!) (mixed).

Geog. Dist.: Europe, N. Africa and Orient. Introduced elsewhere.

2. S. alba L., Sp. Pl. ii. 668 (1753); B.F.O. 395; S.P. (70) 129 (1919); S.E.P. 339.

Syn: Brassica alba (L.) Rabenh., Fl. Lusatica, i. 184 (1839);

B. alba H. f. et T. Anderson in Fl. Brit. India. i. 157 (1872).

Type:/

Type: Not precisely designated. (L5!).

Annual, 20-75 cm. tall, erect, branched, usually stiffly hairy with simple, somewhat recurved hairs. Lower leaves lyrate pinnatifid, 2-3- jugate, 5-15 x 2-6 cm.,  $\pm$  hispid, stalked; terminal lobe somewhat larger than the lateral lobes; lobes  $\pm$  ovate, sinuate-dentate, obtuse; upper leaves shortly stalked, sinuate-dentate subequally lobulate. Racemes 30-50 (-100) - flowered, ebracteate, corymbose, increasing up to 30 cm. in fruit. Flowers 10-13 mm. across, yellow; pedicels 5-8 mm. long, increasing up to 14 mm. in fruit, sparsely hairy or glabrous, slightly thickened, often subrecurved. Sepals 4-5.5 x 1-1.5 mm., oblong, subequal, yellowish. Petals 7-12 x 3.5-5 mm., obovate, long clawed. Stamens 4-5: 5.5 - 7.5 mm.; anthers about 1.5 mm. Siliquae 2-4 x 0.3-0.4 cm. (including beak about as long or longer than the valves) subcylindrical, torulose, bristly hairy; beak compressed, sabre-shaped, often curved, and one seeded; valves strongly 3 - parallel veined; seeds 1-4 in each loculus, globose, about 1.5 mm. in diam., pale brown, finely alveolate; septum membranous, not veined.

W. Pakistan:

Punjab: Karnal, Drummond No. 20318 (K!); Ferozepur, Thomson (K!)

N.W. Himalayas:

Kumaon, Duthie (K!); Herb. Bot. Garden Sahranpur No. 10975 (E!)

Kashmir, Baltistan, Shigar, 2400 m. R. Stewart No. 20556 (R-E!)

Geog. Dist.: A native of the Mediterranean region. Introduced elsewhere.

3. DIPLOTAXIS DC., Syst. Nat. ii. 628 (1821); B.H.G. 84; B.F.O.

387; F.B.I. 157; S.P. (70) 149 (1919); S.E.P. 342.

Syn: Pendulina Willkomm in Linnaea xxv. 2. (1852).

Annual/

Annual to perennating herbs, erect, branched below, hairy with simple hairs, often hispid or scabrous, very rarely glabrous. Lower leaves shortly petioled, lyrate-pinnatisect, upper subsessile or sessile, simple; all leaves  $\pm$  dentate. Racemes corymbose above, becoming lax in fruit, ebracteate rarely bracteate below. Flowers often large, yellow or violet, rarely whitish pedicellate. Sepals oblong, subequal, inner pair slightly hooded at the apex, not saccate. Petals broad obovate, shortly clawed or cuneate at the base, apex subemarginate. Stamens 6; filament linear; anthers oblong, subobtusate, yellow. Lateral nectariferous glands often minute, depressed-prismatic; median short, subglobose or stalk-like, up to 1 mm. long. Ovary subcylindrical, 16-250-ovuled. Siliquae long, slender, linear,  $\pm$  compressed erect or pendulous, short beaked (beak without or rarely 1-seeded), dehiscent; valves with a distinct mid-vein; gynophore present or absent, short; seeds usually indefinite, biseriate, small, 0.5-1 mm. in diam., ovoid or ellipsoid, pendulous, light brown; stigma large,  $\pm$  bilobed, subsessile; septum hyaline, not veined.

About 23 species, chiefly in C. Europe and Mediterranean region.

Best distinguished from *Brassica* by its 2-seriate-seeded pods.

*D. griffithii* (H. f. et T.) Boiss., Fl. Or, i. 388 (1867); S.P. (70) 151 (1919); S.E.P. 344.

Syn: *Brassica Griffithii* H. f. et T. in Journ. Linn. Soc. Bot. v. 171 (1861); *D. griffithii* (H. f. et T.) H. f. et T. in Fl. Brit. India. i. 157 (1872); *D. acris* var. *Griffithii* (H. f. et T.) Coss., Comp. Fl. Atlant. ii.

171 (1885).

Type: Afghanistan, Oostad, Griffith (K!)

Annual, 12-90 cm. tall, branched below, <sup>†</sup> hispid rarely glabrous. Lower leaves loosely rosulate, stalked, 2.5-12 (-20) x 0.8-3 (-5) cm., obovate-oblong or lyrate - pinnatifid; lobes short obtuse, obscurely 2-3-toothed; upper leaves few, sessile or subsessile, oblong-elliptic or linear, 1-3 x 0.2-1 cm., entire or obscurely toothed; all leaves <sup>†</sup> hairy, sometimes subglabrous or glabrous. Racemes 15-60-flowered, ebracteate corymbose becoming lax and increasing up to 45 cm. in fruit. Flowers large, 7-15 mm. across, violet or pink, sometimes white or pale pink; pedicels 7-20 mm. long increasing up to 25 mm. in fruit, filiform. Sepals 5-7 x 1.2-1.8 mm., oblong <sup>†</sup> hairy subequal. Petals 10-15 x 4.5-6 mm. obovate, clawed (claw about as long as the limb), apex subemarginate. Stamens 6-7: 8-9 mm.; anthers 2-2.5 m. Siliquae oblong-linear 2-4 (-6) x 0.15-0.2 (0.27) cm., compressed; gynophore 1-3 mm. long, distinct; valves with a distinct mid vein; style about 0.5 mm. long with a large, bilobed stigma; seeds indefinite, biseriate, about 1 mm. long, ovoid, pale brown; septum hyaline, not veined.

W. Pakistan:

N.W.F.P.: Dara Ismail Khan, Herb. Bot. Dept. N. India No. 7105 (E!); Peshawar, H. Deane No. 83 (K!); Waziristan, J.L. Stewart (K!); (without locality) J.L. Stewart (E!)

Punjab: Jhelum, Drummond No. 13819 (K!); Aitchison No. 7 (K!); Shahpur, Drummond No. 20,323 (K!); Between Kohat and Indus, Aitchison No. 3 (K!); Attock, E. Nasir (R-E!)

Baluchistan: (without locality) Stocks Nos. 708 (K!) and 707\* (K!); Forst Sandeman, Harsukh. No. 18777 (K!) and/

\* O.E. Schulz in Notizblatt. ix. (1927) wrongly includes Stocks No. 707 under Sinapis arvensis forma louronensis Bonnier.

and No. 20459 (only photograph, K!); Quetta, Lace No. 3664<sup>o</sup> (E!); Loralai, M. Nath No. 2268 (R-E!).

Afghanistan: Oostad, Griffith (K!).

Geog. Dist.: Endemic.

Differs from D. acris Boiss. by its large seeds about 1 mm. (not 0.5 mm.), larger leaves and usually more hispid.

4. ERUCA Mill., Gardeners Dictionary ed. 6 (1754); ed. 7, (1759);  
Adans., Fam. ii. 418 (1763); B.H.G.P. 84; B.F.O. 395; F.B.I.  
158; S.P. (70) 180 (1919); S.E.P. 344 and 786; K.F.U. 469.  
Syn: Euzonum Link, Enum. Pl. Hort. Berol. ii. 175 (1822);  
Velleruca Pomel, Mater. Fl. Atlant. 12 (1860).

Annual or perennial, erect, branched, hispid with simple hairs, sometimes subglabrous. Leaves pinnatifid; lower stalked, upper subsessile or sessile. Racemes subcorymbose, lax, abracteate, elongating in fruit. Flowers large, usually yellowish, rarely violet, short pedicelled. Sepals erect, oblong, obtuse, subequal, inner pair subsaccate at the base. Petals about twice as long as the sepals, obovate, long clawed, violet veined. Stamens 6; filaments linear., not appendaged; anthers oblong, subobtuse. Nectariferous glands minute, lateral ones depressed-prismatic, median subglobose or suboblong. Ovary cylindrical, 13-50- ovuled; stigma bilobed. Siliquae oblong or subelliptic, 1-3 cm. long, tetragonal, † Eurgid with a flat, conical seedless beak; valves with a strong mid-rib; seeds biseriate, subglobose or ovoid, 1-2.5 mm. long, pendulous brown; septum hyaline, not veined.

5/

<sup>o</sup> Lace No. 3664 from Quetta was wrongly identified by G. Watt (as well as by someone from Kew Herb.) as Sisymbrium loesellii DC., while Duthie wrongly recognised it as a Raphanus sp.

5 species, mostly in Mediterranean region.

There is a great disagreement on the authority of the genus Eruca. Most of the taxonomists recognize Adans (1763) as its authority. Blatter in Journ. Bomb. Nat. Hist. Soc. xxxiv. 296 (1930) recognized Tournefort (1700), a pre Linnean authority. However, there could be no doubt that the authority for the species E. sativa is Miller (1768). (as Garsault's (1764-7) names have been rejected according to the International rules. See T.S. Sprague in Journ. Bot. vol. 59 (1921) 156). Therefore, Blatter's recognition of Garsault as the authority of E. sativa is wrong. As Miller's names are recognized, I don't find any reason not to accept him as the authority of the genus Eruca. (Miller's Dict. ed. 6, 1754; and ed. 7, 1759), because Adans. date of publication is 1763. I, therefore, recognize Miller as the authority of the genus as well as the species, E. sativa.

E. sativa Mill., Gard. Dict. ed. 8. n.l. (1768); Lam., Fl. France ii. 496 (1778); F.B.I. 158; S.P. (70) 181 (1919). S.E.P. 346; K.F.U. 469.

Syn: Brassica Eruca L., Sp. Pl. ii. 667 (1753); B. eruroides Roxb., Hort. Beng. 48 (1814) et Fl. Ind. iii. 117 (1832); E. cappadacia Reut., Cat. Grain. Geneve 2. (1815); B.F.O. 396.

Type: Cult., Miller (BM? - not seen).

Annual or biennial, 15-80 cm. tall, erect, branched, <sup>†</sup> hispid with simple often stiff hairs. Leaves lyrate-pinnatifid, <sup>†</sup> fleshy; lower subrosulate, stalked, 4-6- jugate, usually 7-15 x 3-5 cm.; terminal/

terminal lobe somewhat large, suborbicular or ovate, obtuse, irregularly toothed; lateral lobes ovate-oblong; upper leaves 1-3-jugate, small, short stalked to sessile. Racemes 15-50-flowered, ebracteate, subcorymbose, lax, increasing up to 30 cm. in fruit. Flowers 14-18 mm. across, usually pale yellow or whitish; pedicels 1.5-2.5 mm. long, increasing up to 5(-8) mm. becoming somewhat thickened and subappressed in fruit. Sepals 8-10 x 1.8-2 mm. oblong, subequal, hairy, often pale-violet coloured. Petals 15-22 x 5-6.5 mm., obovate, long clawed, violet veined, apex truncate. Stamens 9-13: 11-15 mm.; anthers 2.5-3.5 mm. Siliquae 1.5-3 x 0.4-0.5 cm., oblong-ellipsoid (including 6-8 mm. long seedless beak with  $\pm$  5 parallel veins); valves with a prominent mid rib; seeds 6-12 in each loculus, subglobose or ovoid, 1.5-2 mm. in diam., pale brown; septum hyaline, not veined.

A very variable species.

W. Pakistan

Chitral: Drosh, 1350 m., Toppin No. 61 (K!)

N.W.F.P.: Dera Ismail Khan, Herb. Bot. Dept. N. India, No. 7104 (E!); Peshawar, H. Deane (K!); Campbellpur, H. Deane No. 25 (K!).

Punjab: (without locality), J.L. Stewart (E!K!); Ferozepur, Thomson (K!); Aitchison (K!); (without locality) Edgeworth (K!); Royle (K!); Rawalpindi, Herb. Schlagintweit cap. No. 10918 (BM!).

Sind: (without locality), Ritchie (E!)

Baluchistan: Quetta, Duthie No. 8593 (BM!); Smalan, Lace No. 3676 (E!); Hurnai, Jafri (E!).

Afghanistan: Harirud Valley, Aitchison Nos. 225 (K!) and 261 (K!); Erak pass, 3000-3600 m., Griffith (K!); Kabul, W.R. Hay No. 113 (K!)

N.W. Himalayas: Kumaon, Almora, 1500 m., Strachey and Winterbottom (K!); Kashmir, Ladak, 3090m. F. Ludlow No. 517 (BM!)



Geog. Dist.: Europe, N. Africa and Orient, C. Asia and China.  
Introduced elsewhere.

5. RAPHANUS L., Sp. Pl. ii. 669 (1753); B.H.G.P. 101; S.P. (70)  
194 (1919); S.E.P. 347; K.F.U. 492.

Syn: Raphanistrum Ludwig, Definit. Gen. Fl. 219 (1760);  
Dondisia Scop., Introd. 316 (1777); Ormycarpus Necker,  
Elem. Bot. iii. 82 (1790); Durandea Delarbre, Fl.  
auvergne, 2 ed. 365 (1800).

Annual to perennating herbs, erect, branched usually hispid below and subglaucous above; root often fusiform. Leaves lyrate-pinnatisect; upper most often simply toothed. Racemes corymbose becoming lax in fruit, ebracteate. Flowers large, yellow, white or violet, pedicellate. Sepals oblong, erect, subequal obtuse, inner pair subsaccate at the base. Petals obovate, long clawed, often dark veined. Stamens 6; filaments without appendages; anthers oblong, obtuse, Lateral nectariferous glands minute, depressed; median subglobose or stalk like. Ovary subulate, biarticulated, lower part short, sterile, upper long with 2-21 ovules. Siliquae elongated, biarticulated; lower part (corresponding with the valves of a typical siliqua) very short, seedless slender; upper part long constricted between the seeds and breaking into 1-seeded joints at maturity, or cylindrical and indehiscent (not breaking); apex narrowing into a seedless beak; seeds <sup>+</sup> spherical or ovoid, <sup>+</sup> uniseriate, purple-brown or brown; septum complete in the lower part.

8 species in the Mediterranean region.

R. sativus L., Sp. Pl. ii. 699 (1753); F.B.I. 166; S.P. (70)

205 (1919); S.E.P. 349; K.F.U. 493.

Syn: "R. raphinistrum" H. f. et. T. in Journ. Linn. Soc. Bot.  
v. 180 (1861) (non L., Sp. Pl. ii. 699 (1753)).

Type: Not precisely designated (LS!)

Annual or biennial, 20-90 cm. tall, erect, branched, <sup>†</sup> bristly below and glabrous above; tap root slender, tuberous, usually white. Lower leaves, large very variable, 3-5 cm. long stalked, lyrate-pinnatisect, 3-4 (-5) - jugate; terminal lobe suborbicular or subovate, apex rounded, margin crenate; lateral lobes much shorter, alternate, oblong-ovate, obtuse, dentate; upper leaves small, shortly petioled, 1-2- jugate, dentate; uppermost leaves often simple, linear or oblong, dentate, sessile or subsessile; all leaves fleshy, <sup>†</sup> sparsely hispid. Racemes lax, 10-30 (-55) - flowered, ebracteate, increasing up to 40 cm. in fruit. Flowers 10-18 mm. across usually white or violet; pedicels 5-8 mm. long, increasing up to 18 mm. in fruit. Sepals 6-8 x 1.2-2 mm., oblong subequal, glabrous or sparsely hairy, inner pair subsaccate at the base. Petals 13-20 x 5-7 mm., obovate, long clawed, apex subemarginate. Stamens 7-9.5: 10-12 mm.; anthers 2-3 mm. Siliquae 3-6 x 0.15-0.2 cm., cylindrical, inflated, hardly or irregularly constricted between the seeds and not breaking into 1- seeded joints but biarticulated; lower part 1-3.5 mm. long, oblong, sterile, bilocular; upper part long, 4-12 seeded, with usually a long conical beak; valves spongy, thickened; seed uniseriate, about 2 mm. in diam., brown reticulated.

W/

W. Pakistan:Chitral: Drosh, 1350 m., Toppin No. 100 (K!);N.W.F.P.: (without locality), J.L. Stewart (E!).Punjab: Salt Range, Fleming No. 54 (E!); near Pathankot, R. Stewart No. 789 (K!); (without locality), Edgeworth (K!); Royle (K!)Sind: (without locality), Ritchie (E!); Shikarpur, Griffith (K!)Baluchistan: Quetta, 1680 m., Lace No. 3520 (E!);Afghanistan: Kabul, W.R. Hay No. 148 (K!).N.W.Himalayas: Kashmir, Gilgit, Toppin No. 1007 (K!); Gunkot, 2250 m., Giles No. 167 (K!,E!).Geog. Dist.: A widely cultivated plant of doubtful origin and nowhere found wild but not infrequent as an escape from cultivation.

Several races, primarily distinguished by the size and shape of the radix are known. It is not possible to say anything about these from the herbarium specimens which lack the root part.

Taxonomic status of R. caudatus L. (Mantiss. i. 95 (1767)) is not definitely known. It is distinguished by its long whip-like pods (20-60 cm. long). Hooker f. and T. Anderson in Fl. Brit. India i. 166 (1872) recognised it as a variety of R. sativus L. and remark, "The variety (R. caudatus) with whip-like pods as long as the entire plant, is commonly cultivated in W. India and the Punjab." Blatter (1930), following O.E. Schulz (1919) recognised it as a distinct species. I have not seen any specimen of it from the present area and therefore, leave it as an open question whether to recognize it as a distinct species, or a variety of R. sativus L. with which it resembles in every respect except the length of the fruit.

6. CRAMBE L., Sp. Pl. ii. 671 (1753); B.H.G.F. 98; B.F.O. 405;

S.P. (70) 228 (1919); S.E.P. 357; K.F.U. 474.

Stout/

Stout, perennating herbs, often woody below, erect, branched, glabrous or hairy with simple hairs, root thickened. Lower leaves large, lyrate-pinnatipartite, rarely simple, long stalked, glabrous or hairy; upper leaves small, linear, sometimes absent or very few. Racemes few to many flowered ebracteate. Flowers small or mediocre, white or pale yellow, pedicellate. Sepals oblong, subequal, erect, glabrous, inner pair broad, hardly saccate at the base. Petals obovate, cuneate at the base. Stamens 6; filaments of the inner stamens usually toothed; anthers oblong, obtuse. Lateral nectariferous glands hardly conspicuous median short semiglobose. Gynophore short, stalk-like or thickened (often equally thickened as the basal part of the fruit.) Fruit biarticulated; upper part globose or ovoid, much larger than the lower part, indehiscent, 1-seeded, glabrous; lower part very short stalk-like, seedless; valves reticulately rugose, stigma depressed-capitate, sessile or subsessile; seed one, subglobose, brown.

About 20 species in C. Europe, Mediterranean region, Trop. Africa, W. and C. Asia.

C. cordifolia Steven in Mem. Soc. Nat. Mosc. iii. 267 (1812);

F.B.I., 165;

Syn: C. cordata Willd., Enum. Pl. Hort. Berol. Suppl. 43 (1813); C. Kotschyana Boiss., Fl. Or. i. 406 (1867);

C. cordifolia var. Kotschyana (Boiss.) O.E. Schulz in Pflanzenreich (70) 236 (1919).

Type: Caucasus, Steven (L?,K!).

Large, stout, perennial herb, 60-180 cm. tall, branched, erect, glabrous above, <sup>+</sup> hispid below. Basal leaves largest; lamina

20-40 cm. across, cordate, or somewhat reniform, sinuate dentate, apex rounded; petiole 15-30 cm. long, thick; upper leaves few, smaller; uppermost if present linear, 0.5-1 cm. long. Racemes lax, 10-25-flowered, ebracteate. Flowers 7-8 mm. across, white; pedicels 5-10 mm. long, subspreading, increasing up to 15 mm. (rarely up to 40 mm.) in fruit. Sepals 2.5-4 x 1-1.2 mm. subequal. Petals 5.5-9 x 2.8-3 mm., obovate-oblong, cuneate at the base, apex rounded. Stamens 2.5-3: 3.5-5.5 mm.; filaments of the inner stamens toothed; anthers about 1 mm. Gynophore about 1-1.5 mm. long. Siliculae biarticulated; lower part short 1-1.5 mm. (rarely 2 mm.) long, stalk-like; upper part globose, 4-5 mm. in diam. unilocular, 1-seeded; valves reticulately veined, thick crustaceous; seed one, sub-globose, 3-5 mm. across, pale brown.

W. Pakistan

Baluchistan: Quetta, Urak, 2250 m., Lace No. 3751 (E!K!); Quetta, Stocks No. 946 (K!); Urak, 2100 m., on rocky conglomerate hillside, H. Crookshank Nos. 102 (K!); and 93 (K!); Zarghoun, 2400 m., H. Crookshank No. 496 (K!).

Afghanistan: Tangi Gharu, 1650 m., flowers white, sweet smelling, W.R. Hay No. 67 (K!); Harirud Valley, Badghis, Nitchison No. 344 (K!); Kurhuk pass, Griffith (K!); Bolan pass, Griffith (K!).

N.W. Himalayas: Bashahr state, 2700 m., Lace (E!); (without locality) J.L. Stewart (E!); Chenab Valley, Salagraon, 2700 m., R. Ellis No. 1270 (K!); Madagron, R. Ellis No. 1269 (K!); Lahul, Pangi, D. Brandis No. 3985 (K!); Kumaon, Jacquemont (K!); (without locality), Royle (K!); On the way to Tindi, 2850 m., Watt Nos. 2114 (E!); and 2345 (E!); Rulti, 1800 m., Watt No. 4895 (E!); West Tibet, Thomson (K!);

Geog. Dist.: Persia and Trans-Caspian region.

\*7. ERUCARIA Gaertner, De Fruct. et Sem. Pl. ii. 298. t. 143. fig. 8.

(1791)/

(1791); B.H.G.P. 100; B.F.O. 365; S.P. (84) 8 (1923); S.E.P. 366.

Syn: Pachila Raf. in Loudon, Garden, Mag. viii. 246 (1832);  
Hussonia Boiss., Diagn. ser. I. (8) 46 (1849).

Annuals, branched from the base, glabrous or hairy. Leaves usually pinnatisect. Racemes ebracteate. Flowers violet, or white, usually large; pedicels short, † appressed and thickened in fruit. Sepals erect, subequal, oblong or linear, obtuse or subobtuse, inner pair subsaccate at the base. Petals obovate, clawed, apex truncate, densely veined. Stamens 6; filaments not appendaged; anthers oblong, obtuse. Nectariferous glands minute, lateral subcompressed or scale-like, median triangular-conical or compressed-semiglobose. Ovary cylindrical, sessile, biarticulated, both parts fertile, lower 1-8 ovuled, upper somewhat broadened below and 1-4 ovuled; stigma depressed-capitate. Siliquae biarticulated; breaking into two parts when mature; lower part cylindrical, bilocular, dehiscent; upper sub-compressed, valve 3-5- parallel-veined, ovoid below, beaked above; seeds oblong, ellipsoid or subglobose † compressed, pale brown; cotyledons various.

About 5 species mostly in Mediterranean region.

\*E. hispanica (L.) Druce in Rep. Bot. Exch. Club Brit. Isles, 418 (1914); Burth and Lewis in Kew Bull. 288 (1949).

Syn: Sinapis hispanica L., Sp. Pl. 669 (1753); Bunias myagroides L., Mant. Prim. 96 (1767); Erucaria aleppica Gaert., Fruct. et Sim. ii. 298 (1791); E. boveana/

boveana Coss., Ill. Fl. Atl. i. 45 (1884); S.P. (84)  
 11 (1923); E. lineariloba Boiss. in Ann.Sc. Nat. Ser.  
 II. (17) 290 (1842); S.P. l.c. 12; E. myagroides (L.)  
 Hal., Comp. Fl. Graec. i. 123. (1900); S.P. l.c. 9.

Type: Cult., Herb. Clifford (BM!)

Annual, 30-90 cm. tall, erect, branched, flexuose, glabrous or sparsely hairy below with rigid simple hairs. Leaves bipinnatisect, stalked; basal subrosulate, 10-18 x 3.5-5.5 cm., middle and upper leaves much smaller; lateral lobes 3-5, alternate, narrowly linear, 1-4 mm. broad, those of upper most leaves often filiform, sparsely lobulate or irregularly dentate; all leaves fleshy, glabrous, glaucous rarely sparsely hairy. Racemes 30-45-flowered, corymbose above, ebracteate, flexuose, increasing up to 30 cm. in fruit. Flowers 7-9 mm. across, mauve; pedicels 1-2 mm. long, hardly increasing more than this in fruit, thickened, appressed. Sepals 4.5-7.5 x 1-1.2 mm., oblong, subequal, inner pair subsaccate at the base. Petals 11-15 x 3-5 mm., obovate, clawed, apex truncate. Stamens 7-9: 8-10 mm.; anthers 1.2-1.6 mm. Ovary biarticulated, lower part 4-6 ovuled, upper 1-3 ovuled; style short with minute capitate stigma. Siliquae (7) 10-15 (-17) x 0.18-0.28 cm., biarticulated, torulose, erect or slightly curved; valves 3-5 longitudinally veined; septum thickened; lower part obconical or oblong tetragonal 1-3 x 1-1.5 mm., with concave valves and truncate apex, (2-) 4-6-seeded; upper part breaking away when mature, 1-3-seeded, about as long or longer than the lower part, broad towards the apex, compressed, obtuse; style 2-4 mm. long filiform/

filiform. Seeds elliptic or suborbicular, about 1-1.2 mm. long. Cotyledons very variable, replicate, recurved or straight.

W. Pakistan

Baluchistan: Coast of Baluchistan, Pierce (K!)

Geog. Dist.: N. Africa, Balkans, Cyprus, Asia Minor, Syria, Palestine, Transjordan, Arabia, Iraq, Persia, Baluchistan.

I have followed Burt and Lewis (Kew Bull. 228, 1949) in recognizing E. hispanica (L.) Druce, as a widespread species from Mediterranean to Baluchistan and showing a geographical cline from east to west in respect of the length of the cotyledons. I have therefore, included E. boveana Coss., E. lineariloha Boiss. and E. myagroides (L.) Hal. as synonyms of E. hispanica (L.) Druce. Schulz (1919) recognizes the first three as distinct species and quotes Sinapis hispanica L. as synonym of E. myagroides (L.) Hal.

8. PHYSORRHYNCHUS Hooker f., Icon. Pl. 2. ser. V. t. 821 and 822 (1852); B.H.G.P. 100; B.F.O. 402; S.P. (84) 33 (1923); S.E.P. 372.

Perennial, often woody at the base, glabrous, glaucous<sup>u</sup>; branches long, straight, pale green. Lower leaves obovate, or elliptic, shortly stalked; upper leaves ovate-oblong, or linear, sessile, semi-amplexicaule; all leaves entire, acute or submucronate, fleshy<sup>†</sup> coriaceous. Racemes lax, elongated, ebracteate. Flowers large violet or purple, shortly pedicelled. Sepals linear or lanceolate, erect, subequal, inner pair subsaccate at the base. Petals more than twice as long as the sepals narrowly elliptic, long clawed, apex rounded. Stamens 6; filaments not appendaged; anthers/



anthers long, narrowly-lanceolate, acute. Lateral nectari-  
ferous glands short, scale-like; median stalk-like. Ovary sessile,  
biarticulated, 2-4 ovuled; stigma large conical, bilobed with  
decurrent lobes. Siliculae biarticulated, upper part large,  
subglobose with a terminal long beak (about as long as the rest  
of the pod), bilocular, indehiscent, glabrous; lower part short,  
sterile, narrow, stalk-like, valves rigid, thick. Seeds 1-2 in  
each loculus, ellipsoid, pendulous, brown finely reticulated;  
septum membranous.

2 species; one in Persia and Arabia and the other in Afghanis-  
tan and W. Pakistan.

P. brahuicus Hooker f., Icon. Pl. 2 ser. V. t. 821 and 822 (1852);

B.F.O. 403 (excl. Persian plant); Hooker f. et T. Anderson  
in Fl. Brit. India i. 165 (1872)-(excl. syn.);

Type: Between Sind and Baluchistan, (W. Pakistan), Brahuic  
hills, J.E. Stocks No. 515 (K!)

Perennial, 40-100 cm. tall, woody at the base, glabrous,  
glaucous; branches slender elongated, pale green, straight.  
Lower leaves shortly stalked, obovate elliptic or ovate-oblong  
3-6 x 2-4 cm., acute or submucronate., upper leaves small, ovate-  
oblong or broadly linear, sessile, auricled, semi-amplexicaule,  
acute; all leaves thick, coriaceous, glabrous, glaucous, entire,  
Racemes 12-25 flowered, lax, increasing up to 40 cm. in fruit,  
ebracteate. Flowers 15-20 mm. across, violet or purple; pedicels  
2-4 mm. long increasing up to 5 mm. in fruit, ascending. Sepals  
7-8 x 1.5-2 mm. Petals 15-20 x 4-5 mm. Stamens 6-8: 9-11 mm.,  
anthers/

anthers 3-3.5 mm. Siliculae 10-20 x 4-6 mm. biarticulated; upper part 10-18 mm. long, subglobose, long beaked, (beak about as long as the ovary), 1-2-seeded; valves thick, coriaceous, smooth, lower part very short, 1-3 mm. long, stalk-like, sterile; seeds about 2 x 1.5 mm. ellipsoid, brown finely reticulated; septum membranous.

W. Pakistan:

Punjab: Salt Range, Vicary (K!);

Sind: Hala Range, Vicary (K!); Boogta hills; Vicary (K!);  
(without locality) Dalzell (K!).

Baluchistan: Sibi, 90 m., sandy soils, Lace No. 3430 (E!)

Afghanistan: (without locality), Griffith No. 1550 (K!)

9: FORTUYNIA Shuttleworth ex Boiss. in Ann. Sc. Nat. ser. II.

xvi. 379 (1841); B.H.G.P. 100; B.F.O. 401; S.F. (84) 35

(1923); S.E.P. 373.

Perennial, woody below, erect, branched, glabrous, glaucous.

Leaves simple, oblong-elliptic, entire, acute or obtuse, glabrous, glaucous, fleshy, subsessile or sessile. Racemes lax, ebracteate, flexuose. Flowers large, 10-20 mm. across, white or pale lilac, shortly pedicellate. Sepals subequal, erect, subobtuse, inner pair hardly saccate at the base. Petals about twice or more as long as the sepals narrowly oblanceolate, apex rounded. Nectariferous glands minute, laterals semiannular, median somewhat conical. Stamens 6; filament not appendaged; anthers linear, apex acute or slightly beaked. Ovary 2-4 ovuled; stigma large, bilobed with decurrent lobes. Siliculae biarticulated; lower part stalk-like, sterile, bilocular; valves with a distinct mid-vein; upper part large, flattened, broadly winged; wings broader than the Locule, glabrous, indehiscent, bilocular, coriaceous; apex/

apex often notched; locules ovoid or ellipsoid, often notched; with or without a mid-vein on the valves; seeds 1-2 in each loculus, small ellipsoid, pendulous, brown, finely reticulated; septum thin, not veined.

2 species in Persia, Afghanistan and Baluchistan.

*Fortuynia* Shutt., is a very little known genus. There are very few specimen sheets at Kew and due to the immature fruits on some of them it is difficult to clearly distinguish the three species recognized by O.E. Schulz in *Pflanzenreich* (84) 35-37 (1923). It appears that the general tendency in the fruit is to become notched at the apex when they are mature due to more growth of the wings at the sides than at the apex of the siliculae. Therefore, this character is not reliable in separating taxa as done by the previous authors. Deeply notched to entire apex of the fruits are present even on the type sheet of *F. aucheri* Shutt., and therefore the key character of O.E. Schulz (S.P. p.35, (1923)) does not hold good. The size of the lower part (articulation) of the fruit also seems to be very variable and not reliable for separating taxa.

A careful study reveals that there are only two distinguishable species of *Fortuynia*, *F. aucheri* and *F. bungei*, primarily distinguished on the character of the fruit-locule shape. It is ovoid in the latter with valves without a distinct mid-vein, and ellipsoid with valves having a distinct mid-vein in the former. In my opinion, therefore, *F. garcinii* (Burm.) Shutt. is conspecific with *F. aucheri*. (Fig. 9).

Watson's/

Watson's specimen from Baluchistan is no doubt F. bungei Boiss. (and not F. aucheri Shutt. as determined by D. Chatterjee at Kew) - See Fig. 9 (d), which closely resembles the fruit of F. bungei.

F. bungei Boiss., Fl. Or. i. 402 (1867); S.P. (84) 36 (1923).

Type: S. Persia, Kerman, Bunge (G,K!).

Perennial, woody below, erect, branched mostly from below, glabrous, glaucous. Leaves fleshy, elliptic-oblong, entire, acute, glabrous glaucous, those on the main stem comparatively larger than those on the branches, uppermost linear, small. Racemes (6-) 12-30- flowered, lax, flexuose, ebracteate. Flowers large, 10-20 mm. across; pedicels 5-10 mm. long in fruit, sub-appressed. Sepals 7-8 x 1.7-2.2 mm., Petals 12-18 x 2-3 mm., oblanceolate, apex rounded. Stamens 6.5-7.5: 8-9 mm., anthers 3.5-4.5 mm. Siliculae 1.6-2.8 x 1.2-2 cm., biarticulated; lower part 7-10 x 1-1.5 mm., with distinct mid-vein, bilocular, sterile; upper part broadly winged with the seed chamber 4-8 mm. broad, ovoid, valves not with a distinct mid vein; apex of the fruit notched and slightly beaked; seeds 1-2 in each loculus, ellipsoid, brown; septum thin, not veined.

W. Pakistan:

Baluchistan: Kacha Thana, 1500 m., 1. 5. 1912, L.A. Watson No. 65 (K!).

Afghanistan: Anardereh, Bunge (G- not seen).

Geog. Dist.: Kerman, Bunge (K!); Yezd, in desert, J. Bornmuller No. 2243 (K!).

10. \* SAVIGNYA DC., Syst. Nat. ii. 283 (1821) et Prodr. i. 157 (1824);

B.H.G.P. 85; B.F.O. 397; S.P. (84) 57 (1923); S.E.P. 383.

Short, bushy annuals, glabrous, viscid, branched mostly from the base; branches short, thin, rigid, † spreading. Leaves fleshy; lower often viscid, obovate-oblong, shortly stalked, sinuate-dentate or pinnatifid; upper oblong or linear, subsessile, apex rounded or obtuse. Racemes lax, corymbose above, ebracteate. Flowers small, whitish or pale lilac; pedicels long filiform, spreading or hanging in fruit. Sepals erect, subequal, inner pair broad, subsaccate at the base. Petals about twice as long as the sepals, obovate, cuneate at the base, apex rounded sub-emarginate. Stamens 6; filaments not appendaged, anthers oblong obtuse. Lateral nectiferous glands short, bilobed, median semi-globose. Ovary ellipsoid, 18-30- ovuled; gynophore short. Siliculae broadly ellipsoid, compressed, (biarticulated?); lower part bilocular, dehiscent with a distinct mid-vein and reticulate venation on the valves; upper part (beak) much shorter and narrow, style-like, sterile; stigma depressed - capitate, subbilobed; seeds biseriate, ovoid, winged; septum membranous with a distinct mid-vein and reticulate venation.

2 species in N. Africa and Orient.

\* S. parviflora (Delile) Webb, Florul. Aethiop.- Aegypt. in

Parlatore, Giorn. Bot. Ital. ii. 215 (1847); S.P. (84) 57 (1923); S.E.P. 384.

Syn: Lunaria parviflora Delile, Illustr. in Mem. Bot. iv. 19. n. 584 (1813); Savignya aegyptiaca DC., Syst. Nat. ii. 283 (1821) et Prodr. i. 157 (1824); B.F.O. 397; Farsetia/

Farsetia parviflora Spreng, Syst. Veg. ii. 871 (1825).

Type: Egypt, Saggarah, Delile (P,K!).

Annual, 7-30 cm. tall, glabrous or hairy below with eglandular and glandular hairs; branches sub-spreading. Lower leaves shortly stalked, obovate, subsinnate-dentate, 2-6 x 1-2.2 cm., apex obtuse; upper leaves linear-oblong, 1-2.5 x 0.1-0.4 cm., obtuse, sessile, entire; all leaves  $\dagger$  fleshy. Racemes 10-25-flowered, lax, ebracteate, increasing up to 15 cm. in fruit. Flowers about 5 mm. across, whitish or pinkish; pedicels 8-12 mm. long, filiform, increasing up to 20 mm. in fruit, often reflexed. Sepals 2.2-3 x 1-1.5 mm. Petals 3.8-4.5 x 2-2.2 mm. narrowly obovate, cuneate at the base, apex sub-emarginate. Stamens 2.2-2.5: 3-3.3 mm.; anthers about 0.5 mm. Siliculae broadly elliptic, flattened, 8-16 x 4-7 mm., rounded towards both the ends, glabrous; gynophore minute (less than a mm.), beak 1-2.2 mm. long, style-like, sterile, with depressed-capitate, subbilobed stigma; seeds 9-15 in each loculus, biseriate, 2.5-3 mm. in diam. orbicular, winged; septum membranous, veined.

Afghanistan: Helmand and Seistan, A.H. McMahon No. 21/50 (K!).

Geog. Dist.: N. Africa and Orient: Egypt, Aucher Eloy No. 241 (K!); Sinai, Wadi Ghurundal, Post (K!); Bahrain Island, Fernandez No. 433 (K!); Kuwait, Arafjan, Dickson No. 61 (K!); Iraq, East of Felluja, Gillett and Rawi, No. 6748 (K!).

11 MORICANDIA DC., Syst. Nat. ii. 626 (1821) et Prodr. i. 221 (1824);

B.H.G.P. 85 (excl. syn.); B.F.O. 385; S.P. (84) 63 (1923);

S.E.P. 387.

Perennial, glabrous, glaucous rarely hairy or glandular, erect, branched/

branched. Leaves fleshy, sessile; lower obovate, semiamplexicaule; upper ovate, cordate, amplexicaule; all leaves entire, fleshy, usually glabrous, glaucous. Racemes lax, ebracteate. Flowers usually large, white or lilac; pedicels short, somewhat thickened in fruit. Sepals erect, subequal, inner pair broad, and saccate at the base. Petals about twice as long as the sepals, obovate, long clawed, apex truncate. Stamens 6; filaments not appendaged; anthers broadly linear, acute. Lateral nectariferous glands semilunate; median absent. Ovary cylindrical, many (40-200) ovuled; beak short sterile; stigma bilobed with decurrent lobes. Siliquae linear - oblong, compressed-quadrangular, bilocular, dehiscent; beak very short, sterile; valves glabrous with a prominent mid rib; seeds many 1-2- seriate, small ellipsoid, brown; septum membranous, not veined.

8 species in Mediterranean region, N. Africa and Orient.

M. sinaica Boiss. in Ann. Sc. Nat. Bot. xvii. 85 (1842); B.F.O. 386.; S.P. (84) 69 (1923); S.E.P. 389.

Syn: M. papillosa Steud, Nom. Bot. 2 ed. ii. 161 (1841)  
- nom. nud.; "M. arvensis" Hooker f. et T. in Journ. Linn. Soc. Bot. v. 172 (1861) et F.B.I. 158 (non DC., Syst. Nat. ii. 626 (1821)).

Type: Sinai, Aucher Eloy No. 167 (G,K!).

Perennial, 20-70 cm. tall, glabrous, glaucous, erect or sub-erect, branched mostly from the base. Lower leaves obovate, 4-11 x 2-7 cm., entire or subentire, apex obtuse, rounded or retuse; upper leaves <sup>†</sup> ovate, 1.5-8 x 1-6 cm., sessile, cordate, amplexicaule, entire, /

entire, apex usually rounded; all leaves fleshy, glabrous, glaucous. Racemes 15-30-flowered, lax, increasing up to 25 cm. in fruit, ebracteate. Flowers 8-12 mm. across, lilac or pale violet; pedicels 3-5 mm. long, increasing slightly (rarely up to 8 mm.) and becoming slightly thickened in fruit. Sepals 6-9 x 2 mm. Petals 12-15 x 4-4.5 mm. oblong-obovate, long-clawed, apex subtruncate. Stamens 6-8: 8-10 mm.; anthers 1.5-2.5 mm. Siliquae oblong-linear, compressed-terete, 4.5-8 x 0.15-0.2 cm., glabrous; valves with a prominent mid rib; beak very short, 1.5-3 mm. long, style-like, sterile; stigma conical, bilobed; seeds definite, biseriate, 0.5-0.75 mm. long, ellipsoid, brown; septum membranous with biseriate depressions formed by the seeds.

W. Pakistan:

N.W.F.P.: Waziristan, Shakai, 1800-2100 m., Harsukh No. 15696 (K!); (without locality), J.L. Stewart (K!)

Baluchistan: From Bibinane to Kelat, Stocks No. 1103 (K!); Chapar Rift, Lace (E!).

Geog. Dist.:

N. Africa and Orient: Sinai, Lucher Eloy No. 167 (K!); Wadi Isla, Shabetai (K!); Central Arabia, Darabiyah, Dickson No. 385 (K!); Persia, Stapf No. 716 (K!)

M. sinaica Boiss. is distinguished from M. arvensis DC. by its robust habit, larger leaves and pods having very short beak. This is the only species of Moncandia which extends up to W. Pakistan. There is still no record of it from Afghanistan.

12.\* DOUEPIA Camb. in Jacq. Voy. Ind. iv. 18. atlas ii. t. 18 (1844);

S.P. (84) 72 (1923); S.E.P. 389.

Perennial, woody below, branched, erect, glabrous, glaucous. Leaves fleshy; lower stalked, elliptic-oblong, entire or obscurely toothed, apex acute or submucronate; upper leaves sessile; upper most leaves semiamplexicaule, linear entire; all leaves glabrous, glaucous/



glaucous. Racemes subcorymbose above, lax, flexuose, ebracteate. Flowers large, lilac; pedicels short, slightly thickened in fruit. Sepals erect, oblong,  $\pm$  equal, inner pair not saccate at the base. Petals about twice as long as the sepals, oblong cuneate at the base, apex rounded,  $\pm$  violet veined. Stamens 6; filaments not appendaged; anthers linear-oblong, acute, bases of the inner ones often subequal. Lateral nectariferous glands semicircular, thickened in the middle, median large, oblong-ovoid. Ovary narrowly cylindrical, sessile, about 30- ovuled; stigma bilobed, large, lobes decurrent. Siliquae linear, tetragonal, bilocular, dehiscent with a very short oblong, conical sterile beak; valves with a prominent mid-rib, glabrous, rigid; seeds uniseriate, ellipsoid, brown, often obscurely winged; septum membranous, rigid.

1 species in W. Pakistan.

Distinguished primarily from Morcandia by its equal not saccate sepals, presence of median nectariferous glands, only 30-ovuled ovary and uniseriate siliquae with a very short conical beak.

D. tortuosa Camb. in Jacq. Voy. India. iv. 18. t. 18 (1844);

S.P. (84) 72 (1923); S.E.P. 390.

Syn: Morcandia tortuosa (Camb.) H. f. et T. in Journ. Linn. Soc. Bot. v. 172 (1861); F.B.I. 158.

Type: Punjab (W. Pakistan), Salt Range Jacquemont (P,K!), Perennial, 30-75 cm. tall, often woody below, glabrous, glaucous, branched, erect. Leaves fleshy, glabrous, glaucous; lower leaves/

leaves shortly stalked, elliptic-oblong, 5-15 x 1.5-6 cm., entire of sinuate-crenate, obtuse, sub-mucronate or acute; upper leaves small, narrowly oblong, 2-5 x 0.5-2.4 cm., sessile or subsessile acute; uppermost semiamplexicaule. Racemes 10-20-flowered, ebracteate, lax, increasing up to 30 cm. in fruit. Flowers 10-17 mm. across, lilac; pedicels 2-4 mm. long, increasing up to 6 mm. and becoming slightly thickened in fruit. Sepals 7-9 x 1.2-2.2 mm. Petals 12-14 x 1.5-2.5 mm. Stamens about 7: 9 mm.; anthers 3.5-4 mm., acute. Siliquae oblong-linear, 2.5-7 x 0.15-0.2 cm., terete; valves rigid, with a distinct mid-rib, glabrous; beak 4-7 mm. long and about 0.7-1 mm. broad, sterile; stigma large, bilobed with lobes decurrent; seeds 10-15 in each loculus, uniseriate, large, about 2 mm. long, oblong-ellipsoid, brown; septum rigid, pale yellowish.

W. Pakistan:

Punjab: Salt Range, Fleming (K!E!); (without locality), J.L. Stewart (E!); Salt Range, Pind Dad Khan, Jacquemont (K!); Salt Range, Aitchison No. 13 (K!); Mt. Tiller, Aitchison (K!); Salt Range, J.L. Stewart (K!); West of Indus, Talbot (K!); Jhelum, Aitchison No. 257 (K!); Mianwali, Kalabagh, Drummond No. 20409 (K!); Salt Range, Drummond No. 20325 (K!); 20330 (K!); 20326 (K!,E!); 20328 (K!), 20324 (K!), 20327 (K!,E!), 20329 (K!); Mt. Tiller, R.R. Stewart No. 782 (K!); near Bannu, J.L. Stewart (K!); Sakesar, A. Rehman (R-E!); Khewra, A. Rehman (R-E!).

Geog. Dist.: Endemic.

13. CONRINGIA Adanson, Fam. ii. 418 (1763); Link, Enum. Pl. Hort.

Berol. ii. 172 (1822); B.H.G.P. 78; B.F.O. 209; F.B.I. 152; S.P. (84) 84 (1923); S.E.P. 395; K.F.U. 495.

Syn: Erysimum L. sect. Coringia DC., Syst. ii. 507 (1821); Goniolobium Beck in Verhandl. Zool. - Bot. Ges. Wien, xl./

xl. 19. (1890).

Annual rarely biennial, glabrous rarely glandular hairy,  
 glaucous, sparsely branched below. Lower leaves often many,  
 shortly stalked or sessile, ovate or oblong-elliptic, upper  
 sessile, cordate, amplexicaule; all leaves entire rarely ob-  
 scurely toothed, fleshy, usually glabrous, glaucous, apex obtuse  
 or acute. Racemes corymbose above, elongating in fruit and  
 becoming lax, ebracteate. Flowers large, mediocre or small,  
usually white; pedicels short, † thickened. Sepals erect, sub-  
 equal, inner pair subsaccate at the base. Petals oblong-obovate,  
 clawed apex obtuse. Stamens 6; filaments not appendaged; anthers  
 oblong, obtuse. Lateral nectariferous glands semicircular, often  
bilobed, median usually absent. Ovary narrowly cylindrical,  
 sessile 12-50- ovuled; stigma depressed-capitate, often sub-  
 bilobed. Siliquae linear, often elongated, † tetragonal, com-  
pressed, bilocular, dehiscent; valves 0-3- parallel-veined;  
beak short, narrowly cylindrical or tapering, sterile; seeds  
uniseriate, oblong-ellipsoid, brown, not winged, finely granular;  
 septum membranous, not veined.

6 species in C. Europe, Mediterranean region, and C. Asia.

Key to the species:

1. Flowers small, 3.5-4 mm. across; petals 3-4 mm. long.....  
 ..... 2. C. persica
1. Flowers mediocre or large, 5-10 mm. across; petals 6-12 mm.  
 long :.....
2. Pedicels 1-2 mm. long in fruit; beak clavate .. 3. C. clavata.
2. Pedicels 4-8 mm. long in fruit; beak slender:

3. Siliquae compressed, 1-1.5 mm. broad; seeds about  
1.5 mm. long ..... 4. C. planisiliqua
3. Siliquae tetragonal, subcompressed, 2-2.8 mm. broad;  
seeds 2-2.5 mm. long..... 1. C. orientalis

\*\*

1. C. orientalis (L.) Andrz. ex DC., Syst. ii. 508 (1821) in  
synon; B.F.O. 211.; S.P. (84) 86 (1923); S.E.P. 397;  
K.F.U. 496.

Syn: Brassica orientalis L., Sp. Pl. ii. 666 (1753).;  
Erysimum orientale Crantz, Class. Crucif. 116 (1769);  
C. parfoliata Link, Enum. ii. 172 (1828).

Type: Not precisely designated (L!).

Annual 10-50 cm. tall, erect mostly branched below, glabrous, subglaucous. Lower leaves very variable in size, obovate-cuneate, subsessile or sessile, <sup>+</sup> entire, apex rounder or obtuse; upper leaves oblong, broadly elliptic or suborbicular, cordate, amplexicaule, apex rounded or subretuse; all leaves fleshy, <sup>+</sup> glaucous. Racemes 10-25-flowered, corymbose above, increasing up to 20 cm. in fruit, ebracteate. Flowers 7-10 mm. across, pale white or pink; pedicels 4-7 mm. long increasing up to 10 mm. (rarely up to 14 mm.), in fruit. Slightly thickened. Sepals 5-7 x 1.4-1.8 mm., oblong, subequal, inner pair saccate at the base. Petals 8-12 x 1.5-2 mm. oblong, narrowly obovate, long clawed, apex rounded. Stamens 5-7: 6-8 mm.; anthers 1.2-1.7 mm., narrowly oblong obtuse. Siliquae cylindrical-tetragonate, 8-14 x 0.2-0.28 cm., straight or slightly curved, obscurely torulose; valves with a prominent mid-rib, rigid, glabrous; beak short, 1-2.5 mm. (rarely/

(rarely up to 4 mm.) long, less than a mm. thick, sterile; stigma depressed-capitate; seeds 12-20 in each loculus, large, 2-2.5 mm. long; septum membranous, not veined.

Afghanistan: Hurrum Valley, Habib Kalla, Aitchison No. 206 (K!); Kabul, 1695 mm., cornfields, W.R. Hay No. 115 (K!).

Geog. Dist.: Europe, N. Africa and Orient and Transcaspicum region.

2. C. persica Boiss., Diagn. ser. I. (6) 12. (1845); B.F.O. 210; S.P. (84) 90 (1923); S.E.P. 397; P. Wendelbo in Nytt Mag. Bot. i. 32 (1952).

Syn: C. ramosa Boiss., Diagn. Ser. II. (5) 25 (1856); "Sisymbrium salsugineum" H. f. et T. in Journ. Linn. Soc. Bot. v. 159 (1861) (non Pallas, Reise Russ. Reich, ii. 466 (1773)).

Type: Persia, Schiraz, Kuh-Barfi, Kotschy No. 339 (G,K1).

Annual, 5-18 cm. tall, erect, glabrous; stem mostly simple or sparsely branched. Basal leaves obovate-cuneate, 1.5-3 x 0.6-1.2 cm., apex rounded, entire or subentire; cauline leaves distant, few, ovate-cordate, amplexicaule, 1-3 x 0.5-2 cm., entire, apex rounded; all leaves fleshy, glabrous. Racemes 3-15-flowered, lax, increasing up to 8 cm. in fruit, ebracteate. Flowers small 3.5-4 mm. across, yellow; pedicels 1-2 mm. long increasing up to 4 mm. and becoming thickened in fruit. Sepals 1.6-2 x 1-1.2 mm., oblong, obtuse or subobtuse, subequal, inner pair subsaccate at the base. Petals 3-4 x 1 mm., oblong-cuneate, apex subemarginate. Stamens 1-1.5: 2-2.5 mm., anthers about 0.5 mm., obtuse, ovoid. Siliquae oblong-linear, subcompressed, 2.5-4.5 x 0.1 cm., glabrous; valves/

valves with a distinct mid-vein, obscurely torulose; beak minute, about 1 mm. long, style-like, with a short depressed-capitate stigma; seeds 6-9 in each loculus, uniseriate, about 1 mm. long; septum membranous, not veined.

W. Pakistan:

Chitral: ex P. Wendelbo, l.c. (Herb. Oslo).

Baluchistan: Khojak pass, Duthie No. 8587 (K!).

Afghanistan: Base of Chillion, 1800-1950 m., Griffith No. 1479 (K!).

Geog. Dist.:

Iran: Kuj-Barfi, Schiraz, Kotschy No. 339 (K!); Mt. Elbrus,

Kotschy No. 114 (K!); Khurdistan, Olguin (K!).

Transcaucasian region: Armenia, M. Zorab No. 347 (K!).

\*

3. C. clavata Boiss. in Ann. Sc. Nat. Bot. Ser. II. xvii. 84

(1842); B.F.O. 84; S.P. (84) 92 (1923); S.E.P. 397.

Syn: Sisymbrium perfoliatum C.A.M., Verz. Pfl. Caucas.

188 (1831); Erysimum clavatum Walpers, Rep. i. 169

(1842) - in textu; C. perfoliata (C.A.M.) Busch in

Komarov, Fl. U.R.S.S. viii. 497 (1939) non Link,

Enum. ii. 172 (1822).

Type: Armenia, Aucher Eloy No. 152 (G,K!).

Annual, 5-20 cm. tall, glabrous, <sup>+</sup> glaucous, erect; stem simple or branched. Basal leaves obovate-cuneate, 1.4-2.5 x 0.5-1 cm., cauline leaves few distant, broadly ovate or sub-orbicular, cordate, amplexicaule; all leaves fleshy, glabrous, <sup>+</sup> glaucous, apex rounded. Racemes 8-20-flowered (rarely 1-3-flowered), corymbose above, ebracteate, increasing up to 10 cm. in fruit. Flowers 5-7 mm. across, pale yellow; pedicels 1-1.5 mm. long, increasing up to 3 mm. and becoming as thick as the pods/

Pods. Sepals 4.5-6 x 1-1.5 mm., oblong, obtuse or subobtuse, subequal, inner pair saccate at the base. Petals 8-10 x 1.5-2 mm., narrowly oblong-obovate, clawed, purple veined. Stamens 6.5-7: 8-8.5 mm.; anthers about 1 mm. Siliquae subcylindrical, straight, ascending, 4-7 x 0.1-0.12 cm.; valves with a distinct mid vein, glabrous; beak 1.5-3 mm. long, thickened, clavate; stigma broad, bilobed; seeds 15-25 in each loculus, about 1.5 mm. long; septum membranous, not veined.

Afghanistan: Hairrud Valley, abundant all over the country, Aitchison No. 346 (K!).

Geog. Dist.:

Orient: Turkey, Kuschuk, Kizil hissar, Ball and Gourlay No. B 820 (K!); Iran, Hills near Band, 1500 m., Cowan and Darlington Nos. 2060 (K!), and 2633 (K!); near Tabriz, B. Gilliat-Smith No. 1461 (K!); Kaswin, J.E. Polak (K!); Iraq, Hills west of Bastura Chai, J.B. Gillett No. 10413 (K!); Dohuk-Zakho, Guest No. 2246.

C. Asia: Armenia, Aucher Eloy No. 152 (K!); Kharpeet, P. Sintenis No. 615 (K!); Samarkand, Popov and Vvedensky No. 100 (K!).

N. Busch (Komarov, Fl. U.R.S.S. viii. 497 (1939)) recognizes the name C. perfoliata (C.A.M.) N. Busch instead of C. clavata Boiss. (1842) by making a new combination from C.A. Myer's Sisymbrium perfoliatum (1831), probably not knowing that this name C. perfoliata was pre-occupied by C. perfoliata Link (Enum. ii. 172 (1822)). Although Link's species is conspecific with C. orientalis (L.) Andrz. (DC., Syst. ii. 508 (1821)), even then Busch's new combination is invalid according to the international rules.

4. C. planisiliqua F. et.M., Animadvers., Bot. Ind. III in Sem.

Hort. Petrop. 32 (1837); B.F.O. 211; F.B.I. 152; S.P. (84) 93 (1923); S.E.P. 397.

Syn/

Syn: Erysimum planisiliquum Stend., Nom. 2 ed. i. 594 (1840); Sisymbrium planisiliquum H. f. et T. in Journ. Linn. Soc. Bot. v. 159 (1861).

Type: N. Asia, Iberia, Fischer? (L - not seen).

Annual, 15-45 cm. tall, erect, branched, glabrous, glaucous. Lower leaves oblong-elliptic, 3-10 x 0.8-2.8 cm., shortly stalked or sessile, obtuse, entire or obscurely toothed; upper leaves usually oblong-ovate, sessile, cordate, amplexicaule, obtuse or acute, often slightly mucronate, 2-9 x 0.5-5 cm., all leaves <sup>†</sup> fleshy, often violet-coloured. Racemes 12-50-flowered, corymbose above, ebracteate, increasing up to 20 cm. in fruit. Flowers about 5 mm. across, pale yellow or whitish, veins often pale violet, pedicels 5-8 mm. long, increasing up to 12 mm. in fruit, very slightly or not thickened, erect. Sepals 3.5-5 x 1-1.2 mm. Petals 6-7 x 1.6-1.8 mm., narrowly oblong; apex rounded or obtuse. Stamens 3.5-4: 5-6 mm.; anthers about 1 mm. long. Siliquae linear-oblong, compressed, 5-9 x 0.1-0.15 cm., torulose; valves with a distinct mid-vein, glabrous; beak about 1 mm. long style-like; stigma depressed-capitate; seeds 12-18 in each loculus, about 1.5 mm. long; septum membranous, not veined.

W. Pakistan:

Baluchistan: Zarghun, 2190 m., Lace No. 3744 (E!); Urak, 2100 m., Lace (K!); Gustoi, Harsukh No. 20458 (K!); Urak, 2100m., fairly common on conglomerate hillside, H. Crookshank No. 109 (K!).

Afghanistan: Zebak, Badakhshan, 2400 m., in meadow lands, Giles No. 182 (K!).

N.W. Himalayas:

Kashmir: Gilgit, Boyan, 2400-2700 m., Giles No. 203 (K!); (without locality), Giles (E!); Ladak, 3000-3600 m., J.L. Stewart (K!E!); Ladak, Kandala pass, Herb. Schlagintweit (BM!); Karakerum glaciers, between Nagyr (2400 m.) and Hopar (2800 m.), W.M. Conway No./



No. 90 (K!); Baltistan, 3300 m., Duthie No. 11949  
(E!).

W. Tibet: Nubra, Kartsas to Kharand, Herb. Schlagintweit  
Cat. No. 2435 (B!); Zenskar, 3600-3900 m., Thomson  
(K!); Falconer Herb. East Ind. Co. No. 171 (K!).

Geog. Dist.: Turkey, Trans-Caspian region, Iran and C. Asia.

Tribe II. Lepidieae - according to O.E. Schulz in Pflanzenfam.  
(17b) 405 (1936).

Lateral nectariferous glands separated (in pairs) or united, sometimes with emitting processes; median absent or present, when present rarely joining the laterals. Hairs usually simple or absent. Stamen filaments with or without appendages; anthers usually short and blunt. Ovary sessile or shortly stalked; stigma capitate often shortly bilobed. Siliculae with narrowly elliptic septum (angustiseptate), laterally compressed or flattened, contradictory to the septum (but sometimes subflattened, or unilocular without septum), dehiscent or indehiscent, sometimes breaking longitudinally into 1-seeded halves.

The 18 genera of the present area belonging to this tribe fall into the following 7 subtribes:

Key to the 7 subtribes

1. Cotyledons small, linear or elongated:
  2. Cotyledons stalked ..... subtribe (a) Lepidiinae
  2. Cotyledons sessile ..... subtribe (b) Isatidinae
1. Cotyledons broad, elliptic to suborbicular:
  3. Siliculae laterally flattened; septum narrowly elliptic.
    4. Fruits very inflated with valves globose or semiglobose (never winged) ..... subtribe (c) Physariinae
    4. Fruits laterally compressed with valves <sup>†</sup> boat shaped (sometimes winged):
      5. Ovary mostly 2-ovuled ..... subtribe (d) Iberidinae
      5. Ovary 4-100-ovuled (except some species of Aethionema and/

and *Thlaspi* which have only 2 ovules):

6. Plants glabrous (rarely hairy with simple or forked hairs) ..... subtribe (e) Thlaspidinae

6. Plants hairy mostly with branched hairs .....  
..... subtribe (f) Capsellinae

3. Siliculae <sup>†</sup> globose or laterally subflattened; septum

broadly elliptic ..... subtribe (g) Cochleariinae

Subtribe (a) Lepidiinae Hayek, Fl. Steiermark, i. 529 (1909) et  
in Bot. Centralbl. xxvii. 286 (1911) emend; S.E.P. 407.

14. (1) Lepidium L.; 15 (2) Coronopus Zinn.; 16 (3).

Winklera Regel.

subtribe (b) Isatidinae O.E. Schulz in Pflanzenfam. (17b) 420 (1936).

17. (4) Isatis L.; 18. (5). Pachypterygium Bunge;

19. (6) Sameraria Desvaux.

subtribe (c) Physariinae O.E. Schulz, l.c. 427

20. (7). Didymophysa Boiss.

subtribe (d) Iberidinae Hayek in Bot. Centralbl. xxvii. 291 (1911)

pro parte; S.E.P. 430.

21. (8) Iberis L.; 22. (9). Megacarpaea DC.;

23. (10) Moriera Boiss.

subtribe (e) Thlaspidinae Hayek, Fl. Steiermark, i. 537 (1909) et

l.c. 294, pro parte; S.E.P. 440.

24. (11) Aethionema R. Br.; 25 (12). Thlaspi L.

subtribe (f) Capsellinae Hayek, Fl. Steiermark, i. 523 (1909) et l.c.

302, pro parte; S.E.P. 452.

26. (13) Capsalla Medik.; 27 (14). Hedinia Ostenf.;

28./

28. (15). Hymenolobus Nutt.

subtribe (g) Cochleariinae O.E. Schulz in Pflanzenfam. (17b). 459  
(1936).

29. (16) Dilophia Thom.; 30. (17). Cochlearia L.;

31. (18) Strogonowia Kar. et Kir.

Key to the genera of the tribe Lepideae.

1. Siliculae globose or subglobose; septum broadly elliptic:

2. Racemes elongated in fruit; valves not gibbous at the back:

3. Siliculae 2-seeded ..... 31. Stragonowia

3. Siliculae many seeded ..... 30. Cochlearia

2. Racemes condensed, <sup>†</sup> umbellate in fruit; valves gibbous with  
double crest at the back ..... 29. Dilophia

1. Siliculae laterally flattened; septum narrowly elliptic or  
absent:

4. Fruits <sup>†</sup> bilobed; valves of each lobe inflated, globose or  
semiglobose, not keeled (not winged):

5. Valves membranous, smooth ..... 20 Didymophysa

5. Valves rigid, rough, <sup>†</sup> pitted ..... 15 Coronopus

4. Fruits <sup>†</sup> compressed; valves boated shaped, <sup>†</sup> keeled (winged  
or not winged):

6. Siliculae unilocular, indehiscent:

7. Valves narrowly winged; wing inflated.. 18. Pachypterygium

7. Valves, distinctly, often broadly winged; wing <sup>†</sup>  
compressed:

8. Plants subaphyllous; cauline leaves small, linear-  
cuneate; valves membranous, white .. 23 Moriera.

8. Plants leafy; cauline leaves <sup>†</sup> auricled at the base, amplexicaule; valves usually submembranous, somewhat rigid, not white:
9. Valves coarsely veined in the middle; style distinct  
 ..... 19. Sameraria
9. Valves not coarsely veined; stigma sessile .....  
 ..... 17. Isatis
6. Siliculae bilocular dehiscent, or breaking into two 1-seeded halves, rarely indehiscent, (rarely unilocular in Aethionema):
10. Fruits indehiscent or breaking into two 1-seeded halves:
11. Siliculae indehiscent, not breaking into halves ..... 27. Hedinia
11. Siliculae breaking longitudinally into two 1-seeded halves:
12. Plants robust; pods large, prominently winged ..... 22. Megacarpaea
12. Plants short; pods small, not winged ....  
 ..... 16 Winklera
10. Fruits dehiscent:
13. Siliculae not winged, 12-24-seeded (ovary 12-24-ovuled); seeds minute:
14. Plants hairy with branched hairs; fruits obtriangular, apex emarginate (often deeply so) . 26. Capsella
14. Plants glabrous, fruits obovate-elliptic,

- elliptic, apex entire or obscurely retuse  
 ..... 28. Hymenolobus
13. Siliculae <sup>†</sup> winged (except in some species of  
Lepidium and Thlaspi), usually 2-seeded (ovary  
 2-6 (-16) ovuled); seeds large:
15. Flowers irregular ..... 21. Iberis
15. Flowers regular:
16. Siliculae obscurely, slightly (only above)  
 or not winged, small; style minute or  
 absent ..... 14. Lepidium
16. Siliculae <sup>†</sup> distinctly winged (rarely  
 wings suppressed in some species of  
Thlaspi but usually much longer than  
 broad), style present:
17. Stamen filaments not appendaged;  
 siliculae often elongated .. 25. Thlaspi
17. Filaments of the inner four stamens  
 generally appendaged; siliculae <sup>†</sup>  
 suborbicular ..... 24. Aethionema

14. LEPIDIUM L., Sp. Pl. 643 (1753); B.H.G.P. 87; B.F.O. 353;

A. Thellung, Die Gattung Lepidium in Mitt. Bot. Mus. Univ.  
 Zurich, xxviii. 1-340 (1906); K.F.U. 501.

Syn: Nasturtioides Medik. in Pflanzengatt. i. 81 (1792);

Senkenbergia Gaert. in Meyer et Scherb., Fl. Wett.

ii. 413 (1800); Cardaria Desvaux in Journ. de Bot.

ii. 163 (1814); Lepia Desv., l.c. 166; Dileptium Raf.,

Fl./

Fl. Ludov. 85 (1817); Cardiolepis Wallr., Sched. Crit. 340 (1822); Lepidinella Spach, Hist. Nat. Veg. Phaner. vi. 325, 552 (1838); Thlaspidium Spach., l.c. 557; Physolepidion Schrenk, Enum. Pl. 97 (1841); Physolepidium Endl., Suppl. ii. 108 (1842); Monoploca Bunge in Lehman, Pl. Preiss. i. 259 (1845); Cardamon Fourr. in Ann. Soc. Linn. Lyon Nouv. xvi. 338 (1868); Lepidiberis Fourr., l.c.

Annual to perennial herbs, sometimes woody below, often much branched (branches often dichotomous and corymbose), glabrous or hairy with simple or forked hairs. Leaves mostly linear to elliptic, entire, toothed or pinnatifid, lower often stalked, upper sessile or sessile. Racemes corymbose, ebracteate, often dense. Flowers small, white rarely yellowish or pale pink, pedicellate. Sepals oblong, obtuse, short, subequal, glabrous, often green with white margin; inner pair slightly broad, but not saccate at the base. Petals small, linear to spatulate, sometimes shorter than the sepals, rarely absent. Stamens 6 or by abortion 4 or 2.; filaments not appendaged; anthers short, ovoid or suborbicular, obtuse. Nectariferous glands usually fragmentary, minute, present between the stamen bases (except Section Cardaria). Ovary flat, elliptic with generally 2 pendulous ovules; style short or absent, rarely about as long as the ovary; stigma capitate, often subretuse, usually sessile or sessile in fruit. Siliculae ovate, obovate, orbicular or broadly elliptic, apex often <sup>†</sup> notched with a persistent stigma and style (if present), laterally flattened, rarely inflated, dehiscent very rarely indehiscent, bilocular; valves usually strongly keeled, often slightly winged above; seeds one in each loculus (rarely one abortive), <sup>†</sup> ovate/

† ovate (often oblique), brown; septum narrow, † elliptic, membranous, not veined.

About 150 species of nearly cosmopolitan distribution.

Lepidium L., a cosmopolitan genus with about 150 species, is represented by 11 species in the present area.

I have followed Komarov (Fl. U.R.S.S. viii. (1939)) and therefore included Cardaria Desv. as a synonym of Lepidium L. which is treated as a distinct genus in Pflanzenfamilien (1936) by O.E. Schulz. I do not find any good reason to separate Cardaria as a distinct genus and in my opinion, a place for it under a separate section of Lepidium is absolutely justified (B.F.O. 356; B.F.S. 87; K.F.U. 504).

Schulz (1936) recognized only one species, Cardaria draba (L. draba L.), under Cardaria with one subspecies Chalepensis (L. chalepense L.). Boissier (1867) not only recognizes L. draba L. and L. chalepense L. as distinct species (which is no doubt they are), but he places the two under two different sections. No doubt L. chalepense L. is definitely intermediate between L. draba L. and other species of Lepidium, but is very closely allied to L. draba L. and should be included under the section Cardaria (Desv.) DC. The other intermediate species are L. repens (Schrenk) Boiss. and L. propinguum F. et M. And, therefore, separation of Cardaria as a distinct genus is not justified.

How far L. chalepense L. and L. repens (Schrenk) Boiss. are distinct species is an open question, but <sup>there is</sup> no doubt, they are quite distinct from L. draba L. I find that the plants of the present area/



area (especially of Baluchistan) have siliculae mostly ovate and distinctly inflated (but suborbicular siliculae are not lacking, perhaps due to immature condition of the siliculae, and sometimes occur on the same plant) when mature. I have, therefore, preferred to recognize L. repens (Schrenk) Boiss. as a distinct species. The same treatment is given in Boiss., Fl. Or. i. 356 (1867) and Komarov, Fl. U.R.S.S. viii. 505 (1939).

L. ruderale L. and L. apetalum Willd. apparently look very much alike, but <sup>there is</sup> no doubt. the two are distinct species.

A careful examination reveals that the plants of the present area belong to L. apetalum, and the former species does not occur in the present area. L. apetalum is distinguished from the former by its somewhat robust habit, slender tap root, long racemes, elliptic-oblong siliculae with apex distinctly notched, petals rudimentary or absent, always shorter than the sepals and with only 4 or 2 stamens. H. f. and Thomson wrongly identified these plants as L. ruderale L. in Journ. Lin. Soc. Bot. v. 174 (1861), and H. f. and T. Anderson in Fl. Brit. India. i. 160 (1872).

Boissier (1867) described a new species, L. affghanum, based on a single specimen collected from Keratkuh in Afghanistan. This species has rightly been transferred to Stragonowia Kar. et Kir. by N. Pavl. in Komarov, Fl. U.R.S.S. viii. 529 (1939). Aitchison (1884-85) collected good specimens of this species during his journey to Afghanistan, but he, with W. Hemsley, wrongly named it as Heldreichia longifolia Boiss., perhaps due to ~~the~~ superficial resemblance of <sup>their</sup> long leaves (Plate No. XIX). But a careful taxonomist should not depend on such superficial resemblances.

The/

The fruit character is so different and distinct in Aitchison's plants that a taxonomist would hardly miss recognizing it at least as Lepidium. However, for reasons discussed under Stragonowia Kar. et Kir., I have included these Aitchison's specimens (No. 516) under S. affghana (Boiss). N. Pavl.

I have recognized L. sibiricum Schweigg as a distinct species from L. latifolium L. (Plates Nos. VIII and IX). The former is centred to C. Asia and China but extends into the Himalayas and the northern part of Afghanistan. The intermediate forms between the two species are not lacking, but perhaps they might be due to interbreeding. The floral parts of the two species and siliculae are distinct from each other (Fig. No. 9).

In my opinion L. brosczovi N. Busch is conspecific with L. aucheri Boiss., which is also evident from the figure given in Komarov, Fl. U.R.S.S. viii. 509. t. xxviii. fig. 2 (1939)

The 11 species of the present area are divided as follows into four sections:

Key to the sections:

1. Siliculae subinflated, indehiscent; apex entire with distinct, long style (style about as long as the ovary).. Sect. I. Cardaria.
1. Siliculae † compressed, dehiscent, apex distinctly to obscurely notched with usually indistinct style (style usually much shorter than the ovary):
  2. Cauline leaves † stalked (even the upper most); pedicels appressed ..... Sect. II. Lapidocardamon
  2. Cauline leaves † sessile (at least the upper most); pedicels † spreading/

† spreading or ascending:

3. Siliculæ suborbicular, apex deeply notched; valves winged above ..... Sect. III. Cardamon.
3. Siliculæ † elliptic, apex slightly or obscurely notched; valves not or slightly or obscurely winged above .....  
..... Sect. IV. Nasturtioides.

Sect. I. Cardaria (Desvaux) DC., Syst. ii. 529 (1821); B.F.O. 356; Komarov, Fl. U.R.S.S. viii. 504 (1939).

1. L. repens (Schrenk) Boiss.; 2. L. propinquum F. et M.

Sect. II. Lepidocardamon Thellung, Monsgr. l.c. 74 (1906); S.E.P. 408; Komarov, l.c. 507.

3. L. aucheri Boiss.

Sect. III. Cardamon DC., Syst. ii. 533 (1821); S.E.P. 408; Komarov, l.c. 507.

4. L. sativum L.

Sect. IV. Nasturtioides (Medik.) Thell., Monsgr., l.c. 75; Komarov, l.c. 507.

5. L. apetalum Willd.; 6. L. capitatum H. f. et T.;

7. L. perfoliatum L.; 8. L. crassifolium Wald. et Kit.

9. L. latifolium L. 10. L. sibiricum Schweigg.;

11. L. persicum Boiss.

#### Key to the species

1. Siliculæ † inflated, apex entire with 1-1.5 mm. long style:

2. Cauline leaves auricled ..... 1. L. repens

2. Cauline leaves cuneate (not auricled) ..... 2. L. propinquum

1./

1. Siliculae <sup>†</sup> compressed (subcompressed in L. sibiricum), apex deeply to obscurely notched with subsessile or sessile stigma (rarely style 0.3-0.6 mm. long):
3. Pedicels <sup>†</sup> thickened, appressed, 2-3 mm. long in fruit...  
 ..... 3. L. aucheri
3. Pedicels filiform, <sup>†</sup> spreading or ascending, (4) 5-8 mm. long in fruit.:
4. Siliculae deeply notched at the apex, 4.5-6 x 2.8-4 mm.  
 ..... 4. L. sativum
4. Siliculae slightly or obscurely notched at the apex, (1.4) 2-3 (-4) x 1.2-2.5 (-4) mm.:
5. Annual or biennial herbs:
6. Basal and lower leaves bipinnatisect; upper ovate-cordate, entire ..... 7. L. perfoliatum
6. All leaves <sup>†</sup> pinnatifid (uppermost sometimes linear):
7. Racemes elongating 5-10 cm. in fruit; petals present or absent, if present about 0.5 mm. long .....  
 ..... 5. L. apetalum
7. Racemes <sup>†</sup> capitate in fruit (not increasing more than 3 cm.); petals always present, about 0.7 mm. long ..... 6. L. capitatum
5. Perennials:
8. Plants 15-20 (-30) cm. tall; racemes about 15 (-20)-flowered; flowers 3 mm. across.. 8. L. crassifolium
8. Plants 30-120 cm. tall; racemes (20) 30-50-flowered; flowers 2-2.5 mm. across:
9. Branches <sup>†</sup> aphyllous above; upper leaves cuneate  
 at/

at the base; basal leaves entire .....

..... 11. L. persicum

9. Branches leafy above; upper leaves sessile,  
semiamplexicaule; basal leaves <sup>†</sup> dentate:

10. Leaves thick, glabrous, upper entire; petals  
obovate-cuneate; siliculae subcompressed....

..... 10. L. sibiricum

10. Leaves not thick, hairy or glabrous; upper  
<sup>†</sup> dentate; petals spatulate, clawed;

siliculae compressed .... 9. L. latifolium.

1. L. repens (Schrenk) Boiss., Fl. Or. i. 356 (1867); K.F.U. 505.

Syn: Physolepidium repens Schrenk in Fisch. et Meyer, Enum.  
Pl. Nov. 97 (1841); "L. Draba" H. f. et T. in Journ. Linn.  
Soc. Bot. v. 173 (1861) et F.B.I. 160 (non L., Sp. Pl.  
645 (1753)); L. draba subsp. chalepense var. repens  
(Schrenk) Thellung, Monogr. 89 (1906); O.E. Schulz in  
Notizblatt, Berlin, ix. 1086 (1927); "L. draba ssp.  
chalepense" O.E. Schulz, l.c. 1086.

Type: C. Asia, Baskan, Schrenk (L - not seen).

Perennial, 20-80 cm. tall, erect, branched, <sup>†</sup> hairy with short  
simple or forked hairs rarely glabrous; rootstock branched, woody.  
Lower leaves elliptic-oblong or oblong-obovate 3-10 x 1-3 cm. stalked,  
obtuse or acute, sinuate-toothed or dentate; upper leaves lanceolate  
or oblong-ovate, 1-10 x 0.5-3 cm., sessile auricled at the base,  
amplexicaule, sinuate-toothed or dentate, acute or obtuse; all leaves  
<sup>†</sup> hairy, rarely glabrous. Racemes 25-50- flowered, corymbose above,  
increasing/

increasing up to 10 cm. in fruit, ebracteate. Flowers 5-6 mm. across, white; pedicels 3-4 mm. long, increasing up to 10 mm. in fruit, filiform, <sup>†</sup> spreading. Sepals 2-2.2 x 0.8-1.2 mm., oblong, subequal, subhairy or glabrous. Petals 3.6-4 x 1.3-1.6 mm., spatulate, clawed, apex subemarginate. Stamens six, about 2: 3 mm.; anthers about 0.3 mm. Siliculae 3-4 mm. long (excluding 1-1.5 mm. long style) and <sup>†</sup> equally broad, ovate or suborbicular, <sup>†</sup> inflated, glabrous rarely hairy; apex entire with distinct style; valves slightly keeled; seed about 2 x 1.2 mm., ovate, red<sup>d</sup>ish brown, septum about 1 mm. broad.

W. Pakistan:

N.W.F.P.: Hazara, M. Nath No. 165 (R-E!); Peshawar, H. Deane (K!); Vicary (K!).

Punjab: Shahpur, Drummond No. 20336 (K!); Hazara, Drummond Nos. 20335 (E!,K!), and 20334 (K!); J.L. Stewart (K!E!); Rawalpindi, Pinfold (E!); Gujrat, a weed in grassland, R.N. Parker No. 3323 (K!); Salt Range, J.L. Stewart (K!); Rawalpindi, Aitchison Nos. 322 (K!) and 1012 (K!); Attock, Falconer Herb. East Ind. Co. No. 159 (K!);

Baluchistan: (without locality), J.E. Stocks No. 710 (K!); Quetta Duthie No. 8600 (K!); Singarh, Harsukh No. 20455 (K!); Hunna Valley, Quetta, Lace Nos. 3552 (E!K!) and 3908 (E!); Kutchlak, Jafri (E!); Ziarat, 2400 m., H. Crookshank No. 247 (K!); Quetta, 1650 m. H. Crookshank Nos. 139 (K!), 34(K!) and 15 (K!).

Afghanistan: (without locality), Griffith (K!); Khyber pass, 1080 m., Johnston No. 47 (E!K!); Tangi Ghuru, 1650 m., very common in soils at foot of slopes, W.R. Hay No. 79 (K!); Kurrum Valley, Aitchison Nos. 182 (K!) and 58 (K!); Harirud Valley, Aitchison No. 315 (K!).

Geog. Dist.: Persia and Armenia.

2. L. propinquum Fisch. et Meyer in Bull. Soc. Nat. Mosc. 378 (1838);

H. f. et T. in Journ Linn. Soc. Bot. v. 173 (1861); B.F.O. 356;

Blatter and Hall. in Journ. Ind. Bot. i. 57 (1919); K.F.U. 506.

Type: Caucasus, Helenendorf (L-not seen)

Perennial/

Perennial, 20-60 cm. tall, erect, branched, hairy or glabrous; hairs short simple or forked. Leaves similar as in L. repens (Schrenk) Boiss, except the cauline leaves which are cuneate at the base (not auricled). Racemes 20-40- flowered ebracteate, increasing up to 7 cm. in fruit. Flowers 4-5 mm. across, white; pedicels 3-4 mm. long increasing up to 10 mm. in fruit, filiform, spreading. Sepals about 2 x 1 mm. Petals about 3.5 x 1.4 mm., spatulate, apex subtruncate. Stamens six, about 2: 3 mm.; anthers about 0.25 mm. Siliculae 2.5-3 x 2-2.5 mm., ovate-orbicular, inflated, bases subcordate, hardly or not dehiscent, apex entire, glabrous; style 1-1.2 mm. long with capitate stigma; seed about 1.8 x 1 mm., ovate-oblong, brown; septum about 0.7 mm. broad.

Afghanistan: (without locality), Griffith (K!).

Geog. Dist.: C. Asia: Caucasus, Georgia, R.F. Hohenacker (K!); Armenia, Szovits (K!).

3. L. aucheri Boiss. in Ann. Sc. Nat. 195 (1842); B.F.O. 354; S.E.P. 408.

Syn: L. Borsczovi N. Busch in Komarov, Fl. U.R.S.S. viii. Addenda p. 652 (1939) t. xxviii. fig. 2.

Type: Iraq (Mesopotamia), Baghdad, Aucher Eloy No. 319 (G,K!).

Annual, 10-30 cm. long, branched mostly from the base, procumbent or suberect, glabrous or subhairy with simple hairs; secondary branches short, bearing mostly flowers and fruits. Basal leaves oblong-cuneate, pinnatifid or pinnatipartite, stalked, 4-7 x 0.5-1 cm. glabrous/

glabrous, lobes few, short, oblong, obtuse; upper leaves oblong obtuse dentate to entire, shortly stalked or subsessile. Racemes 30-50- flowered, corymbose above, ebracteate, increasing up to 10 cm. in fruit. Flowers small, about 2 mm. across, white; pedicels short, 1-1.5 mm., increasing up to 3.5 mm. and becoming somewhat thickened and appressed in fruit. Sepals about 1 x 0.7 mm., suborbicular or oblong, subequal. Petals 1.5-1.7 x 0.6-0.8 mm., spatulate, apex rounded. Stamens six, about 1.2: 1.4 mm.; anthers minute, about 0.2 mm. Siliculae 2.5-3 x 1.6-2 mm., ovate-oblong, apex notched; style about 0.3 mm. long with short capitate stigma, not exceeding the notch; seed about 1 x 0.7 mm., oblong-elliptic, light brown; septum about 0.4 mm. broad, narrowly elliptic.

W. Pakistan:

N.W.F.P.: Dera Ismail Khan, Herb. Bot. Dept. N. India No. 7102 (E!); Dera Ismail Khan, Harsukh No. 7102 (K!); Waziristan, J.L. Stewart (K!,E!).

Punjab: Bannu, J.L. Stewart (K!)

Sind: Kotri, Stocks No. 826 (K!)

Afghanistan: (without locality), Griffith (K!); Harirud Valley Aitchison No. 451 (K!); Oostad Koti, Griffith (K!).

Geog. Dist.: Arabia, Palestine, Iraq, Iran and C. Asia.

Stocks specimen quoted under Baluchistan in Fl. Orientalis belongs to the Sind Province. There is every possibility of its occurrence in Baluchistan, but so far I have not seen any specimen from that area.

4. L. sativum L., Sp. Pl. 644 (1753); B.F.O. 354; F.B.I. 159;

S.E.P. 408

Type: Not precisely designated - No. 6 (LS!)

Annual, 30-90 cm. tall, erect, branched, glabrous. Leaves pinnatisect; lower 4-10 x 2.5-3.5 cm., stalked, upper sessile or subsessile/



subsessile, uppermost linear, sessile; lobes lobulate, toothed to entire. Racemes 15-30- flowered, corymbose above, ebracteate, increasing up to 20 cm. in fruit. Flowers small, 2.5-3 mm. across, white or pink; pedicels 1-2 mm. long, increasing up to 5 mm. in fruit, filiform, ascending. Sepals 1.2-1.5 x 0.7-1 mm., oblong obtuse, subequal. Petals 2.8-3.2 x 1 mm., obovate-cuneate, apex rounded. Stamens 6, about 1.8: 2.2 mm., anthers minute, about 0.2 mm. Siliculae 4.5-6 x 2.8-4 mm., broadly elliptic or sub-orbicular, glabrous, narrowly winged above with an apical notch; style short, about 0.6 mm., not protruding/<sup>beyond</sup>the notch; seed about 2.8 x 1 mm., obliquely obovate-oblong, brown; septum about 1 mm. broad, elliptic, not veined.

W. Pakistan:

Chitral: Waste ground, Toppin No. 114 (K!).

N.W.F.P.: Peshawar, H. Deane (K!).

Punjab: Rawalpindi, Aitchison No. 568 (K!); Hurroo, Aitchison No. 1013 (K!); Rawalpindi, Fattahjung, Aitchison (K!); (without locality), Thomson (K!); J.L. Stewart (E!); Herb. Schlagintweit (BM!); Royle (K!); Karnal, Drummond No. 20333 (K!); (without locality, Griffith (K!); Fagwaria, Jacquemont (K!); Ferozepur, Thomson (K!); Umballa, Drummond No. 4330 (K!);

Sind: (without locality), N.A. Dalzell (K!).

Baluchistan: Quetta, 1680 m., Watt No. 3523 (E!); Hurnai, Jafri (E!).

Afghanistan: (without locality), Griffith (K!)

N.W. Himalayas: Simla, 1800 m., H. Collett No. 434 (K!); Kumaon, 1650m. Strachey and Winterbottom (K!); Simla, 1650 m., Watt No. 9713 (E!); Kashmir, Ladak, Leh, Herb. Schlagintweit (BM!).

Geog. Dist.: N. Africa and Orient. Widely cultivated and introduced.

5. L. apetalum Willd., Sp. Pl. iii. 439 (1800); B.F.S. 91; K.F.U. 508.

Syn: L. micranthum Ledeb., Icon. Pl. Fl. Ross. 22 (1829);

"L. ruderale" H. f. et T. in Journ. Linn. Soc. Bot. v.

174 (1861) et H. f. et T. Anderson in Fl. Brit. India  
i. 160- (non L., Sp. Pl. 645 (1753)).

Type: Siberia, Willdenow? (B - not seen).

Annual or biennial, 10-30 (-45) cm. tall, erect, with a slender tap-root; branches short, ascending, few, glabrous or very sparsely hairy with simple, or glandular hairs, especially below. Basal leaves sinuate-toothed or pinnatifid, 3-5 (-8) x 0.6-1 cm.; lobes short, entire or toothed, acute; upper leaves pinnatipartite or pinnatifid; upper most, linear entire or subentire; all leaves submembranous, green, glabrous or sparsely glandular-hairy. Racemes 30-50- flowered, ebracteate, corymbose above, increasing up to 10 cm. in fruit. Flowers minute, less than a mm. across; pedicels 1-1.5 mm. long increasing up to 5 mm. in fruit, filiform, <sup>†</sup> spreading or slightly recurved. Sepals about 0.8 x 0.5 mm., oblong, subequal. Petals present or absent, if present very minute, about 0.5 x 0.25 mm., obovate, cuneate, apex subemarginate. Stamens 4 or 2 only, outer two always absent, about 0.7 mm. long with minute, about 0.2 mm. long anthers. Siliculae 2.5-3 x 2-2.6 mm., broadly elliptic, notched at the apex, obscurely winged above stigma subsessile; seed about 1-1.3 x 0.5-0.6 mm., ovate-oblong, redish brown; septum 0.5-0.8 mm. broad.

W. Pakistan:

Punjab: Murree Hills, M. Singh (R-E!).

Afghanistan: Kabul, roadside, Griffith (K!).

N.W. Himalayas: Simla, 2100 m. A weed of gardens, R.N. Parker No. 3275 (K!); Kashmir, Baltistan, Satpur Valley, 2700 m., Duthie No. 12045 (E!); Baltistan, Skardu, 2100-2400 m., Duthie No. 12068 (BM!); Dal Lake, A.P. Young (BM!); Ramoo, 1800 m., C.B. Clarke No. 2848 A (BM!).  
W. Tibet, Nubra, Herb. Schlagintweit (BM!); (without locality) Thomson (K!).

Geog./

Geog. Dist.: C. Asia and China. Introduced elsewhere.

6. L. capitatum H. f. et T. in Journ. Linn. Soc. Bot. v. 175 (1861);  
F.B.I. 160.

Syn: L. incisum Edgeworth in Trans. Linn. Soc. xx. 33. (1851).  
(non Roth. Neue Beit. i. 224, 1802; Bieb, Fl. Taur.  
Cauc. ii. 98 (1808)).

Type: Himalayas, Edgeworth (K!).

Annual or biennial, 6-25 cm. long, procumbent or suberect, spreading, glandular hairy, branched. Lower leaves pinnatifid, 3-6 x 1-2 cm., oblong, shortly stalked or sessile with short, narrow, oblong, acute lobes; upper leaves pinnatifid or simply toothed, sessile, smaller. Racemes 20-50-flowered, dense, capitate above, ebracteate, increasing up to 3 cm. in fruit. Flowers minute, about 1 mm. across, white; pedicels 1-2 mm. long increasing up to 4 mm. in fruit, filiform. Sepals about 0.7 x 0.5 mm., subequal. Petals about as long or slightly shorter than the sepals, obovate-cuneate, apex emarginate. Stamens four (outer two absent), about 1 mm. long; anthers minute, about 0.2 mm. Siliculae 2.5-3 x 2.2-2.6 mm., ovate or broadly elliptic; slightly notched at the apex, glabrous, stigma sessile; valves obscurely winged above; seed about 1.5 x 0.8 mm., oblong-ovate, pale brown; septum 0.5-0.7 mm. broad, elliptic.

N.W. Himalaya:

Mulam glacier, 3900 m., Strachey and Winterbottom (K!); Kashmir, Lañak, 4350 m., W. Koelz No. 2353 (K!); 4260 m., W. Koelz No. 2437 (E!, K!); near Lebung glacier, 3900-4200 m., Duthie No. 5348 (E!); Ladak, J.L. Stewart (K!, E!); Ladak, Kaltse to Damkar, Schlagintweit (BM!); (without locality), Edgeworth (K!); Ladak, 4200-4500 m., Thomson (K!); Lachlungla, Rupshu, R./

R. Stewart (R-E!).Geog. Dist;

Tihet: Lingka, 4200 m., Hingston No. 40 (K!); Khambajung, Younghusband No. 150 (K!); Gyangtse, H. J. Walton No. 64 (K!); Phari, 4200 m., F.S. Chapman (K!); Sikkim, Kangralamo, 4800 m., Smith and Cave No. 2453 (K!); J.D. Hooker (K!).

7. L. perfoliatum L., Sp. Pl. 643 (1753); B.F.O. 362; B.F.S. 96; S.E.P. 409.

Type: Persia or Syria,? (LS!).

Annual or biennial, 12-30 cm. tall, erect, branched mostly above, subhairy below with simple hairs, glabrous or subglabrous above. Lower leaves bipinnatisect, 5-10 x 1.5-2.5 cm., short stalked; lobes narrowly linear, short, acute; middle and upper leaves ovate-cordate, sessile, amplexicaule, 1-1.5 x 1-2 cm., entire, acute; all leaves somewhat fleshy, <sup>†</sup> glabrous. Racemes 30-70-flowered, corymbose, ebracteate, increasing up to 8 cm. in fruit. Flowers small, 1.8-2 mm. across, pale yellow; pedicels 1.5-3 mm. long, increasing up to 7 mm. in fruit, filiform, ascending. Sepals 1-1.2 x 0.6-0.8 mm., oblong, obtuse, subequal. Petals 1.5-1.8 x 0.5 mm., oblong-spathulate, clawed, apex rounded. Stamens six, about 1.1: 1.4 mm.; anthers about 0.25 mm. Siliculae 3-4 mm. across, broadly elliptic or suborbicular, slightly notched at the apex; style short with capitate stigma slightly protruding out the notch; valves thin, obscurely winged; seed about 2 x 1.6 mm., ovate-oblong, redish brown; septum 1-1.4 mm. broad, elliptic.

W. Pakistan:

Baluchistan: Khanuk near Mustang, Stocks No. 1008 (K!); Quetta Griffith (K!).

Afghanistan:

Afghanistan:

Harirud Valley, Aitchison No. 284 (K!); Kabul, H. Collett No. Cl (K!).

Geog. Dist.: S. and S.E. Europe, W. and C. Asia.

8. L. crassifolium Wald. et Kit., Pl. Hung. i. 4. (1799); Willd., Sp. iii. 435 (1800); B.F.O. 357; B.F.S. 97;

Syn: Thlaspi cartilagineum J. Mayer in Abh. Bohm. Ges. 235 (1786); L. cartilagineum (J. Mayer) Thell. ssp. crassifolium Thell. l.c. 153-154.

Type: Europe, Hungary, Kitbal (G? - not seen).

Perennial, 15-30 cm. long, branched, spreading, or suberect,

† hairy with simple short hairs; rootstock branched, densely covered with † sheathing bases of the radical leaves. Radical leaves densely rosulate, long petioled, ovate or elliptic, 3-7 x 0.8-2.5 cm. including 1.5-3 cm. long petioles, entire or distantly subdentate; cauline leaves lanceolate, 1-4.5 x 0.3-1.5 cm., sessile, semi-amplexicaule, entire or obscurely toothed; all leaves fleshy, † glabrous, acute or subobtuse. Racemes about 15 (-20) - flowered, corymbose, ebracteate, increasing up to 10 cm. in fruit. Flowers small, about 3 mm. across, white; pedicels 2-3 mm. long, increasing up to 5 mm. in fruit, filiform. Sepals 1-1.3 x 0.6-0.8 mm., oblong, subequal, obtuse. Petals 1.8-2 x 0.8-1 mm., spatulate, apex rounded. Stamens six, about 1: 1.3 mm.; anthers minute, about 0.2 mm. Siliculae about 3 x 2.5 mm., ovate-elliptic, obscurely notched at the apex; stigma short, capitate, subsessile, glabrous; seed about 1.2 x 0.7 mm., ovate-elliptic, redish-brown; septum about/

about 0.5 mm. broad narrowly elliptic.

W. Pakistan:

Baluchistan: Zangi Lora near Quetta, 1680 m., Lace No. 3314 (E!, K!); Zurd in Salt ground, Stocks No. 943 (K!); Quetta, Duthie No. 8599 (K!); Quetta, Griffith (K!).

Afghanistan: Harirud Valley?, Aitchison No. 1012 (K!); Kabul, 1680 m., W.R.Hay Nos. 94 (K!) and 86 (K!).

Geog. Dist.: S.E. Europe, Orient and C. Asia.

9. L. latifolium L., Sp. Pl. 644; B.F.O. 359 (excl. syn. Led.); F.B.I. 160 (excl. var.); S.E.P. 409. Komarov, Fl. U.R.S.S. viii. (1939).

Type: Not precisely designated - Europe No. 8 (LS!).

Perennial, 30-120 cm. tall, erect, often much branched and somewhat woody below, glabrous or hairy with simple and forked, short hairs. Lower leaves long petioled (petiole 2.5-15 cm. long); lamina ovate, lanceolate or oblong-elliptic, 5-12 x 3-6 cm., margin usually serrate, apex acute; upper leaves 3-8 x 1-3 cm. usually oblong-elliptic, or lanceolate, short stalked or sessile, serrate or subentire, acute; upper most leaves much smaller, 1-3 x 0.2-0.5 cm., oblong-elliptic, linear or lanceolate, acute, subentire or entire, sessile; all leaves submembranous to slightly fleshy, lower + hairy, upper glabrous or subhairy. Racemes 30-50 $\frac{1}{2}$  flowered, short, corymbose, ebracteate. Flowers small, 2-2.6 mm. across, white often with light pink bases; pedicels 3-4 mm. long, increasing up to 5 mm. in fruit, filiform. Sepals 1-1.3 x 0.8-1 mm., ovate-oblong or suborbicular, subequal, apex obtuse or rounded. Petals 2-2.8 x 1-1.8 mm., spatulate, distinctly clawed, limb oblong-orbicular/

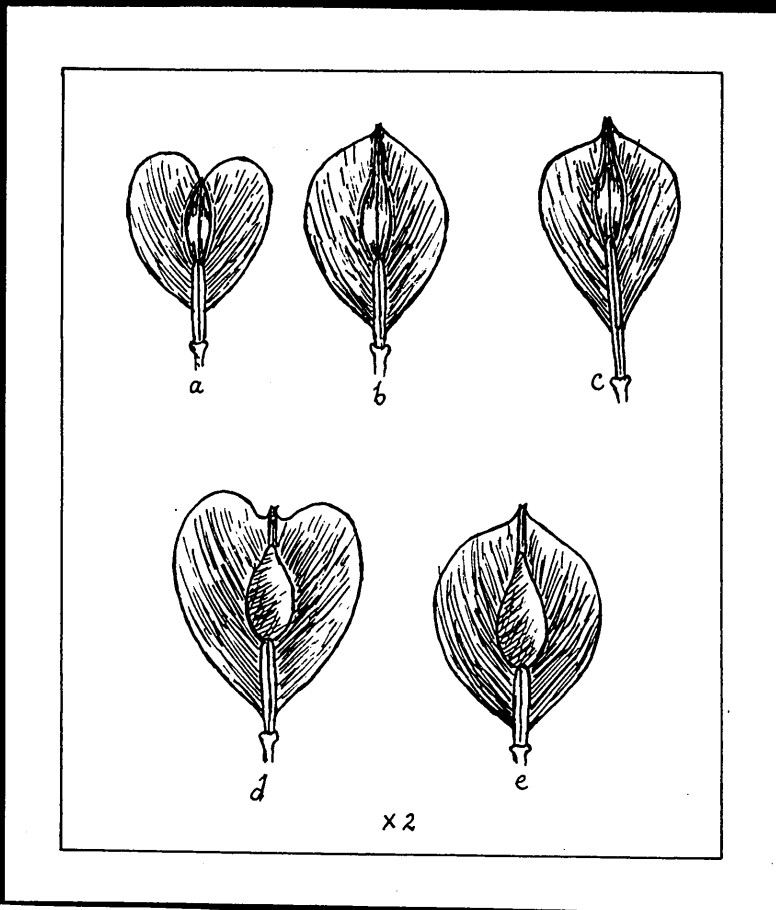


Fig. no. 8

Fruits of Fortuynia spp.

a,b,c - Fortuynia aucheri Shuttl.; d,e - Fortuynia bungei Boiss.

[a and b drawn from the type specimen of F.aucheri; c from F.garcinii; d from F.bungei; and e from Watson's specimen from Baluchistan.]

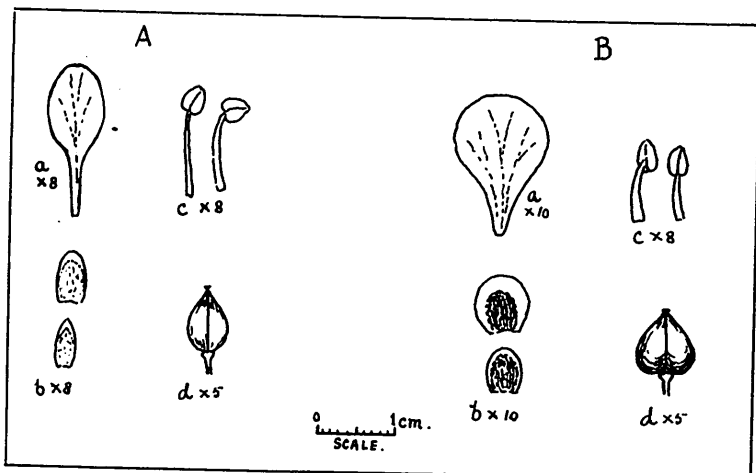


Fig. no. 9

A - Lepidium latifolium L.

B - Lepidium sibiricum Schweigg.

[a = petal; b = sepals; c = stamens; d = siliculae].

orbicular, apex rounded. Stamens six, 1.4-1.6: 1.6-1.8 mm.; anthers about 0.7 mm. Siliculae broadly elliptic or ovate-orbicular compressed, 1.4-2.6 x 1.2-2.2 mm., apex obscurely retuse, glabrous rarely subhairy; stigma capitate, almost sessile, topping the apex of fruit; seeds about 1 mm. long, elliptic-oblong, brown, septum 0.5-1 mm. broad, elliptic. (Plate No. VIII).

Afghanistan:

(without locality), Griffith (K!); Kurrum Valley, Shalizan, fields, Aitchison Nos. 694 (K!) and 621 (K!); Kelat-i-Ghilzvi, 1350 m., W.R. Hay No. 203 (K!); Kabul, 1680 m., W.R. Hay Nos. 364 (K!); 368 (K!) and 433 (K!); Harirud Valley, Aitchison No. 607 (K!, BM!);

N.W. Himalayas: (without locality) Jacquemont (K!); J.L. Stewart (E!). Kashmir: Below nil nag, 1650 m., R. Stewart No. 23026 (K!); Baltistan, 2550 m., R. Stewart No. 20789 (R-E!); Ladak road, c. 3000 m., R. Stewart Nos. 755-6 (K!) and 22353 (K!); Baltistan, Herb. Schlagintweit Catl. No. 5449 (BM!); Shigar, Herb. Schlagintweit Catl. No. 5416 (BM!); Ladak, Herb. Schlagintweit Catl. No. 1131 (BM!); Gilgit, Duthie (BM!); Baltistan, Winterbottom (K!); Baltistan, Dras Valley, 3000-3300 m., Duthie No. 13688 (E!); Gilgit, near Nomal in Hunza Valley, 1650 m., Duthie (E!); Ladak, 3150 m., W. Koelz No. 2605 (E!) Karakorum, C.B. Clarke No. 30100 B (K!). W. Tibet, 3000-4200 m., Thomson (E!) (with L. sibiricum Schweig).

Geog. Dist.: Europe, N. Africa and Orient, C. Asia.

10. L. sibiricum Schweigg., Enum. Pl. H. Region. 43 (1812); Komarov, Fl. U.R.S.:S. viii. 515 (1939).

Syn: L. affine Led., Ind. Sem. Hort. Dorp. 22. (1821);

L. latifolium var. platycarpa Trantv. in AHP. i. 170 (1872); F.B.I. 160.; L. latifolium ssp. sibiricum (Schweig.) Thell., l.c. 159-161 (1906); B.F.S. 100.

Type: Siberia, Schweigg. (L? - not seen).

Perennial, 30-80 cm. tall, branched, glabrous, glaucous;

branches suberect or arcuate, subfleshy. Leaves thick, fleshy, glabrous, glaucous; lower shortly stalked, variable in size 6-15 x



1.5-4 cm., oblanceolate, obtuse, entire or obscurely toothed; upper small, sessile, <sup>†</sup> lanceolate or oblong, amplexicaule, entire, obtuse. Racemes 20-50-flowered, often dense, corymbose, crowded ebracteate, hardly increasing in length in fruit. Flowers 2-2.5 mm. across, white; pedicels 2-3 m. long increasing up to 4 mm. in fruit. Sepals 1-1.3 x 1-1.2 mm., suborbicular, apex rounded, subequal, margin broadly white. Petals 2-2.5 x 1-2 mm., obovate-cuneate. Stamens about 1.5: 1.7 mm.; anthers about 0.7 mm. Siliculae 1.4-2.2 x 1.2-2 mm., ovate, subcordate, subinflated apex obtuse or obscurely emarginate; stigma capitate, almost sessile; seed about 1 mm. long, ovate, brown, septum about 1 mm. broad. (Plate No. IX).

Afghanistan:

Aitchison No. 607 (BM!).

N.W. Himalayas:

Chamba, Nurpur, Herb. Schlagintweit Cat. No. 11678 (BM!); Kashmir, Ladak, 3300 m., along streams, flowers fragrant, white, W. Koelz No. 2567 (E!); Ladak, J.L. Stewart (E!, K!); Baltistan, 2310 m., C.B. Clarke No. 30043 B (K!); Baltistan, Isakrdo, Winterbottom (K!), Thomson (K!); Ladak, 3000 m., Ludlow and Sherriff No. 8390 (BM!); Baltistan, Haldi to Tsorkonda, Herb. Schlagintweit (BM!); Ladak, Lah, Herb. Schlagintweit (BM!); Baltistan 2250 m., F. Ludlow No. 333 (BM!); Ladak, Khalsar, 3090 m., F. Ludlow No. 516 (BM!); Gilgit, 3750 m., Giles No. 267 (K!); Ladak, R. Stewart (R-E!)

Geog. Dist.: C. Asia, Tibet and China.

11. L. persicum Boiss. in Ann. Sc. Nat. Bot. 196 (1842); B.F.O.

360; Komarov, Fl. U.R.S.S. viii. 519 (1939).

Type: Persia, Ispahan, Aucher Eloy No. 4141 (G,K!).

Perennial, 30-70 cm. tall, erect, glabrous, subaphyllous above;

rootstock thick, <sup>†</sup> woody, dichotomously branched. Lower leaves subrosulate, very variable in size, 4-8 x 0.4-0.8 cm., oblong-lanceolate/

lanceolate; petiole about as long as the lamina; middle and upper leaves elliptic or linear, 1-4 x 0.15-0.5 cm., shortly stalked to sessile; all leaves glabrous, entire, acute, submembranous or slightly thickened. Racemes 20-30-flowered, subcorymbose, increasing up to 8 (-10) cm. in fruit. Flowers small, 2-2.5 mm. across, white; pedicels 1.5-2.5 mm. long, increasing up to 5 mm. in fruit, filiform. Sepals 1.2-1.4 x 1-1.2 mm., suborbicular, subequal, often pinkish. Petals 2.2-2.5 x 1.3-1.5 mm., spatulate, apex obscurely emarginate. Stamens six, 1.2-1.4: 1.5-1.6 mm.; anthers about 0.6 mm. Siliculae 2-2.3 x 2 mm., ovate-suborbicular, glabrous; stigma capitate, sessile, apex obscurely retuse; seed about 1.2 x 0.8 mm., ovate-oblong, light brown; septum 0.7-1 mm. broad.

Afghanistan:

Kabul, 1680 m., W.R. Hay Nos. 147 (K!) and 175 (K!); Descent to Bamead Valley, Griffith No. 1488 (K!); Sandy ground, Kharabagh, Griffith No. 1485 (K!); Kabul, Stony hills, 2100 m. H. Collett No. C94 (K!).

Geog. Dist.: C. Asia and Persia.

- 15.\* CORONOPUS Zinn., Cat. Pl. Hort. Acad. et. Agri. Gotting. 325 (1757), Vgl. A. Becherer in Fedde, Rep. xxv. 16 (1928); Bohmer in Ludwig, Defin. Gen. Pl. 3 ed. 226 (1760); Gaert., Fruct. ii. 293, t. 242 (1791); S.E.P. 410.
- Syn: Senebiera DC in Mem. Soc. Hist. Nat. Paris, 140 t. 8 et 9 (1799); Eudistemon Raf., Medical Fl. ii. 219 (1830).

Annual, biennial or perennial herbs, glabrous or hairy with simple/

simple hairy. Leaves usually pinnatifid. Racemes short, ebracteate, often leaf opposed. Flowers minute, often inconspicuous, shortly pedicelled. Sepals  $\pm$  spreading,  $\pm$  ovate, scarious margined, inner pair not saccate at the base. Petals minute, white, spatulate, scarcely exceeding the calyx, sometimes abortive. Stamens 6 or by abortion 4 or 2.; anthers minute, subglobose. Nectariferous glands minute, dotlike, present between the stamen bases, lateral ones comparatively prominent than the median ones. Ovary subglobose-hilobed, 2-ovuled; stigma minute, capitate, subsessile. Siliculae short, laterally subcompressed, indehiscent but breaking longitudinally into two 1-seeded halves from the septum; valves hemispherical, reticulately pitted or tuberculated; septum very narrow.

8 species mostly in drier parts of Eurasia.

There is some disagreement on the authority of the genus. I have followed O.E. Schulz (1936) in recognizing J.G. Zinn as its authority.

C. didymus (L.) Smith., Fl. Brit. ii. 691 (1804); S.E.P. 412;  
K.F.U. 538.

Syn: Lepidium didymum L., Mant. 92 (1767); Senebiera didyma (L.) Pers., Syn. ii. 185 (1805); S. pinnatifida DC in Mem. Soc. Nat. Par. 144 (1799).

Type: Not precisely designated.

Annual or biennial, 15-30 cm. tall, foetid, diffuse or procumbent, branched mostly from below, glabrous or hairy with simple hairs. Basal leaves rosulate, pinnatisect, 6-10- jugate, 5-10 cm. long/

long, stalked; lower leaves <sup>†</sup> similar as the basal leaves; upper leaves pinnatisect or pinnatifid, 3-5- jugate, 1.5-3 cm. long, sessile or subsessile; lobes sinuate toothed, usually only on one side. Racemes 30-60- flowered, ebracteate, corymbose above, increasing up to 8 cm. in fruit. Flowers minute, about 1 mm. across; pedicels short, about 3-4 mm. long in fruit. Petals present or absent, about as long as slightly shorter than sepals, spatulate. Stamens 2 or 4 (but only 2 fertile). Siliculae shorter than the pedicels, about 1.5 x 2.5 mm., broader than long, bilobed; valves globose, reticulately rugose, glabrous; stigma sessile; seed about 1.5 x 1 mm., <sup>†</sup> reniform, redish-brown; septum very narrow, about 0.7 x 0.2 mm.

W. Pakistan:

N.W.F.P.: Peshawar garden, H. Deane (K!)

Punjab: Pathankot, 300 m., R. Stewart No. 1075 (K!); Lahore, J.L. Stewart (K!); Henderson (K!); Karnal, Drummond Nos. 20340 (E!K!), 20339 (E!,K!), 20341 (E!,K!); 20342 (E!K!) and 20343 (E!,K!).

Karachi: Jafri (E!)

N.W. Himalayas: Kulu Valley, 1260 m., M. Nath No. 1306 (R-E!)

Geog. Dist.: Introduced. A weed of cultivation and waste grounds. Probably native only in S. America but widely introduced.

⊗

16 WINKLERA Regel in AHP. ix. 617 (1886); Hayek Crucif. - Syst.,

l.c. 291 (1911); S.E.P. 413; Komarov, Fl. U.R.S.S. viii.

545 (1939).

Perennial, caespitose herbs; rootstock thick, woody, dichotomously branched, covered with withered leaf bases; aerial stems forkedly branched, sparsely leafy. Radical leaves densely rosulate, pinnatisect, 1-3- pinnate, <sup>†</sup> hairy with simple or forked hairs; cauline/

cauline leaves much smaller, sessile, simple pinnatisect. Racemes densely corymbose, ebracteate. Flowers mediocre, yellow, pedicellate, Sepals broadly oblong, apex toothed or obtuse, yellowish with white margin, inner pair not saccate at the base. Petals about twice as long as the sepals, spatulate, apex entire or obscurely toothed. Stamens 6; filaments not appendaged; anthers ovate, obtuse. Nect<sup>ar</sup>iferous glands small, present between the stamen bases, those at the bases of shorter stamens (laterals) somewhat curved; median smaller † dotlike or semiglobose. Ovary oblong-elliptic, 2-pundulous ovuled; style about 2/3 as long as the ovary with a short capitate stigma. Siliculae † elliptic or obovate, laterally compressed, indehiscent but breaking longitudinally into two one seeded halves along the septum; apex entire or emarginate with a distinct style; valves membranous, reticulately veined, not winged; seed one in each loculus, ovate-oblong, brown, not winged; septum membranous.

2 species in C. Asia.

Winklera Regel is closely allied to Heldreichia Boiss. so far<sup>as</sup> the fruit character is concerned, but the nect<sup>ar</sup>iferous glands are quite distinct: being fragmentary in the former and † complete in the latter.

O.E. Schulz (Pflanzenfam., 1936) includes H.f. and Thomson's species Heldreichia silaifolia under both the genera, while Komarov (1939), definitely includes it under Winklera, and Boissier (1867) under Heldreichia. In my opinion Komarov's treatment of this species is correct.

ⓧ W. silaifolia (H. f. et T.) Korshinsky in Bull. Acad. Petersb.

ser V. ix. 419 (1898); S.E.P. 414; Konarov, Fl. U.R.S.S. viii. 546 (1939).

Syn: Heldreichia silaifolia H. f. et T. in Journ. Linn. Soc. Bot. v. 176 (1861); B.F.O. 320; S.E.P. 435.

Type: Afghanistan, Siah Sung, Griffith (K!).

Perennial, caespitose; rootstock about 1 cm. thick, woody, densely covered with withered leaf bases; aerial branches 15-30 cm. tall, dichotomously branched, sparsely leaved (only at places of branching), erect. Radical leaves densely rosulate, bipinnatisect, 5-15 x 2-3.5 cm., <sup>†</sup> hairy with simply rarely forked hairs; petiole 2-5 cm. long with broad sheathing bases; cauline leaves small, 1-2-pinnatisect; lobes short, narrowly oblong. Racemes 20-30-flowered, corymbose, paniced, ebracteate, increasing up to 5 cm. in fruit. Flowers 4-5 mm. across, yellow; pedicels 4-6 mm. long, filiform, ascending, <sup>†</sup> hairy. Sepals 2-3 x 1.2-1.8 mm., oblong, obtuse. Petals 4.5-5.5 x 1.8-2.2 mm., spathulate, margin obscurely toothed especially above. Stamens 2-2.8: 2.5-3.5 mm.; anthers about 0.8 mm. long. Siliculæ obovate, laterally flattened, 8-10 x 7-9 mm., (excluding about 2 mm. long style), apex emarginate, glabrous; valves membranous, reticulately veined, not winged; seed one in each loculus, about 5 x 2 mm., ovate-oblong, brown; septum about 1 mm. broad, byaline.

W. Pakistan:

Chitral: Sutkhoo, 2700-3000 m. Toppin No. 252 (K!); ~~Shajanali~~, 3000-3900 m., Toppin No. 252A (K!); Chitral, 1200 m., Harriss No. 16179 (K!); Chitral, 2400 m., Giles (K!).

Afghanistan: Siah Sung, Griffith (K!).

N.W. Himalayas: Gilgit, Dorah Pass, 3600 m. Giles No. 264 (K!); (without locality), Giles (E!).

Geog./

Geog. Dist.: C. Asia.

17. ISATIS L., Sp. Pl. 670 (1753); B.F.O. 376; S.E.P. 420; Komarov, Fl. U.R.S.S. viii. 203 (1939).

Annual to perennial herbs, often tall, branched, usually glabrous and glaucous. Basal leaves petioled; cauline leaves sessile, sagittate, aplexicaule. Racemes usually many flowered, corymbose, panicle. Flowers small, yellow, rarely white; pedicels filiform, often deflexed in fruit. Sepals suberect, almost equal, not saccate at the base. Petals oblong-obovate, often about twice as long as the sepals, apex usually rounded. Stamens 6, filaments not appendaged. Lateral nectiferous glands <sup>or</sup> † annular, often subsinate towards the inner side; median joining the laterals. Ovary oblong or elliptic, flattened, unilocular with 2 ovules; stigma subbilobed, sessile. Siliculae oblong-cuneate, to obovate or suborbicular, laterally flattened, indehiscent, unilocular, often broadly winged (wing often much broader than the loculus), apex usually truncate or sub-retuse, glabrous or minutely hairy; seed usually one, oblong, not winged.

About 40 species in C. Europe, Mediterranean region, W. and C. Asia.

Isatis L. is represented by 7 species in the present area; of these 4 are new records. I. emarginata Kar. et Kir. is added for the first time to Afghanistan (Plate No. XI).

Samareria Desv. is treated as a distinct genus.

Some of the species of Isatis are very polymorphic but a thorough/

thorough study of several herbarium specimens leaves no doubt that they represent one taxon. Thus, the newly described species, I. Koelzii Rech. f. (1951) from Afghanistan, is conspecific with I. tinctoria L.

Recently Rechinger F. (1951) described two new species of Pachypterygium from Afghanistan, P. macranthum and P. leptoloma. These are cases of misidentification and these species are conspecific with already known species of Isatis. P. macranthum Rech. f. is conspecific with Isatis stocksii Boiss. (Plate No. X) and P. leptoloma Rech. f. with I. harsukhii O.E. Schulz.

Pachypterygium is very closely allied to Isatis but its very minute flowers, short subterete siliculae with very narrow inflated margins easily distinguish it from the latter. Immature young siliculae of I. stocksii superficially look very much like fruits in Pachypterygium brevipes Bunge, due to shape and minutely hairy habit, but size of the flower and branching habit distinguish it easily from the latter. The same is the case with the other species of Rechinger f.

Korshinsky (1896) described Aitchison's "I. armena" (non L.) as a new species, I. aitchisonii, which is now rightly been transferred to Samer<sup>a</sup>eria by B. Fedtsch. (1939), making a new combination, S. aitchisonii (Korsh.) Fedtsch. In the same year B. Fedtschenko correctly transferred Aitchison and Hemsley's new species I. bullata to Samer<sup>or</sup>eria. Therefore, out of 4 species of Isatis recorded by Aitchison (1888), 2 go under Samareria.

Aitchison's 'I. boissieriana' (No. 227 (K!) from Afghanistan) is a misidentification of Tanscheria lasiocarpa F. et M. (Plate No.



XXI.) There is a superficial resemblance in the fruit of I. boissieriana Rechb. f. and Tanscheria lasiocarpa F. et M., but a careful study shows that the wing margins, are incurved and finely wavy with the valves tumid only towards the lower side of the fruit in the latter. While the margin is flat and valves tumid on both sides in the former.

The 7 species of Isatis are classified into 4 sections as follows:

Key to the sections:

1. Loculus of siliculae non spongy ..... Sect. I. Ermoglaston
  1. Loculus of siliculae spongy:
    2. Valves of siliculae winged round the loculus:
      3. Wings membranous, broad ..... Sect. II. Samerarioides
      3. Wings somewhat thickened, narrow ..... Sect. III. Glastum.
    2. Valves winged above only ..... Sect. IV. Apterolobus
- Sect. I. Ermoglaston Bunge in Mem. Acad. St. Petersb. vii. 214  
(1854); B.F.O. 376; S.E.P. 421; K.F.U. 207.
1. I. stocksii Boiss.; 2. I. emarginata Kar. et Kir.
- Sect. II. Samerarioides Boiss., Fl. Or. i. 377 (1867); S.E.P. 421;  
K.F.U. 208:
3. I. latisiliqua Stev.
- Sect. III. Glastum DC. Syst. ii. 568 (1821); B.F.O. 378; S.E.P. 421;  
K.F.U. 209:
4. I. tinctoria L.; 5. I. costata C.A.M.; 6. I. harsukhii  
O.E. Schulz;
- Sect. IV. Apterolobus Boiss., Fl. Or. i. 383 (1867); S.E.P. 422;  
K.F.U./

K.F.U. 221.

7. I. minima Bunge.Key to the species:

1. Siliculae winged above (at the apex) only ..... 8. I. minima
1. Siliculae winged completely round the loculus:
2. Loculus of siliculae non spongy; fruits somewhat flask-shaped (but compressed) with † rounded lower part and narrowly oblong, beak-like upper part:
3. Petals 2.4-2.8 mm. long; pedicels 10-15 mm. long in fruit, glabrous ..... 2. I. emarginata
3. Petals 4-4.5 mm. long; pedicels 5-6 mm. long in fruit, † hirsute ..... 1. I. stocksii
2. Loculus of siliculae spongy; siliculae oblong, linear or broadly elliptic.
4. Siliculae broadly elliptic; wing membranous:
5. Fruits small, 6-7 x 3-5 mm. .... 6. I. harsukhii
5. Fruits large, 10-20 x 7-15 mm. .... 3. I. latisiliqua
4. Siliculae oblong or linear; valves somewhat thickened.
6. Siliculae 10-15 mm. long, oblong, apex † rounded; loculus about as long or longer than the apical sterile part (wing) ..... 5. I. costata
6. Siliculae 15-22 mm. long; linear or oblong, apex usually † truncate; loculus much shorter than the apical sterile part (wing) ..... 4. I. tinctoria
1. I. stocksii Boiss. Fl. Or. i. 376 (1867); S.E.P. 421.

Syn:/

Syn: Pachypterygium macranthum Rech. f. in Phyton, iii. 48 (1951).

Type: Baluchistan, Doorbund (Quetta), Stocks No. 964 (K!).

Annual, 6-45 cm. tall, erect, branched, glabrous glaucous below,  $\dagger$  hairy with simple, short hairs above. Basal leaves few, oblong-oblongeolate or oblong-elliptic, 3-6 x 0.7-2 cm., sessile or subsessile, entire or subentire, obtuse; upper leaves, oblong-lanceolate, 0.5-4 x 0.15-2 cm., distant, auricled at the base, amplexicaule, obtuse or acute, entire or subentire; all leaves glabrous, glaucous, subfleshy. Racemes 20-30-flowered, corymbose above, ebracteate, increasing up to 15 cm. in fruit. Flowers 3-4 mm. across, yellow; pedicels 3-5 mm. long, increasing up to 6 mm. in fruit, filiform,  $\dagger$  hairy, often hispid, spreading or deflexed. Sepals 2-2.5 x 0.8-1 mm., oblong, obtuse,  $\dagger$  hairy. Petals 4-4.5 x 1.2-1.5 mm. obovate-oblong, apex obtuse or subrounded. Stamens about 2.5: 3 mm.; anthers about 0.5 mm. Siliculae flask-shaped or lanceolate with broad  $\dagger$  ovate base and oblong apex, 7-9 x 2-2.8 mm., hairy; wing narrow, with often  $\dagger$  ciliate white hairs, locular wall usually with short subglandular hairs rarely glabrous; seed about 2 x 1 mm., oblong-ellipsoid, brown. (Plate No. X.)

W. Pakistan:

Baluchistan: Doorbund (Quetta), Stocks No. 964 (K!); Zarghun, 2160 m., Lace No. 3792 (only photograph - K!); Surkab Valley, 1650 m., Lace No. 3831 (E!); Uam, 2100 m., Lace (E!).

Afghanistan: In bushes near Chokey, Griffith No. (506) (K!); Kabul-Ghazni road, 2250 m., edge of cultivated land, W.R. Hay No. 193 (K!); Pulalam, 2100 m., flowers yellow, pods flattened and curved, Koelz No. 11866 (V,U-E!).

Geog. Dist.: Endemic.



11866 Palalaz, Afghanistan  
 elev. 7000', yellow, fl. yellow,  
 pod flattened & curved.  
 Koebe

UNITED STATES NATIONAL MUSEUM



PLANTS OF AFGHANISTAN  
*Pachypterygium sacranthum* Koch. f.

Palalaz  
 El. 7000 ft. June 15, 1937  
 In desert, fl. yellow,  
 pod flattened and curved.

WALTER KOEBE 11866

2. ~~III~~ I. emarginata Kar. et Kir., Enum. Pl. Songor. No. 126 in Bull. Soc. Nat. Mosc. xv. (1842); Komarov, Fl. U.R.S.S. viii. 207 (1939).

Syn: I. violascens Bunge. Rel. Lehm. 214 (1854) No. 140; B.F.O. 376; S.E.P. 421.

Type: Turkestan, Chiwa, Kar. et Kir. (L,K!).

Annual, 20-40 cm. tall, erect, branched above, glabrous (except siliculae), subglaucous. Basal leaves oblanceolate, subsessile or sessile, 4-7 x 1-1.8 cm., entire or obscurely toothed, apex obtuse or rounded; middle cauline leaves oblong-ovate, sessile auricled-cordate, amplexicaule, 2.5-6 x 1.5-2.5 cm. entire, apex obtuse or acute; uppermost leaves linear-oblong, auricled at the base; all leaves glabrous, subglaucous or glaucous. Racemes 15-25-flowered, lax, increasing up to 10 cm. in fruit, ebracteate. Flowers 2-2.5 mm. across, yellow; pedicels 3-5 mm. long, filiform, glabrous, increasing up to 15 mm. and becoming <sup>†</sup> deflexed in fruit. Sepals 1.6-1.8 x 1 mm., Petals 2.4-2.8 x 1 mm., oblong, apex rounded. Stamens about 1.5: 1.8 mm.} anthers about 0.25 mm. Siliculae about 10 x 5 mm., <sup>‡</sup> flask shaped with broad neck, base rounded, apex truncate and subretuse, <sup>†</sup> densely hairy with minute simple hairs, narrowly winged; seed one, 3-4 x 1-1.2 mm., broadly-elliptic, dark brown. (Plate No. XI).

Afghanistan: Badghis, in the sandy downs of Gulran, Aitchison No. 1013 (K!).

Geog. Dist.: C. Asia and Persia.

3. ~~III~~ I. latisiliqua Stev. in Mem. Soc. Nat. Mosc. iii. 267 (1812);

Blatter/

Blatter and Hall. in Journ. Indian Botany 1. 57 (1919); Komarov,  
Fl. U.R.S.S. viii. 208 (1939)

Type: Caucasus, Steven (L - not seen).

Perennial, 20-45 cm. tall, erect, branched above, hairy to glabrous; hairs simple rarely branched. Basal leaves <sup>†</sup> - rosulate, oblanceolate or spatulate, stalked, 6-10 x 1-2 cm., entire, apex rounded; upper leaves lanceolate-linear, sessile, auricled at the base, amplexicaule, entire, apex rounded, obtuse or acute, 1.5 - 6 x 0.5 - 1 cm.; all leaves glabrous or subhairy. Racemes 20-60-flowered, lax, ebracteate, increasing up to 15 cm. in fruit. Flowers about 5 mm. across, yellow; pedicels 3.5-10 mm. long, filiform, glabrous, increasing up to 12 mm. and becoming deflexed in fruit. Sepals 2.5-3 x 1 mm. Petals 4-5 x 1.5-2 mm., obovate-oblong, apex rounded. Stamens about 3: 3.5 mm.; anthers about 0.7 mm. Siliculae very polymorphic in size, shape and degree of indumentum, broadly elliptic to suborbicular, 1-2 x 0.7-1.5 cm., apex entire to subretuse, glabrous or hairy, wings broad, membranous; seed 3-4 x 1-1.5 mm., oblong-ellipsoid, brown.

W. Pakistan:

Baluchistan: near Punjgur, 1200 m., Hotson nos. 318 and 318A (Herb. St. Xavier's College, Bombay).

Geog. Dist.:

Syria : Damascus, Kotschy no.116 (K!).

Persia : Mt.Elburz, 2100 m., A.C. Trott no.476 (K!);  
Lauristan, 2700m., Hausknecht (K!).

C.& W. Asia: Pigana, P. Sintenis no. 973 (K!).

4. I. tinctoria L., Sp. Pl. 670 (1753); F.B.I. 163; S.E.P. 421;

Komarov, /

Komarov, Fl. U.R.S.S. viii. 212 (1939).

Syn: I. Koelzii Rech. f. in Phytion, iii. 46 (1951) - Type:  
Afghanistan, Koelz no. 11642 (V-K!).

Type: Europe (not precisely designated) (LS!)

Biennial, 40-120 cm. tall, glabrous, glaucous, erect, very branched especially above; main stem stout. Basal leaves rosulate oblanceolate, short stalked, 5-15 x 1-3 cm., very variable in size often much larger in cultivated plants, entire, obtuse or acute; cauline leaves 1-8 x 0.5-2.5 cm., linear - lanceolate,  $\frac{1}{2}$  sagittate - amplexicaule, sessile, acute or obtuse, entire; upper most much smaller; all leaves glabrous or subhairy. Racemes 30-80-flowered paniced, corymbose above, ebracteate, increasing up to 10 (-15) cm. in fruit. Flowers 4-5 mm. across, yellow; pedicels 4-8 mm. long glabrous, increasing up to 10 mm. and becoming  $\frac{1}{2}$  deflexed in fruit, filiform. Sepals 1.8-2.4 x 1.2-1.6 mm., yellowish-green, Petals 3-4.5 (-5) x 1.4-2 mm., obovate-cuneate, apex rounded. Stamens 1.8-2: 2-2.5 mm., anthers about 1 mm. Siliculae very variable, 1.5-2.2 x 0.3-0.6 cm., oblong  $\frac{1}{2}$  elliptic with cuneate bases and rounded to truncate apex, broadest in the middle, glabrous, loculus shorter than the wing; seed one, 3-4 x 1 mm., oblong-ellipsoid, brown.

W. Pakistan:

Chitral: 1350-1500 m., Toppin No. 80 (K!);

N.W.F.P.: Peshawar, H. Deane (K!).

Afghanistan: Ootipore, Griffith (K!); Kurrum Valley, very profuse from Kurrum to Seratgah, C. 3300 m., Aitchison Nos. 78 (K!) and 251 (K!) Danlatshah, 2100 m., Koelz No. 11642 (V-K!).

Geog. Dist.: Native of C. and S. Europe; introduced elsewhere.

A very variable species in size and shape of the siliculae and leaf characters. Formerly it was extensively cultivated in some parts/

parts of the world for obtaining blue dye.

The taxonomic status of the subspecies and varieties occurring outside the present area is not definitely known. I. Koelzii Rech. f. is nothing but a form of this species with narrow (immature) siliculae.

5. I. costata C.A.M. in Ledeb, Fl. Alt. iii. 204 (1831); F.B.I. 163; B.F.S. 160; Komarov, Fl. U.R.S.S. viii. 218 (1939).

Type: C. Asia, Altai, Ledebour (L,K!).

Annual, rarely biennial, 40-120 cm. tall, erect, very branched above, apparently glabrous, subglaucous. Basal leaves obovate-oblong, 8-14 x 2-3 cm., subsessile, apex rounded, margin entire or obscurely dentate; cauline leaves 1.5-10 x 0.5-2 cm., lanceolate, sessile, sagittate, amplexicaule, entire, acute or obtuse; all leaves glabrous or sparsely ciliate hairy with simply hairs. Racemes 30-50-flowered, panicled, corymbose above, ebracteate increasing up to 10 cm. in fruit. Flowers 3-3.5 mm. across, yellow, pedicels 3-6 mm. long, glabrous, increasing up to 8 mm. and becoming  $\pm$  deflexed in fruit. Sepals 1.5-1.8 x 0.8-1 mm. Petals 2.6-3.2 x 1-1.2 mm., oblong-obovate, cuneate at the base, apex  $\pm$  rounded. Stamens 1.9: 2.2 mm.; anthers about 0.8 mm. Siliculae 1-1.5 x 0.4-0.7 cm., oblong-obovate, or oblong-elliptic apex  $\pm$  rounded, rarely subretuse, glabrous; loculus  $\pm$  elongated with valves  $\pm$  3-veined; seed one, about 3 x 1 mm., oblong-ellipsoid, brown.

W. Pakistan:

N.W.F.P.: Swat, Hazara, Herb. Gordon College No. 115 (R-E!).

Afghanistan: Hariab Valley, 2100 m., H. Collett No. 16 (K!).

N.W. Himalayas: Chenale Valley, 2400 m., R. Ellis No. 169 (K!);

Kashmir/



Kashmir, Gilgit, Giles (K!); Baltistan, Valley of Kishnganga, 2160 m., Winterbottom No. 598 (K!).

Geog. Dist.: C. Asia.

✱

6. I. harsukhii O.E. Schulz in Notizblatt, Berlin. ix. 1085 (1927).

Syn: Pachypterygium leptoloma Rech. f. in Phytion, iii. 47 (1951)

- Type: Afghanistan, Keolz No. 11380 (V-K!).

Type: Baluchistan (W. Pakistan), Sinkach, Harsukh No. 20464

(B - K (only photograph seen ))

Annual, 20-40 cm. tall, erect, branched, glabrous, subglaucous. Basal leaves withering soon; cauline leaves linear-lanceolate, 1-5 x 0.3-1 cm., sessile, auricled at the base, amplexicaule, entire, acute or obtuse, glabrous or sparsely hairy at the apex. Racemes 15-30- flowered, corymbose above, increasing up to 10 cm. in fruit, ebracteate. Flowers 3-4 mm. across, yellow; pedicels 3-6 mm. long, filiform, increasing up to 8 mm. and becoming † deflexed in fruit. Sepals 1.5-2 x 1 mm. Petals 4-4.5 x 1.5 mm. obovate-oblong, cuneate, apex subrounded. Stamens about 2: 2.5 mm.; anthers about 0.5 mm. Siliculae elliptic, 6-7 x 3-5 mm., flattened apex obtuse or acute; wing narrow, † hairy, with short simple hairs; loculus wall glabrous or hairy with minute hairs; seed 2.5-3 x 1-1.5 mm., oblong-ellipsoid.

W. Pakistan:

Baluchistan: Sinkach, Harsukh No. 20464 (B - K! - only photograph seen.

Afghanistan: Jalalabad, Koelz No. 11380 (V - K!).

Geog. Dist.: Endemic.

8. I. minima Bunge in Del. Sem. Hort. Dorp. 7 (1843); B.F.O. 383;

S.E.P. 422; Komarov, Fl. U.R.S.S. viii. 222. (1939).

Syn:/

Syn: I. songarica Schrenk in Bull. Phys. - Math. d. l'Acad. St. Petersb.

Type: N. Asia, Kerwan, Bunge No. 141 (L,K!).

Annual, glabrous (except pedicels, sepals and siliculae), 12-30 cm. tall, branched, erect. Lower leaves oblong-elliptic, shortly stalked or sessile, 3-8 x 0.5-1.2 cm., sinuate-dentate, apex obtuse; upper leaves linear-lanceolate, 1-7.5 x 0.15-1.8 cm., sessile, bases auricled, semi-amplexicaule, sinuate-dentate to subentire; all leaves glabrous. Racemes 20-35-flowered, corymbose above, ebracteate, lax, increasing up to 15 cm. in fruit. Flowers about 2 mm. across, pale yellow; pedicels 2-4 mm. long, increasing up to 5 mm. and often becoming recurved in fruit, filiform, <sup>†</sup> densely hairy with simple, soft hairs. Sepals 1.5-2 x 0.8-1 mm. Petals 2-2.6 x 0.8-1 mm. Stamens about 1.5: 2 mm.; anthers about 0.3 mm. Siliculae 9-11 x 2.5 mm., oblong-cuneate, broadest towards the apex, apex <sup>†</sup> notched, narrowly winged above, valves densely hairy with simple hairs; seed one, about 3 x 1 mm., oblong-ellipsoid, dark brown.

W. Pakistan:

Baluchistan: Peshin, 1560 m. Lace Nos. 3471 (E!K!) and 3571 (E!); Kula Kazza port, 1500 m., Harsukh No. 18774 (K!); Cultivated in Khozdar, 1200 m., Stocks No. 726 (K!); Kuchlach, in sandy places, Griffith No. 432 (K!).

Afghanistan: (without locality, Griffith (K!); Harirud Valley, in land from which the river had retired after floods - quite common, Aitchison Nos. 238 (K!) and 304 (K!).

Geog. Dist.: Persia and C. Asia.

18. PACHYPTERYGIUM Bunge in Del. Sem. Hort. Dorpat. viii (1843);

B.H.G.P. 94; B.F.O. 373; S.E.P. 422; Komarov, Fl. U.R.S.S. viii. 223 (1939).

Syn: Pachypteris Kar. et Kir. in Bull. Soc. Nat. Mosc. xv.

159 (1842).

Annuals, erect, branched, glabrous, glaucous except the siliculae which are often papillose; branches filiform, rigid, † corymbose. Basal leaves few, oblong, obtuse, subsessile or sessile; cauline leaves ovate or ovate-oblong, bases † cordate, amplexicaule; all leaves glabrous glaucous, apex rounded, obtuse or acute. Racemes lax, subcorymbose above, flexuose, ebracteate. Flowers minute white or pale yellow; pedicels short, filiform, ascending or deflexed. Sepals oblong-elliptic, submembranous, obtuse, almost equal, not saccate. Petals oblong-obovate, apex rounded, slightly longer than sepals. Stamens 6, inner four about twice as long as the outer two; filaments not appendaged; anthers minute, subquadrate-orbicular. Nectariferous glands similar as in Isatis. Ovary oblong-ovate with one pendulous ovule, stigma sessile, broad, † bilobed. Siliculae, ovate or broadly elliptic, laterally flattened, subquadrate, unilocular, narrowly margined indehiscent; margin (wing) narrower than the loculus, inflated; valves † papillose especially on the loculus wall, rarely glabrous; seed one pendulous.

About 5 species in Persia, Afghanistan, Baluchistan and C. Asia.

Very closely allied to Isatis. Best distinguished by its short habit with filiform branches, minute flowers, smaller † subquadrate-flattened siliculae with narrow inflated wings (narrower than the loculus) and papillose valves. (Plate No. XII).

P. brevipes Bunge in Del. Sem. Hort. Dorpat. viii. (1843); S.E.P.

422; Komarov, Fl. U.R.S.S. viii. 224 (1939).

Syn: P. heterotrichum Bunge ex Boiss. Fl. Or. i. 374 (1867);

Burkill, /

Burkill, List of Flowering plants of Baluchistan, 9 (1909).

Type: Persia, Schahrud, Bunge (L, K!)

Annual, 12-35 cm. tall, erect, branched, glabrous, glaucous; branches corymbose, filiform, rigid. Basal leaves obovate-oblong, sessile, withering; lower leaves oblong-ovate, 2-3.5 x 0.5-2 cm., sessile, entire or subentire, apex rounded,  $\pm$  auricled at the base, semiamplexicaule; upper leaves 0.5-2 x 0.2-0.9 mm., ovate-cordate, semiamplexicaule, entire, apex rounded or obtuse; all leaves glabrous, glaucous, subfleshy. Racemes 10-22-flowered, lax, ebracteate, increasing up to 10 (-15) cm. in fruit. Flowers minute, 1.5-2 mm. across, yellow; pedicels 1.5-2.5 mm. long, filiform, increasing up to 4 mm. in fruit, spreading or deflexed. Sepals 1-1.2 x 0.5-0.8 mm. Petals 1.5-2 x 0.5-0.8 mm. oblong-obovate, apex rounded. Stamens 0.6-0.7: 1-1.2 mm.; anthers about 0.2 mm. Siliculae ovate with short oblong upper part, 4-5 x 1.6-2.2 mm.,  $\dagger$  apex truncate and subretuse; valves usually covered with short glandular hairs especially prominent on the loculus; seed one about 2 x 1 mm., ellipsoid, redish-brown. (Plate No. XII).

W. Pakistan:

Baluchistan: Urak (Quetta), 2100 m., Lace No. 3792 (E!K!); Shelabagh 1800-2100 m., Lace No. 3539 (E!); Sor range, 2100 m., H. Crookshank (K!); near Loralai, M. Nath No. 6030 (R-E!).

Afghanistan: Kurrum Valley, Alikhal, Aitchison No. 532 (K!); Paropamisus range, between kohtal-Sangi pass and Dana Sanjiti, C. 1200 m. Aitchison No. 565 (K!).

Geog. Dist.:

Persia: Schahrud, Bunge (K!).

C. Asia: Turkestan, Darch, 1800 m., Komarov (K!); Turcomania, Aschabad, D. Litwinow No. 608 (E!).

Helen Crookshank's plant from Baluchistan is very branched and apparently/

apparently looks aphyllous with small caducous leaves. This might be the effect of the dry arid habitat.

⌘

19. SAMERARIA Desvaux in Journ. Bot. iii. 161. t. 25. fig. 6. (1813);  
B.F.O. 374; S.E.P. 423; Komarov, Fl. U.R.S.S. viii. 229. (1939).

Annual or beinnial herbs, usually erect, branched, tall glabrous except siliculæ which are sometimes hairy, glaucous. Lower leaves oblong-obovate, entire or subentire, subsessile, apex rounded or obtuse; upper leaves oblong or lanceolate, sessile, auricled, amplexicaule, entire, apex acute, obtuse or rounded; all leaves glabrous and glaucous. Racemes lax, ebracteate, flexuose. Flowers small, pale yellow; pedicels filiform, flexuose, often deflexed in fruit. Sepals subspreading, oblong-elliptic, almost equal, not saccate, sometimes persistent in young fruits. Petals longer than calyx, oblong-obovate, apex rounded. Stamens 6; filaments not appendaged. Lateral nectariferous glands annular; median joining the laterals, broadened in the middle. Ovary ovate or elliptic, with one pendulous ovule, stigma capitate, subsessile or on distinct style. Siliculæ ovate or suborbicular, laterally compressed, broadly winged, unilocular, indehiscent apex entire or sub-retuse; valves coriaceous, coarsely veined, puberulous or glabrous; seed one, pendulous.

About 10 species in E. Mediterranean and C. Asia.

Distinguished from Isatis primarily by its coarsely veined valves and a distinct style.

Key to the species:

1. (a) Fruits glabrous; sepals not persistent ..... S. bullata  
1. (b) Fruits covered with a white felt, sepals persistent .....  
..... S. aitchisonii

⌘

S. Bullata/

✱ S. bullata (Aitch. et Hemsl.) B. Fedtsch., *Pact. Typk.* 447 (1915);  
Komarov, *Fl. U.R.S.S.* viii. 234 (1939).

Syn: Isatis bullata Aitch et Hemsl., *The Bot. Afghan. Dilimit.*  
*Comm. in Trans. Linn. Soc.* viii. 37 (1888).

Type: Afghanistan, Badghis, Aitchison No. 1014 (K!).

Annual or biennial, 30-50 cm. tall, erect, branched above, glabrous, glaucous; tap root slender, yellowish-brown. Basal leaves oblong-obovate or oblanceolate, subsessile sessile, with cuneate or auricled bases. 6-9 x 1.8-2.5 cm., subentire, apex rounded; upper leaves ovate-oblong or lanceolate, 1-5 x 0.5-2 cm., bases auricled-cordate, apex acute, obtuse or rounded, margin entire to distantly subdentate; all leaves glabrous, glaucous, subfleshy. Racemes 20-40-flowered, corymbose above, ebracteate, increasing up to 15 cm. in fruit. Flowers 5-7 mm. across, yellow; pedicels 5-7 mm. long, filiform, glabrous, increasing up to 15 mm. and becoming deflexed in fruit. Sepals 3.8-4 x 1-1.5 mm. Petals 5.5-6 x 1.8-2.1 mm., obovate-oblong, apex rounded. Stamens about 3.2: 4 mm.; anthers about 1 mm. Siliculae † ovate-elliptic, 1.4-1.6 x 0.9-1.1 cm., apex entire with somewhat mucronate broad style-like about 1 mm. long part ending in a broad capitate stigma; valves glabrous, coarsely veined with 4-6 depressions on the locular wall on each side, veins terminating in a longitudinal peripheral vein at the margin of the wings; seed one, 4.5-5 x 1.7-2 mm., ellipsoid, brown, surface coarsely reticulate (Plate No. XIII).

Afghanistan:

Badghis, common on the sandy downs of Gubran, Aitchison No. 1014 (K!).

Geog. Dist.: C. Asia.

✱ S. aitchisonii/

✠  
2.S. aitchisonii (Korsh.) B. Fedtsch., Pact. Typk. 447 (1915); Komarov,  
 Fl. U.R.S.S. viii. 234 (1939).

Syn: Isatis Aitchisonii Korsh. in Mem. Ac. Sc. Petersb. viii.  
 90. t. iv. (1896); "I. armena" Aitchison, in Trans. Linn.  
 Soc. iii. 37 (1888) - non L., Sp. Pl. 670 (1753).

Type: Afghanistan, Harirud Valley, Aitchison No. 181 (L,K!).

Annual or biennial, 30-70 cm. tall, erect, rarely suberect or ascending, branched mostly from below, glabrous, glaucous. Basal leaves few, spatulate, entire with broad base. Lower and middle leaves 5-10 x 2-5 cm., oblanceolate or lanceolate-oblong, apex rounded, entire, base sagittate-amplexicaule. Upper leaves 1.5-4 x 1-2.5 cm., † similar to the lower leaves. Racemes 20-25- flowered, lax, ebracteate, increasing up to 20 cm. in fruit. Flowers 5-6 mm. across, white; pedicels 5-9 mm. long, increasing up to 14 mm. in fruit, filiform, spreading and often deflexed. Sepals 3.5-4.5 x 1-1.5 mm. equal, spreading, violet coloured, persistent in fruit. Petals 5-6.5 x 2 mm., oblong-cuneate, apex sub-emarginate. Stamens about 3: 4.5 mm.; anthers about 0.4 mm. Siliculae ovate, 1.2-1.6 0.8-1.2 cm., apex entire with a short, about 0.7 mm. long style; valves densely pubescent in the middle; seed about 4 x 1.5 mm.

(Plate No. XIV).

Afghanistan:

Harirud Valley, a conspicuous plant when in fruit, which is covered with a white felt and subtended by the persistent ruddy sepals, Aitchison No. 181 (K!).

Geog. Dist.: Armenia, P. Sintenis No. 2214 (K!).

Very closely allied to Samareria armena (L.) Desv. but is distinguished primarily by its persistent calyx, smaller siliculae with narrow somewhat/

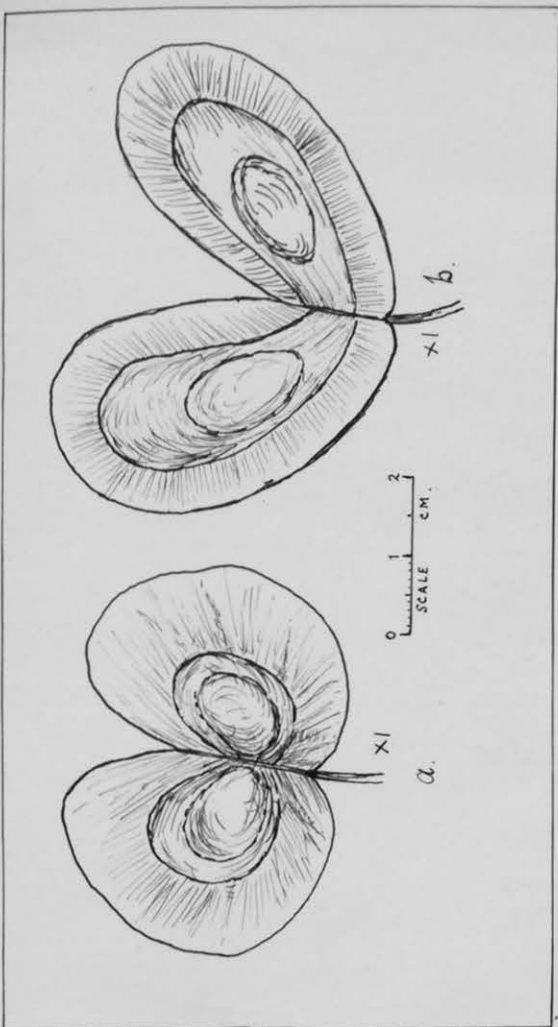


Fig. no. 10

Fruits of: a - *Megacarpaea polyandra* Benth  
 b - *Megacarpaea bifida* Benth

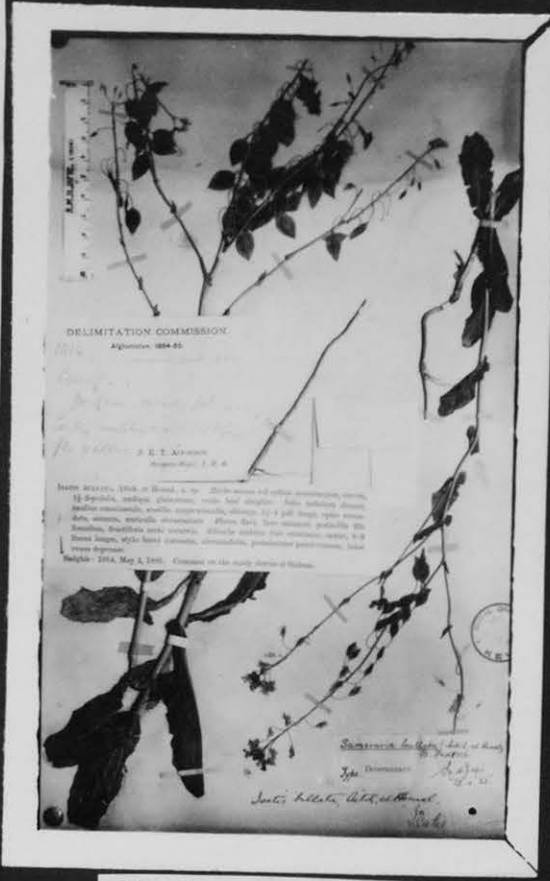


Plate no. XIII.

*Sameraria bullata* (Aitch. et Hemsl.)

B. Fedtsch.

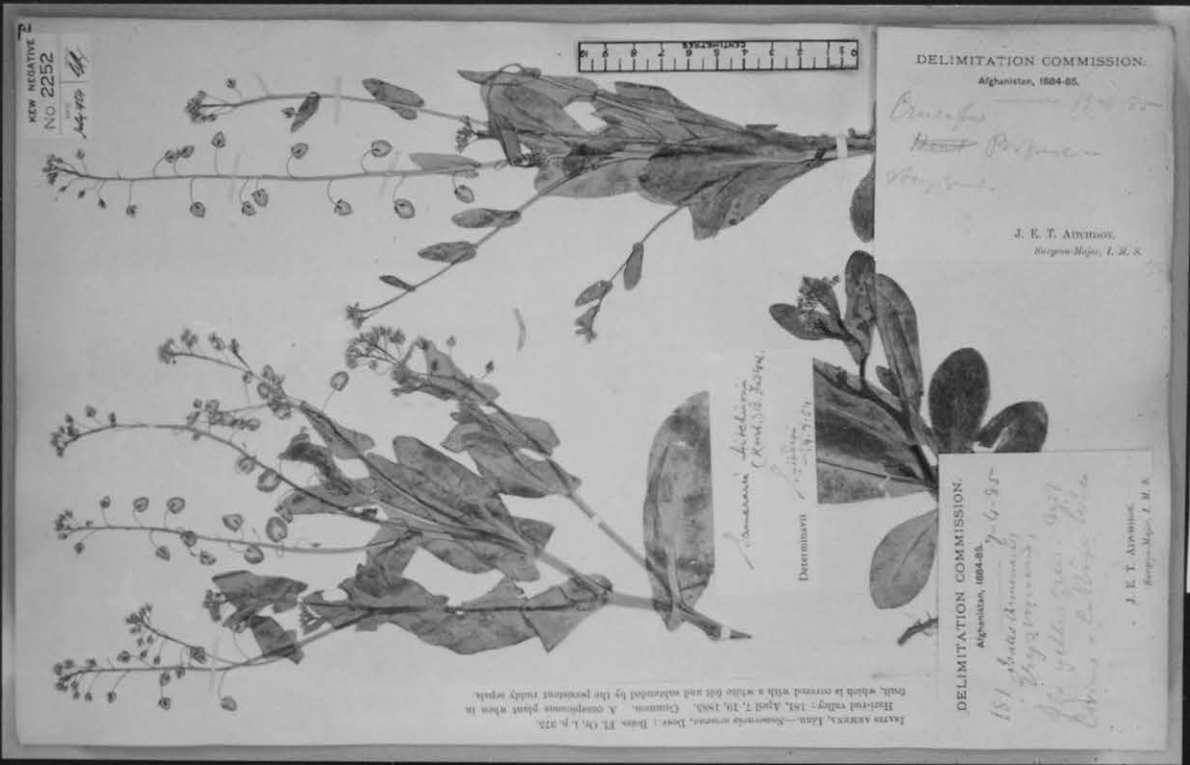


Plate no. XIV.

*Sameraria aitchisonii* (Korsh.) B. Fedtsch.



somewhat thickened wings.

⌘

20. DIDYMOPHYSA Boiss. in Ann. Sc. Nat. Ser. II. xvi. 379 (1841)  
 et xvii. 179 (1842); B.F.O. 318; B.H.G.P. 91; S.E.P. 428;  
 Komarov, Fl. U.R.S.S. viii. 573 (1939).

Perennial, procumbent herbs, with short branches, glabrous.

Leaves alternate, obovate-cuneate, sessile, entire or trilobed  
above, fleshy, glabrous, apex rounded. Racemes short, corymbose,  
 ebracteate. Flowers small, white, pedicels short, not thickened  
 spreading, straight. Sepals broadly elliptic, suberect, equal, not  
 saccate. Petals about twice as long as the sepals, spatulate,  
 apex rounded. Stamens 6; filaments not appendaged; anthers short  
 ovate, obtuse. Lateral nectariferous glands in pairs, each semi  
 linear with a similar emitting process; median glands between the  
 inner pair of stamen bases absent. Ovary <sup>†</sup> orbicular with 4 ovules;  
 style distinct short (about  $\frac{2}{3}$  -  $\frac{1}{2}$  as long as the ovary) with  
 capitate bilobed stigma. Siliculae inflated, balloon-like, bilobed  
bilocular, dehiscent; valves membranous, globose, opaque, glabrous;  
 septum narrowly elliptic, hyaline; seeds 2 in each loculus, ellipsoid,  
 dark coloured.

2 species in Persia, C. Asia and Himalaya.

⌘

- D. fedtschenkoana Regel, Pl. Nov. Fedtsch. 8 (1881); O.E. Schulz in  
 Notizblatt, Berlin, ix. 1074 (1927); S.E.P. 429; Komarov, Fl.  
 U.R.S.S. viii. 574 (1939).

Type: Turkestan, Fedtsch. (L,K!).

Perennial, 6-15 cm. long, procumbent or suberect, glabrous  
 herb. Leaves alternate, <sup>†</sup> distant, obovate-cuneate, 0.5-1 x 0.2-0.4 cm.,  
 entire/

entire, apex rounded, glabrous, fleshy, obscurely veined. Racemes 10-20-flowered, short, corymbose, ebracteate, increasing up to 2 cm. in fruit. Flowers 3-3.5 mm. across, white; pedicels 1.5-2 mm. long, filiform, glabrous, increasing up to 5 mm. in fruit, spreading. Sepals 1.3-1.6 x .7-1 mm. Petals 2-2.2 x 1 mm. Stamens 1.3-1.4: 1.6-1.7 mm.; anthers about 0.25 mm. Siliculae 7-9 x 9-11 mm. inflated, bilobed, glabrous; valves membranous, opaque often with slightly violet colour; septum 0.6-0.8 mm. broad, narrowly-elliptic; style 0.5-0.7 mm. long with a capitate stigma; seeds 2 in each loculus, about 2 x 1 mm., ellipsoid, black.

W. Pakistan:

Chitral: Shartarukh, 2800 m., Harriss (B.); Nawasingh, Agram gaz, 4150, Harriss (B.).

Geog. Dist: C. Asia: Turkestan, Tognab and Seravschan, V. Komarov.  
(K!)

I have not seen any specimen of this species from Chitral and have quoted only those specimen seen by O.E. Schulz (Notizblatt, 1927).

21. IBERIS L., Sp. Pl. 648 (1753); B.H.G.P. 93; S.E.P. 431.

Syn: Biauriculata Bubani, Fl. Pyren. iii. 217 (1901);

Metathlaspi Krause in Archiv. Ver. ii. 174 (1927).

Annual to perennial herbs, erect or suberect, mostly branched from below, hairy or glabrous; hairs simple rarely glandular. Leaves linear, spathulate or lanceolate, entire or sinuate-dentate. Racemes corymbose, many flowered, ebracteate. Flowers irregular with unequal petals, white or pinkish, pedicellate. Sepals suberect, subequal, not saccate. Petals unequal, outer pair much larger than the inner pair, oblong-obovate, clawed. Stamens six; filaments not appendaged. Lateral/

Lateral nectariferous glands usually in pairs, <sup>†</sup> triangular, small; median absent. Ovary ovate with two pendulous ovules; style about as long as the ovary with a capitate, <sup>†</sup> bilobed stigma. Siliculae laterally flattened, ovate or suborbicular, often shortly winged, apex emarginate, bilocular, dehiscent; seed one in each loculus, often large flattened, <sup>†</sup> ovate, winged or not; septum narrowly elliptic, membranous, not veined.

About 30 species mostly in Mediterranean region of Europe and Asia.

The genus in the present area is known only from cultivated species.

I. amara L., Sp. Pl. 649 (1753); O.E. Schulz in Notizblatt, Berlin ix. 1085 (1927); Komarov, Fl. U.R.S.S. viii. 552 (1939).

Type: Not precisely designated.

Annual with slender tap root and <sup>†</sup> erect leafy stem 10-30 cm. tall, corymbosely branched especially above, <sup>†</sup> hairy below. Leaves scattered, lower spatulate, upper oblanceolate, sessile; all sinuate-dentate to entire, hairy or glabrous. Racemes 20-40-flowered, corymbose, ebracteate, increasing in length in fruit. Flowers 6-8 mm. across, white or mauve; pedicels filiform, spreading or ascending. Sepals oblong, suberect, subequal, not saccate. Petals unequal outer pair about 4 times and inner pair about twice as long as the sepals. Stamens about 2: 3 mm.; anthers about 0.5 mm. Siliculae 4-5 mm. across, suborbicular, with wings broadening upwards, apex deeply notched; style about as long as the notch with a capitate, <sup>†</sup> bilobed/

bilobed stigma; valves reticulately veined especially above; seed ovate-orbicular, 2.5-3 mm. in diam., slightly winged below, reddish-brown.

Geog. Dist.: Europe and Mediterranean region. Introduced elsewhere. Cultivated throughout the present area as an ornamental plant in gardens.

Specimens of the cultivated species are not present in the herbaria. And it is not possible to say whether only this species or a few others are cultivated in gardens. Possibly the following species is also cultivated:

2. I. umbellata L. - with <sup>+</sup> - entire narrowly elliptic leaves; infl. not lengthening in fruit; flowers mauve, and fruits with wings prolonged upwards.

22. MEGACARPAEA DC., Syst. ii. 417 (1821) et Prodr. i. 183 (1824); B.H.G.P. 91; F.B.I. 161; S.E.P. 432; K.F.U. 541.

Perennial, robust herbs often <sup>±</sup> with very thick root, erect, branched glabrous or subglabrous above and/hairy below with simple hairs.

Basal leaves large, pinnatisect, with oblong-lanceolate or linear lobes; lobes entire to serrate-dentate; upper leaves smaller; uppermost sinuate-toothed to entire, sessile. Racemes paniced and subcorymbose, often much branched, lengthening in fruit, ebracteate. Flowers large or mediocre white or lilac; pedicels filiform, spreading or sometimes deflexed. Sepals, broadly elliptic, almost equal, not saccate, erect, often thin and patalloid. Petals very slightly larger than the sepals, obovate-cuneate, apex crenulate or rounded. Stamens 6-16, subequal; filaments not appendaged; anthers oblong, obtuse. Lateral nectariferous glands/

glands semianular incomplete towards the inner side, median joining the laterals. Ovary † obovate-orbicular, bilobed, 2-ovuled, apex † emarginate with discoid sessile or subsessile stigma. Siliculae often large, flattened, didymous, indehiscent, but breaking longitudinally into two one-seeded halves along the narrow septum, apex deeply and broadly notched, base slightly to distinctly notched; valves orbicular or obovate, winged, glabrous; seed one in each loculus, large, orbicular, brown; septum short, submembranous.

About 7 species in Central Asia and Himalaya.

The two species of the present area can be easily distinguished on their fruit characters (Fig. 10).

Key to the species:

1. Leaf segments serrate or sinuately toothed; siliculae suborbicular with lobes suborbicular; wing about as broad as the loculus .....  
..... M. polyandra.
1. Leaf segments † entire; siliculae obcordate, bifid, apex very deeply notched, lobes obovate-oblong, wings about half as broad as the loculus ..... M. bifida.

1. M. polyandra Benth. in Kew Journ. Bot. vii. 356 t. 7. (1885);  
F.B.I. 161; S.E.P. 434.

Type: Kashmir, Baltistan, Takpe La, 3150 m., Winterbottom (K!)

Perennial, 100-200 cm. tall, erect, branched, glabrous below and subhairy above; main stem stout, thick, 5-12 cm. in diam. at the base. Basal leaves pinnatisect, 7-9-jugate, 15-30 long; segments 8-20 x 1-5 cm., oblong-lanceolate, apex † acuminate, margin serrate or sinuately-toothed, sparsely hairy or glabrous; upper cauline leaves smaller;/

smaller; uppermost leaves lanceolate or linear, entire or sinuate-toothed. Racemes paniced, dense, many-flowered, increasing up to 20 cm. in fruit. Flowers 6-8 mm. across, white or cream-yellow; pedicels 7-12 mm. long, increasing up to 20 mm. in fruit. Sepals 4-5.5 x 2-2.8 mm., broadly elliptic, apex obtuse or crenulate. Petals 4.5-6 x 2-3 mm., obovate-cuneate, entire or irregularly crenulate; Stamens 8-16, about 4.5-5 mm. long; filaments linear; anthers 1.2-1.5 mm. long. Siliculae 2.8-3.5 x 3.5-5 cm., suborbicular, bilobed, laterally flattened, deeply notched at the apex and slightly or so at the base; lobes sometimes unequal in size, rarely one lobe abortive; wing about as broad as the loculus; seed about 1 cm. in diam., sub-orbicular, not winged, brown.

N.W. Himalayas:

Bashahr State, Charndhar, 3600 m., Gamble No. 24887 (K!); Kumaon, 3600 m., Strachey and Winterbottom (K!); Pelang Gadh, Byans, 3600-3900 m., Duthie No. 5334 (K!, BM!); Valley of Gori, 3600 m., Strachey and Winterb. (K!); Champwa, 3600 m., Strachey and Winterb. No. 872 (K!); Tihrigarhwal, Chansil range, 3300-3600 m., Duthie No. 14550 (K!); Lakhus Gadh, under Sukanta, 3000-3300 m. Duthie No. 909 (K!); Kashmir, Baltistan, Takpe La 3150 m., Winterbottom No. 626 (K!); Gilgit, Kamri pass, 3300-3900 m., Giles No. 690 (K!); (without locality) Falconer (K!); above Kilan merg, 3300 m., the plant is eaten as "sag", Aitchison (K!); Kamri pass, 3000-3900 m., Duthie (K!); Sonmarg, 3900 m., R. Stewart No. 7319 (K! R-E!); Sinthan pass, 4050 m., F. Ludlow No. 192 (BM!).

Geog. Dist.: Endemic.

2. M. bifida Benth. in Kew Journ. Bot. vii. 357 (1885); F.B.I. 161.

Type: Kashmir, Baltistan, Valley of Kishenganga, 2220 m., Winterbottom No. 597 (K!).

Perennial, comparatively less robust than the previous species, erect/

erect; stout, branched; habit <sup>†</sup> similar to M. polyandra Benth. but leaf segments <sup>†</sup> entire, acute or acuminate; flowers about 5 mm. across, yellow; stamens 7-11 only; siliculae distinctly bifid very deeply notched at the apex with lobes diverging; each lobe obovate-oblong, 4-4.8 x 3-3.6 cm.; wing about half as broad as the loculus; seed somewhat darker in colour.

N.W. Himalayas:

Kashmir, Valley of Kishenganga, 2250 m., Winterbottom No. 597 (K!); Karmipass, 3600 m., Giles No. 159 (K!); (without locality), Falconer No. 178; Churwan nala, Gurais Valley, Inayat No. 25487 (only photograph seen - K!).

Geog. Dist.: Endemic.

23. MORIERA Boiss. in Ann. Sc. Nat. 182 (1842); B.H.G.P. 94; B.F.O. 338; S.E.P. 439.

Syn: Aethionema sect. Moriera N. Busch in Komarov, Fl. U.R.S.S. viii. 557 (1939) (partim).

Perennial, suffruticose, very branched, glabrous, sub-glaucous, subaphyllous herbs; rootstock thick woody, branched; branches short, zigzag, rigid, crowded and often ending into sharp tips. Leaves oblong-obovate or linear, fleshy, caducous, entire, apex rounded. Racemes subcorymbose, short, lax, ebracteate. Flowers small, white or pale-rose; pedicles filiform, ascending. Sepals oblong, almost equal not saccate, apex rounded. Petals oblong-obovate, apex rounded. Stamens six; filaments not appendaged; anthers ovate obtuse. Lateral nectariferous glands in pairs, minute, semiglobose; median absent.

Ovary oblong-ellipsoid, 2-ovuled; stigma capitate, entire, sessile. Siliculae suborbicular, laterally flattened, broadly winged apex notched, unilocular, indehiscent, valves membranous white; loculus wall with a prominent/

prominent mid-rib; wing reticulately veined; seed often one, oblong-ovate, brown; septum absent.

About 5 species in W. and C. Asia.

Moriera Boiss. is very closely allied to Aethionema R.Br., and is primarily distinguished from the latter by its characteristic bushy and subaphyllous habit; white membranous indehiscent siliculae.

Busch in Komarov Fl. U.R.S.S. viii (1939) reduces Moriera to the status of a section of Aethionema.

In the present area only one species of each of those genera occur, and the two species, Moriera spinosa and Aethionema carneum, are so distinct from each other that their inclusion under one genus is impossible. Aethionema is primarily a genus of <sup>the</sup> Mediterranean region with about 40 species, but only species of it, Ae. carneum (Soland) Fedtsch., extends up to the present area. This species has dehiscent fruits with rigid (not white) valves and leafy branches, very distinct from Moriera spinosa Boiss. subsp. Cabulica (Boiss.) Jafri of the present area. I have, therefore, followed Boissier (1867), Bentham and Hooker (1862) and O.E. Schulz (1936) in keeping Moriera as a distinct genus from Aethionema.

Boissier, as well as, Schulz, recognize M. spinosa Boiss and M. cabulica Boiss. as distinct species. Boissier quotes only two specimens under each species and distinguishes the latter species from the former by its slightly larger fruits. The following specimens seen at Kew and quoted by Boissier under the two species have the following measurements of fruits:

M. spinosa Boiss.

1. Persia, Ispahan, Aucher Eloy Nos. 347 and 4149 (K!).

siliculae/



siliculae - 4-4.2 x 3.8-4 mm.

M. cabulica Boiss:

1. Persia, Schahrud, Bunge (K!).

siliculae - 4.5-5 x 4.2-5 mm.

2. Afghanistan, Cabul, Griffith:

siliculae - (5.5) 6-6.5 x 6-6.5 (-7) mm.

As a matter of fact we do not know the exact range of siliculae size due to the lack of enough herbarium specimens. They might prove to be one race in future with the increased knowledge of these plants, but under the present circumstances the Afghanistan plants definitely have slightly larger fruits than the Persian plants. I have, therefore, preferred to transfer Bunge's specimen from Persia included under M. cabulica by Boissier to M. spinosa and recognize Griffith's plants from Afghanistan as representing a subspecies cabulica (Boiss.) Jafri of M. spinosa Boiss.

Thus with the present-day knowledge the type species, . . . is confined to Persia . . . and . . . to Central Asia. (Komarov, Fl. U.R.S.S. viii. 557, 1939), while the subspecies cabulica (Boiss.) Jafri is endemic to Afghanistan.

Key to the subspecies of M. spinosa Boiss.

1. Siliculae 4-4.5 (-5) x (3.8) 4-5 mm. . . . . subsp. spinosa.

1. Siliculae (5.5) 6-6.5 x 6-6.5 (-7) mm. . . . . subsp. cabulica.

M. spinosa Boiss. in Ann. Sc. Nat. 182 (1842); H. f. et T. in Journ.

Linn. Soc. Bot. v. 178 (1861) (excl. syn.); B.F.O. 338; S. ELP. 439.

Syn: Aethionema spinosum (Boiss.) N. Busch in Komarov, Fl.

U.R.S.S./

U.R.S.S. viii. 557 (1939).

Type: Persia, Ispahan, Aucher Eloy No. 347 (G,K!).

subsp. 1. spinosa.

Perennial, 15-20 cm. tall, erect, very branched with short forked zigzag, sharp-tipped, subaphyllous branches, glabrous, glaucous; rootstock 4-8 mm. thick, woody. Leaves caducous, linear, fleshy, obtuse, 1-3 x 0.1-0.2 cm., <sup>†</sup> entire. Racemes 10-15-flowered, lax, ebracteate, increasing up to 4 cm. in fruit. Flowers 4-5 mm. across, white; pedicels 1-1.5 mm. long, filiform, glabrous, not increasing in fruit. Sepals about 2 x 1 mm., oblong obtuse. Petals 4-5 x 1-1.2 mm., oblong-cuneate, apex rounded. Stamens about 1.8: 2 mm.; anthers about 0.6 mm. Siliculae orbicular, 4-4.2 x 3.8-4 mm., wings about as broad as the width of the loculus, loculus wall prominently 1-veined; seed usually one, about 1.5 x 0.7 mm. oblong-ovate, brown.

Geog. Dist.: Persia and C. Asia.

subsp. 2. cabulica (Boiss.) Jafri, stat. et comb. nov.

Syn: Moriera cabulica Boiss., Diagn. ser. II. (1) 41 (1853);

B.F.O. 339 (excl. Persial plant); S.E.P. 439.

Type: Afghanistan, Erak, Kohi Baba, 4050-4350 m., Griffith (G,K!).

Perennial, 18-30 cm. tall, comparatively robust than the type race; habit <sup>†</sup> similar. Siliculae comparatively larger, 5-6.5 x 5-7 mm., wing broader than the width of the loculus. Other characters <sup>†</sup> similar as in the type race.

Known from the type locality only.

Geog. Dist.: Endemic.

24. AETHIONEMA R.Br. in Aiton, Hort. Kew. ed. 2. iv. 80 (1812);  
B.H.G.P. 88; S.E.P. 440.

Syn: Diastrophis Fisch et Mey. in Index Sem. Hort. Petrop. ii.  
35 (1835); Disynomia Raf., Fl. Tellur. iii. 81 (1836);  
Campyloptera Boiss. in Ann. Sc. Nat. Ser. II. xvii. 194  
(1842); Lipophragma Schott et Kotschy ex Boiss., Diagn.  
Ser. II. (5) 42 (1856).

Perennial, <sup>†</sup> suffruticose, branched, erect, or suberect, <sup>†</sup>  
leafy, glabrous; rootstock often woody; branches short, <sup>†</sup> straight or  
ascending, leafy. Leaves short, oblong or linear, sessile glabrous  
often glaucous, lower usually opposite, subsessile. Racemes corymbose,  
often many flowered, subflexuose, ebracteate. Flowers usually  
mediocre, rose, lilac or white; pedicels filiform, usually spreading.  
Sepals oblong, almost equal at the base, apex obtuse or rounded, inner  
pair hardly saccate at the base. Petals obovate ~~obovate~~-cuneate.,  
apex usually rounded. Stamens 6; filament of the inner four stamens  
often <sup>†</sup> appendaged; anthers ovate-orbicular, obtuse. Lateral nectari-  
ferous glands in pairs, minute, semiglobose; median absent. Ovary <sup>†</sup>  
ellipsoid with narrowly flattened margin, 2-6- ovuled; stigma capitate,  
subsessile or on distinct short style. Siliculae suborbicular,  
laterally flattened, winged, apex emarginate or deeply notched, often  
with a <sup>†</sup> distinct style, 1-2 locular, <sup>†</sup> dehiscent, glabrous; valves  
obscurely or not veined; wing-margin entire or variously dentate; seeds  
usually one mature in each loculus, ovate, brown, surface often somewhat  
papillose.

About 40 species chiefly in Mediterranean region.

Ae. carneum (Soland.) Fedtsch. in Acta Hort. Petrop. xxiii. 428 (1904);

Komarov, Fl. U.R.S.S. viii. 563 (1939).

Syn: Thlaspi carneum Soland. in Russell Aleppo. 257 (1794);

Ae. cristatum DC., Syst. ii. 560 (1821) et Prodr. i.

209 (1824); H.f. et T. in Journ. Linn. Soc. Bot. v. 175

(1861); B.F.O. 352; S.E.P. 443.

Type: Syria, Aleppo, Russell (BM!).

Annual, 5-15 cm. tall, glabrous, sparsely branched above with † spreading branches. Lower leaves obovate oblong, 5-18 x 2-9 mm., entire, subfleshy, apex rounded, shortly stalked or sessile; upper leaves sessile, auricled at the base, acute or subobtuse. Racemes 20-40-flowered, ebracteate, increasing up to 7 cm. in fruit. Flowers about 2 mm. across, white or pinkish; pedicels 1-1.8 mm. long, filiform, glabrous, increasing up to 3.5 mm. in fruit, subappressed. Sepals 1.2-1.5 x 0.6-0.8 mm., subequal, inner pair subsaccate at the base. Petals 2-2.5 x 0.6-0.8 mm. Stamens 1.2-1.4: 1.4-1.8 mm.; filaments of the inner four stamens appendaged. Siliculae † orbicular with few irregularly and coarsely toothed wings, 7-15 x 6-8 mm., glabrous; wings 5-7 teeth on each side, broader than the loculus; seed about 1.4 x 0.8 mm. broad, elliptic, not veined.

W. Pakistan:

Baluchistan: Quetta, Murdar Mts., 1800 m., Lace No. 3595 (E!); Dooband (Quetta), J.E. Stocks No. 962 (K!); Quetta, gravelly plains and hills, common, Griffith (K!).

Afghanistan: Harirud Valley, Aitchison No. 280 (K!).

Geog. Dist.: W. and C. Asia.

25. THLASPI L. Sp. Pl. 645 (1753); B.H.G.P. 91 (excl. syn.); S.E.P. 444;

K.F.U. 576.

Syn:/

Syn: Thlaspidea Opiz, Seznam, 96 (1852); Thlaspius Lager in  
Ann. Soc. Bot. Lyon, vii. 109 (1880);

Annual to perennial herbs, branched, glabrous, glaucous, rarely hairy, erect to procumbent or suberect; branches <sup>†</sup> leafy. Basal leaves <sup>†</sup> rosulate, usually obovate-oblong, shortly stalked, cauline leaves mostly ovate or lanceolate, cordate, amplexicaule, entire or toothed; all leaves usually glabrous, <sup>†</sup> - glaucous. Racemes corymbose above, often flexuose, ebracteate. Flowers small or mediocre, white, rose or pale purple; pedicels filiform, spreading or ascending. Sepals erect, almost equal not saccate. Petals twice or more as long as the sepals, oblong-obovate, cuneate, apex usually rounded. Stamens six; filaments not appendaged. Lateral nectariferous glands in pairs, semilunar with a short outer process; median absent. Ovary <sup>†</sup> ellipsoid, often narrowly winged, 2-16 ovuled; stigma short, capitate, subbilobed; style short or long. Siliculae usually obovate-oblong, suborbicular, laterally flattened, slightly to broadly winged (rarely wings suppressed), often <sup>†</sup> notched at the apex, (rarely entire), bilocular, dehiscent, glabrous; seeds ellipsoid, brown; septum narrowly elliptic, membranous, not veined.

About 60 species mostly of Eurasia.

Thlaspi is represented by 7 species in the present area. Hooker f. and Thomson (1861) record 5 species, Th. arvense L., Th. cardiocarpum H. f. et T., Th. perfoliatum L., "Th. alpestre" and Th. cochlearioides H. f. et T. They divide "Th. alpestre" into two varieties - var. α with short style and var. β with long style. They quote Th. cochleariforme DC. as the synonym of the var. β. Hooker f. and T. Anderson (1872)/

(1872) dissolved the varietal distinction of "Th. alpestre" and quoted Th. cochleariforme DC. as its synonym. O.E. Schulz (S.P. 1924) and Komarov (K.F.U. 1939) regard Th. cochleariforme DC. as a distinct species from Th. alpestre L. - and no doubt it is. The former is distinguished from the latter primarily by its short ascending branches, and crowded fruiting habit. The latter is widely distributed throughout Europe while the former is confined to C. Asia and Himalaya. Thus, "Th. alpestre" of Hooker f. and T., and H. f. and T. Anderson is Th. cochleariforme DC., while the true Th. alpestre L. does not occur in the present area. The other 4 species mentioned above are very distinct from each other, especially on their fruit characters (Fig. 11).

The other two species, Th. andersonii (H. f. et T.) Schulz and Th. septigerum (Bunge) Jafri (comb. nov.), recorded here for the present area need a word. Hooker f. and Thomson (1861) described a new species, Iberidella Andersonii from N.W. Himalaya. It was correctly transferred to Thlaspi by O.E. Schulz (1926), making a new combination, Th. Andersonii (H. f. et T.) Schulz. The fruits are quite distinct in this species from the other species of Thlaspi of the present area (Fig. 11. (g)): being without wings and with entire, acute apex. A careful study of fruits in Th. cochlearioides H. f. et T. and Th. cochleariforme DC. shows a wide range of variation of fruits, especially in the former where the fruit apex is mostly entire (Fig. 11): it shows entire to distinctly retuse apex in the same species. The laterally compressed fruits contrary to the septum make a distinguishing character for Thlaspi in addition to the other distinguishing characters. Schulz ((S.P. 33 (1924)) recognizes a species/

species of Eutrema, E. septigerum Bunge, confined to Altai and Kashmir, and gives the fruit apex character as "apice obtusissimae, truncatae vel retusae, stylo tenui ca. 0.5 mm. longo." A careful study of Eutrema shows that the fruits are † tetragonal with entire blunt or obtuse fruit apex and broad sessile or subsessile stigma (style if present very short and thick) (Fig. 11 (h)). In Thlaspi the fruits are laterally flattened with apex usually retuse or notched, rarely entire (sometimes entire to retuse condition present even in the same species) with filiform, short or long style. A careful study of the specimens of the so-called "E. septigerum" shows that the fruit character resembles more fruits in some of the species of Thlaspi than those of Eutrema (Fig. 11): being laterally flattened contrary to the septum, apex entire to slightly retuse with short, filiform distinct style. (Plate Nos. XV and XVI). Plate No. XV shows some of the plants from Kashmir, and plate No. XVI shows a part of the fruiting axis of one of the plants in plate No. XV enlarged to show a short and broad fruit which looks exactly like those in Th. cochleariforme DC. or Th. cochlearioides H. f. et T. (marked with X). Longitudinally striated character of seeds as used by Schulz in his key to distinguish Eutrema, is also present in some species of Thlaspi, e.g. Th. arvense L. Considering the above mentioned characters and others I have transferred Bunge's species to Thlaspi, making a new combination, Thlaspi septigerum (Bunge) Jafri.

The seven species are classified into the following four sections:

Key to the sections:

1. Siliculae oblong, † elliptic, apex entire or subretuse, valves not winged or only obscurely winged at the apex .... Sect. I. Apterygium

1. Siliculae obcordate, or orbicular; apex notched or retuse; valves distinctly winged:

2. Fruits obcordate (or obtriangular); apex retuse; seeds not striated:

3. Wings confined to the apex only ..... Sect. II. Pterotropis

3. Valves completely winged ..... Sect. III. Neurotropis

2. Fruits orbicular, apex notched; seeds striated .....

..... Sect. IV Nomisma.

Sect. 1. Apterygium Ledeb., Fl. Ross. i. 164 (1842); S.E.P. 445;

1. Th. andersonii (H. f. et T.) O.E. Schulz; 2. Th.

cochlearioides H. f. et T.; 3. Th. septigerum (Bunge) Jafri.

Sect. 2. Pterotropis DC., Syst. ii. 373 and 377 (1821); K.F.U. 586.

4. Th. cochleariforme DC.

Sect. 3. Neurotropis DC., l.c.; K.F.U. 581.

5. Th. cardiocarpum H. f. et T.; 6. Th. perfoliatum L.

Sect. 4. Nomisma DC., l.c. 375; S.E.P. 445; K.F.U. 580.

7. Th. arvense L.

#### Key to the species.

1. Siliculae completely winged, orbicular to broadly obcordate:

2. Fruits orbicular; seeds striated ..... 7. Th. arvense

2. Fruits obcordate; seeds not striated:

3. Wings of siliculae broad, reticulately veined .....

..... 5. Th. cardiocarpum

3. Wings of siliculae short, not veined ... 6. Th. perfoliatum

1. Siliculae winged above only, sometimes wings suppressed or absent:

4./



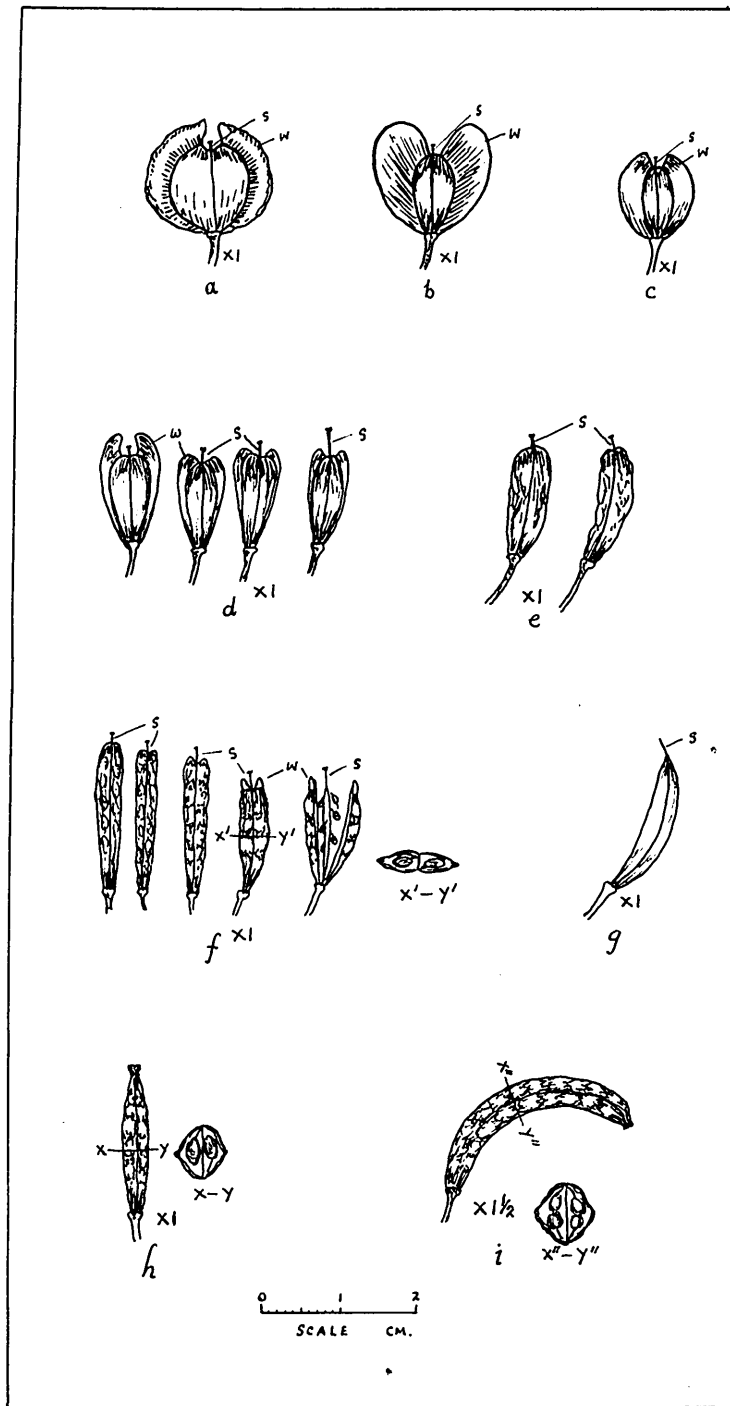


Fig. no. 11

Fruits of: a - g, Thlaspi spp.; h, Eutrema sp.  
i, Arcyosperma primulaefolium.

1 a - Thlaspi arvense L.; b - T. cardio-  
carpum H.f.et T.; c - T. perfoliatum L.;  
d - T. cochleariforme DC.; e - T. cochlear-  
ioides H.f.et T.; f - T. septigerum  
(Bunge) Jafri; g - T. andersonii (H.f.et T.)  
Schulz]. s = style; w = wing; x-y =  
t.s. of fruits.



Plate no. XV. Thlaspi septigerum (Bunge) Jafri

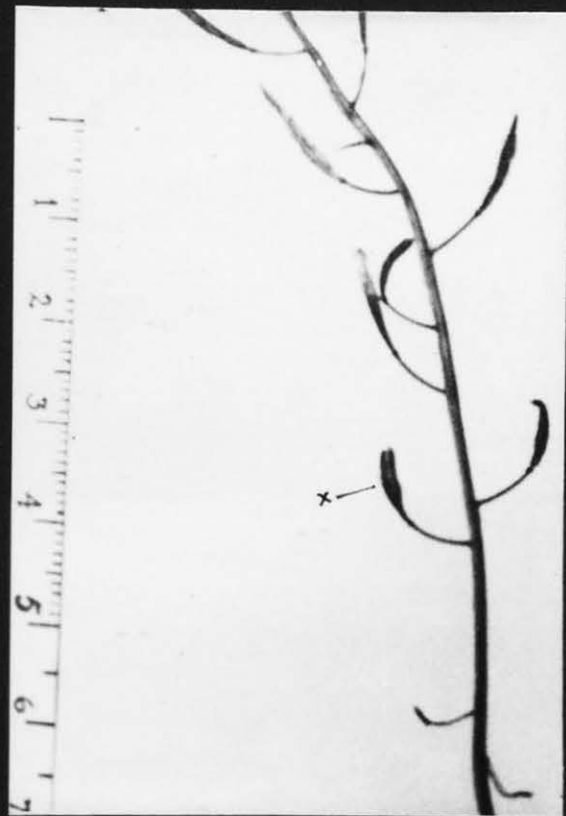


Plate no. XVI. Thlaspi septigerum (Bunge) Jafri  
(Fruits magnified).

4. Flowers 6-7 mm. across; fruits oblong-elliptic, apex  $\dagger$  entire, not winged ..... 1. Th. andersonii
4. Flowers 3-5 mm. across; fruits oblong or obtriangular, apex slightly to distinctly retuse, obscurely to slightly winged at the apex:
5. Siliculæ oblong, often subcontorted; plants short, up to 15 cm. tall in fruits:
6. Fruits 1.2-1.6 mm. broad ..... 3. Th. septigerum
6. Fruits 2-2.7 mm. broad ..... 2. Th. cochlearioides
5. Siliculæ obtriangular, straight; plants up to 30 cm. tall in fruits ..... 4. Th. cochleariforme

<sup>x</sup>  
3. Thlaspi septigerum (Bunge) Jafri, comb. nova.

Syn: Eutrema septigerum Bunge, Verzeichn. Pfl. Ostl. Altai, 73 (1836); S.P. 33; O.E. Schulz in Notizblatt ix. 1084 (1927).

Type: C. Asia, Altai, Bunge (L,K!).

Perennial, 10-15 cm. tall, erect, glabrous; rootstock 3-5 mm. thick. Basal leaves loosely rosulate, 2.5-3.5 x 0.6-1 cm. (including 1.5-2 cm. long petiole), lamina suborbicular, entire. Cauline leaves lanceolate or oblong, sessile, 1-1.5 x 0.3-0.5 cm., acute, entire. Racemes 10-15-flowered, corymbose above, ebracteate, increasing up to 7 cm. in fruit. Flowers 3-4 mm. across, white; pedicels 2-4 mm., increasing up to 7 mm. in fruit, filiform, suberect or ascending. Sepals 1.8-2 x 0.8-1 mm. Petals 3.5-4 x 1-1.3 mm. Stamens about 2:2.5 mm.; anthers about 0.4 mm. Siliquae 9-12 x 1.2-1.5 mm., oblong, subcylindrical/

subcylindrical, apex truncate or slightly retuse; valves 1-veined, glabrous; style about 0.5 mm. long; seeds 4-8 in each loculus, about 1 x 0.5 mm., ellipsoid; septum membranous, not veined. (Plate No. XV and XVI; Fig. No. 11 (f)).

N.W. Himalayas:

Kashmir: Burzil pass, Duthie No. 14030 (B - not seen); Thalle La, Baltistan, 4500-4800 m., R.R. Stewart No. 20756 (R-E!) (with Arabidopsis mollissima)

Geog. Dist.: C. Asia: Altai, Bunge (K!).

1. Th. andersonii (H. f. et T.) O.E. Schulz in Anzeiger. Akad. Wiss. Wein., Math-Nat. Kl. lxiii. 98 (1926) et Notizblatt, Berlin ix. 1094 (1927); S.E.P. 445.

Syn: Iberidella Andersoni H. f. et T. in Journ. Linn. Soc. Bot. v. 177 (1861); F.B.I. 163.

Type: N.W. Himalaya, Kumaon, W. Pindari, 3450 m., Strachey and Winterbottom No. 11 (K!).

Perennial, small, procumbent or suberect herbs, 7-15 cms. long, glabrous, subfleshy; branches dimorphic, some flowering and some only leafy. Radical leaves rosulate, spatulate, shortly stalked or subsessile, 1.2-2.8 x 0.4-1.2 cm.; margin <sup>+</sup>dentate, apex obtuse or rounded; cauline leaves on non-flowering branches similar as the radical leaves, spatulate with cuneate bases; cauline leaves of flowering branches sessile, ovate-oblong, auricled, amplexicaule, 5-10 x 4-8 mm., apex obtuse or rounded, toothed or entire. Racemes 12-20-flowered, corymbose, ebracteate, increasing up to 4 cm. in fruit. Flowers 6-7 mm. across, white or pink; pedicels 2-3 mm. long filiform, glabrous, increasing up to 5 mm. in fruit. Sepals 2-2.5 x 1/

1-1.3 mm. Petals 5-6 x 2-2.7 mm., oblong-obovate, cuneate apex subemarginate. Stamens 2.5-3.2: 3.5-4 mm.; anthers 0.7-0.8 mm. Siliculae (immature) 6-7 x 1.6-2 mm. (excluding 1-2 mm. long style), oblong-elliptic, obscurely or not winged, apex usually acute, entire. (Fig. 11 (g)).

W. Pakistan:

Chitral: Rumber, Harriss (B).

N.W.F.P.: Hazara, Chappri, Inayat No. 2115/a (B);

Punjab: N. side of Murree hills, 1500-3000 m., Thomson (K!) (with T. cochleariforme DC.).

N.W. Himalayas:

Tihri-Garhwal, Harki Dun., 3900 m., pastures, Gamble No. 24274 (K!); Garhwal, Falconer (K!); Kumaon, Pindari, 3400 m., in pastures, Strachey and Winterb. (K!); Pelang gadh, Byans, 3300-3600 m. Duthie No. 5356 (K!); Chamra State, 2100-3000 m., Thomson (K!) (with T. cochleariforme DC.); Kumaon, Byans, 3600 m., J.R. Reid No. 16 (E!);

Geog. Dist.: Himalayas.

2. Th. cochlearioides H. f. et T. in Journ. Linn. Soc. Bot. v. 177 (1861); F.B.I. 162; S.E.P. 445.

Syn: Draba himalayensis Klotzsch in Bot. Ergebn. Reise Prinz. Waldemar 127. t. 34B (1862).

Type: E. Himalaya, Sikkim, 4200-4800 m., J.D. Hooker (K!).

Perennial, decumbent (3) 5-8 cm. long, branched mostly from the base, glabrous; root stock 1-2 mm. thick, covered with withered leaf bases. Basal leaves rosulate, spatulate, 1.5-3 x 0.4-0.8 cm.; Lamina <sup>†</sup> orbicular, slightly to obscurely toothed, apex rounded, stalk about as long as the lamina; cauline leaves few, distant, 3-5 only, sessile, elliptic-ovate or oblong-ovate, 0.5-2 x 0.3-0.8 mm., bases cuneate or slightly auricled, semiamplexicaule, apex obtuse or acute, margin entire or slightly toothed; all leaves glabrous, subfleshy.

Racemes/

Racemes 10-15- flowered, corymbose, ebracteate, increasing up to 3 cm. in fruit. Flowers 3-3.5 mm. across, white; pedicels 2-2.5 mm. long, increasing up to 4 mm. in fruit, spreading, rigid, glabrous. Sepals 2-2.2 x 1 mm. Petals 4-4.5 x 2-2.5 mm., obovate-cuneate. Stamens 1.8-2: 2-2.5 mm.; anthers about 0.4 mm. Siliculae oblong, often subcurved or subcontorted, 8-11 x 2-2.7 mm., flattened, apex subretuse with a short, about 0.5 mm. long style, valves glabrous not winged; seeds 3-5 in each loculus, 1-1.5 x 0.7-0.8 mm., oblong-ovate, pale brown; septum hardly 1 mm. broad ((Fig. 11. (e)).

W. Pakistan:

Chitral: Kaghan Valley, Hazara, 4320 m. Inayat No. 19162 (K!).  
N.W. Himalayas: Kumaon, near Ralam glacier, C. 4200 m., Duthie No. 2721 (K!); Chenab Valley, 3000 m., R. Ellis No. 1418 (K!); Kumaon, Pinduri, C. 3300 m., J.L. Stewart No. 232 (K!, E!).  
Kashmir: Marpo La, Dras C. 4500 m., R. Stewart Nos. 22295 (K!) and 22270B (K!) and 22275 (R-E!); Badzulkad nullah, Lidder Valley, 3900-4200 m., Duthie Nos. 13408 (K!) and 13409 (K!); Tulion, Pahlgam, 3900 m., R. Stewart No. 8158 (K!); Sonmarg, 3900-4200 m., R. Stewart Nos. 7315 $\frac{1}{2}$  (K!) and 6789 $\frac{1}{2}$  (K!); Seshnag, C. 3600 m., Drummond No. 14243 (K!); Sangam Valley, 3900-4200 m., Duthie No. 13271 (K!); Thajwas, near Sonmarg, 4050 m., Ludlow and Sherriff No. 7938 (BM!); Chota Daosai, 3900 m., R. Stewart No. 19937 (R-E!)  
Karakorum: Hispar glacier, Russell No. 1868 (BM!); 4200-4500 m., Russell No. 1505 (BM!); C. 4500 m., Russell No. 1582 (BM!) (with Draba orcales schrenk.); Makerum, C. 4500 m., Russell No. 1466 (BM!) (with Draba altaica C.A.M.)

Geog. Dist.:

Himalayas: Sikkim, W.W. Smith No. 4004 (E!); Rhomoo Nos. 1022 (E!) and 468 (E!); C. 3900 m., J.D. Hooker Bhutan, E. of Phari, C. 4500 m., B.J. Gould No. 1505 (K!).

4. Th. cochleariforme DC., Syst. ii. 381 (1821) et Prodr. i. 176 (1824);

B.F.S. 115; S.E.P. 445; K.F.U. 587.

Syn: "Th. alpestre" H. f. et T. in Journ. Linn. Soc. Bot. v. 177

(1861) Fl. Brit. India i. 162 (1872) (partim) - excl. syn.

Boiss. - (non L., Sp. P. 2 ed. 403 (1762)); P. Wendelbo.

Nytt./

Nytt. Mag. Bot. (1952).

Type: N. Asia, Siberia, Dahauria, Patrin (?G - not seen).

Subsp. 1. Cochleariforme.

Perennial, 5-30 cm. tall, branched mostly from the base, erect or suberect, glabrous, sub-glaucous; rootstock 2-4 mm. thick, covered with withered leaf bases. Radical leaves rosulate, spatulate or oblong-obovate, shortly stalked, 2.5-5.5 x 0.5 x 1.5 cm., apex rounded, entire or sub entire; cauline leaves ovate-cordate, sessile amplexicaule, 1-2 x 0.4-1.5 cm., entire or obscurely toothed, obtuse or acute; all leaves glabrous and subglaucous. Racemes 20-40-flowered, corymbose, ebracteate increasing up to 10 (-15) cm. in fruit. Flowers 4-5 mm. across, white; pedicels 1-3 cm. long, filiform, glabrous, increasing up to 8 mm. in fruit, spreading often † horizontal, sometimes slightly deflexed. Sepals 2.4-3 x 1.2-1.4 mm. Petals 5-7 x 2-2.6 mm., obovate-cuneate, apex subemarginate. Stamens 2.2-2.5: 3-3.5 mm.; anthers about 0.5 mm. Siliculae 4-10 x 2.5-3.8 mm., obtriangular or oblong-obovate, cuneate, apex usually emarginate, sometimes slightly notched or subentire, glabrous, obscurely to slightly winged above; style 1-2.8 mm. long persistent; seeds 3-4 in each loculus, 1-1.5 x 0.8-1 mm., ovate-oblong, pale brown; septum 1.2-1.8 mm. broad. (Fig. 11 (d)).

W. Pakistan:

Chitral: Madaglast, 2700-3000 m., Toppin No.800 (K!);

N.W.F.P.: Nathia, H. Deane (K!); Waziristan, Pirghal, 2400-3450 m., Duthie No. 15609 (K!).

Punjab: Changla gali, 2700 m. R. Stewart (K!); N. of Murree hills, Thomson (K!).

Afghanistan:

Jurum Valley, very common, Shalizan to Alikhel, Aitchison No. 116 (K!) and No. 112 (BM!);

N.W. Himalayas:/

N.W. Himalayas:

Chamba state, Churai, 1890 m., R.N. Parker (K!); 2400-3300 m., Thomson (K!); Simla hills, Nagkunda, Strachey and Winterb. (K!); Madden (K!); Simla, Thomson (K!); J. L. Stewart (E!,K!); Chur, Royle (K!); Drummond No. 20295 (K!); Kumaon, Thomson (K!); Kumaon, near Lebung glacier, 4200-4500 m., Duthie No. 5345 (K!); Kulu Dist., Dibihokri Nal, 4500 m., E. Schelpe No. 3410 (BM!); Ratiruni Valley, 4170 m., E. Schelpe No. 3459 (BM!); Simla, Nagkunda, H. Collett No. 16 (K!); Kandiela, 2700 m., H. Collett No. 944 (K!) and 945 (K!); Simla, 1800-2100 m., Edgeworth No. 103 (K!); Hatugarh, 3150 m., Gamble No. 6102A (K!); Mashobra wood, 2400 m., Gamble No. 4440A (K!); Chenab Valley, 3300 m., R. Ellis No. 1318 (K!); Darwar, 2250 m., R. Ellis No. 1050 (K!); Lahul, Jaeschke No. 225 (K!); Rotang, Drummond No. 20298 (K!); Jaunsar, Desban range, 2100-2400 m., Duthie No. 1028 (K!); Chamba, 1800 m., Watt No. 536 (E!); Simla, Nagkunda, 2700 m., Watt No. 8359 (E!); Lahul, Keylang, 3300-3900 m., Watt No. 3104 (E!); Pangi, 3300-3900 m., Watt No. 2990 (E!); Chamba, Ulwas, 2010 m., Watt No. 737 (E!); (without locality), Watt No. 967 (E!); Near Sauch pass, 2700 m., Watt No. 769 (E!); Bashahr State, Murub hills, 3150 m., Watt No. 10111 (E!); Lahul, Bara Lacha La, 4800 m., N.L. Bor Nos. 13970 (E!) and 8692 (E!); Rangoha gali, 4350 m., Bor No. 14785 (E!); Chamba state, Kalatop forest, 2400 m., Lace No. 1532 (E!); near Raja Dera, 3000 m., Watt No. 2100 (E!). On the ascent to the Sanct pass from Uliocas, 2700 m., Watt No. 752 (E!); Kandang mts., Drummond Nos. 20296 (K!) and 20297 (K!); Kashmir: Gilgit, Dango Pir, 3000-3600 m., Giles No. 586 (K!); Dhuli, R. Stewart (R-E!); Kamri pass, R. Stewart No. 18705 (R-E!); Sheshnag, 3600 m., Drummond No. 14189 (E!K!); Lidder Valley, 3900-4200 m., Duthie No. 13378 (E!); Baltistan, 2700-3000 m., Thomson (K!); Falconer (K!); Pir Panjal, 3300 m., J.L. Stewart (K!); Rattan Panjal, 2700 m., Winterbottom (K!); Rattan Pir, 2100 m., C.B. Clarke No. 28341 (K!); Traqbol, 3420 m., Clarke No. 29263 (K!); Above Gulmarg, 2500-3300 m., Aitchison (K!); Gilgit, Karin Kotal, 3600 m., Giles No. 100 (K!); Baltistan, Hasora, 3300 m., Winterbottom (K!); Falconer (K!); S. Takpe La, 3150 m., Winterbottom (K!); Wardwan, 3000 m., Winterb. (K!); Rasparin pass, 2700 m., Winterb. (K!); Raj Hoti, 4500 m., Strachey and Winterb. (K!); Kashmir, Falconer No. 2621 (K!) (with T. cochlearioides H. f. et T.); Sheshnag, C. 3600 m., Drummond Nos. 14189 (K!) and 14261 (K!); Mohanmarg, Sind Valley, 2700 m., Ludlow and Sherriff No. 8136 (BM!); Baltal, 2850 m., Ludlow and Sherriff No. 8309 (BM!); Rajparayan, 3600 m., Ludlow and Sherriff No. 9362 (BM!); Gulmarg, 2400-2700 m., P. Timins No. 138 (BM!); P.M. Pinfold No. 120 (BM!); J.H. Barbour (BM!); Baltistan Zojila, 3300-3600. Duthie No. 11660 (E!).

Karakorum: on the crest of Rash ridge, C. 3900 m., Conway No. 121 (K!); Zangia Harar, Hunza Valley, 4200 m., Russell No./



No. 1019 (BM!); Makerum, Hispar glacier, 3750 m., Russell  
 No. 14061 (BM!); Herb. Lugma, 3900 m., Russell No. 1365  
 (BM!); 4200 m., C.B. Clarke No. 30441A (BM!).

Geog. Dist.: C. and N. Asia.

Subsp. 2. griffithianum (Boiss.) Jafri, stat. et comb. nov.

Syn: Carpoceras Griffithianum Boiss., Diagn. Ser. II. (1) 40  
 (1853); Th. Griffithianum (Boiss.) Boiss., Fl. Or. i.  
 329 (1867); "Th. alpestre" H. f. et T. in F.B.I. 162  
 (partim) non L.

Type: Afghanistan, Kabul, Bharowul, Griffith (G,K!).

Perennial, robust, 25-35 cm. tall, erect, glabrous, green

(not glaucous). Basal leaves oblong-obovate, cuneate, 3-7 x 0.8-  
 2.5 cm.; cauline leaves ovate-oblong, 1.5-4.5 x 0.7-1.5 cm., auricled,  
 amplexicaule, acute or obtuse. Racemes about 50- flowered, ebracteate,  
 increasing up to 10 cm. in fruit. Flowers 3-3.5 mm. across, white;  
pedicels 2-5 mm. long, filiform, increasing up to 10 mm. in fruit,  
filiform, often deflexed and hanging. Siliculae (immature) about  
5 x 2.2 mm., obtriangular, apex prominently notched with about 0.5  
 mm. long style (not exceeding the apical notch), valves slightly  
 winged above.

Known from the type locality only.

Somewhat robust habit, glabrous-green colour, small obtriangular  
 siliculae with prominent apical notch and loose hanging or deflexed  
 filiform pedicels easily distinguish it from the type race.

Hooker f. et Thomson (F.B.I. 162) quote T. Griffithianum Boiss.  
 as a synonym of T. alpestre.

5. Th. cardiocarpum H. f. et T. in Journ. Linn. Soc. Bot. v. 176  
(1861); B.F.O. 325; F.B.I. 162.

Type: Afghanistan, Kurzar, Griffith (K!).

Annual, 7-35 cm. tall, erect, branched mostly from below, glabrous, glaucous. Basal leaves withering early, small, 1-3 x 0.5-1 cm., ovate-orbicular, shortly stalked, entire or slightly toothed; cauline leaves oblong-ovate, 1-3.5 x 0.5-2 cm., sessile, subcordate or subsagittate, amplexicaule, entire or obscurely toothed; all leaves glabrous, glaucous, apex rounded or obtuse. Racemes 25-50-flowered, ebracteate, corymbose above, increasing up to 16 cm. in fruit. Flowers 1.5-2 mm. across, white; pedicels 1-2 mm. long, increasing up to 6 mm. in fruit, filiform, spreading, glabrous. Sepals 1-1.2 x 0.6-0.7 mm. Petals about 2 x 0.8 mm., oblong-cuneate, apex rounded. Stamens about 1: 1.2 mm.; anthers minute, about 0.2 mm. Siliculae obcordate, winged, 7-11 x 6-10 mm., glabrous; wings reticulately veined, broadest towards the apex; stigma capitate, sessile or subsessile; seeds 4-6 in each loculus, 1.3-1.8 x 0.8-1 mm. ovate-oblong redish brown, not longitudinally striated, septum 1.6-2.2 mm. broad. (Fig. 11 (b)).

W. Pakistan:

Chitral: Dam Gol, 1500 m., Toppin No. 418 (K!); Dambatai, S.A. Harriss No. 15897 (K!); Hazara, Kaghan Valley, 2250 m., Inayat No. 19163 (K!).

Afghanistan: Kurzar, Griffith (K!); Kurrum Valley, Pewarkotal, Aitchison No. 454 (K!).

N.W. Himalayas: Chamba State, Pangl, 2580 m., weed in cultivated ground at Kilar, R.N. Parker (K!); Chenab Valley, R. Ellis No. 1010 (K!); Pangl, Kilar, 2100-2700 m., Watt Nos. 220 (E!), 2947 (E!) and 699 (E!); Kashmir, Pir Panjal, 2700 m., Winterbottom (K!); P.N. Kohli (K!). Srinagar, 1560 m., R. Stewart No. 1259 (R-E!).

Geog. Dist.: Endemic.

6. Th. perfoliatum L., Sp. Pl. 646 (1753); H. f. et T. in Journ. Linn. Soc. Bot. v. 176 (1861); B.F.O. 325; B.F.S. 114; K.F.U. 585.

Type: Europe - (not precisely designated) No. 5 (LS!).

Annual or biennial, 5-25 cm. tall, erect, simple or very sparsely branched, glabrous, glaucous. Basal leaves in loose rosette, obovate, stalked. Cauline leaves ovate-cordate, sessile, amplexicaule with contiguous rounded basal lobes. All leaves glabrous, entire or subentire. Racemes 15-30-flowered, ebracteate, increasing up to 15 cm. in fruit. Flowers small, 2-2.5 mm. across, white; pedicels 2-3 mm. long increasing up to 6 mm. in fruit, spreading. Sepals about 1.5 x 0.7 mm. Petals about 2.8 x 1 mm. Stamens about 1.3: 1.6 mm. Siliquae 4-6 x 3-5 mm., broadly obcordate; wings narrow, smooth; style very short at the base of the apical notch; seeds about 1.5 mm. long, yellowish-brown. (Fig. 11 (c)).  
Afghanistan: (without locality) Griffith (K!).  
Geog. Dist.: Europe, Mediterranean region, Trans-Caspian region, Persia and C. Asia.

7. Th. arvense L., Sp. Pl. 646 (1753); B.F.O. 323; F.B.I. 162; S.E.P. 445; K.F.U. 581.

Syn: Th. collinum MB., Fl. Taur. - Cauc. ii. 99 (1808);

Type: Europe - (not precisely designated) No. 2 (LS!).

Annual or biennial 10-65 cm. tall, branched above, glabrous, rarely hairy with simple or forked hairs. Basal leaves oblanceolate, 2-8 x 0.5-2 cm., withering early; upper leaves lanceolate, 2-6 x 0.5-2 cm., sessile sagittate, amplexicaule; all leaves glabrous, distantly/

distantly toothed, or subentire, obtuse or acute. Racemes 30-70-flowered, corymbose above, ebracteate, increasing up to 25 cm. in fruit. Flowers 3-5 mm. across, white; pedicels 4-8 mm. long, filiform, glabrous, increasing up to 15 mm. in fruit, spreading. Sepals 1.7-2.2 x 1-1.5 mm. Petals 3-4.5 x 1.2-2 mm., obovate-oblong, cuneate at the base., apex subemarginate. Stamens about 1.6: 2 mm.; anthers about 0.5 mm. Siliculae † orbicular, 1-2 cm. in diam., deeply notched at the apex with short, about 0.5 mm. long style (much shorter than the apical notch of the siliculae) glabrous; wing prominent, reticulately veined; seeds 4-8 in each loculus, 1.5-2 x 1-1.5 mm., dark brown, with about 6 prominent circular striations on each side; septum 1-1.8 mm. broad, elliptic, membranous, not veined. (Fig. 11 (a)).

W. Pakistan:

Chitral: Laspur, 2700 m., in fields, Toppin No. 733 (K!);

N.W.F.P.: Hazara, 3000 m., Inayat No. 19160 (K!); Below Nashia, H. Deane (K!).

Punjab: Rawalpindi, Aitchison No. 1015 (K!);

Afghanistan: (without locality), Griffith (K!); Kurrum Valley, Kurrum to Shalizan, Aitchison No. 139 (K!); Band-i-Amir, 2850 m., W.R. Hay No. 399 (K!).

N.W. Himalayas: Simla, Kotgarh, Lace No. 810 (E!); Drummond No. 20337 (E!,K!); Madden (E!); (without locality), J. L. Stewart (E!); Reid (E!); Chamba state, 2100 m., in wheat fields at Alwas, R.N. Parker (K!); Simla, 1800 m., in fields, Gamble (K!); Simla hills, Sainy, Drummond No. 20294 (K!); Chenab Valley, R. Ellis No. 1038 (K!); Kumaon, Almorah, 1500 m., Strachey and Winterb. (K!); Garhwal, Jacquemont (K!); (without locality), Royle (K!); Lahul, Bhaga Valley, Schlagintweit (BM!); Kilar, Watt Nos. 2963 (E!), 2953 (E!); Killar, Gujral nullah, Watt No. 2213 (E!); Pangi, 2700 m., Watt No. 821 (E!); (without locality), Watt No. 828 (E!); Jaunsar, 2100 m., Keshav Nand No. 266 (E!).  
Kashmir, Alaibad, 3000 m., Clarke No. 28699 (BM!); Jamu, Schlagintweit Catl. No. 3091 (BM!); Ladak, Schlagintw. (BM!); Killanmarg, 2700-3000 m., Duthie No. 11364 (E!,K!); Ladak, J.L. Stewart (K!) Pahlgam, C. 2100 m., R. Stewart (K!); Kangan, 1800 m., H. Rich No. 1067 (K!); Rasparin pass, 2400 m., Winterbottom (K!); (without locality), Thomson (K!).

Geog. Dist.: Europe, N. Africa and Orient, N. and C. Asia, China and Japan. Introduced in N. America.

26. CAPSELLA Medicus, Pflanzengatt. i. 85 (1792); S.E.P. 453;

K.F.U. 603.

Syn: Bursa Sieg., Prim. Fl. Petropol. 227 (1736); Marsypocarpus Neck., Elem. iii. 91 (1790); Rodschiedia Gaert., Mey. et Scherb., Fl. Wetterau, ii. 413, 435 (1800); Marsyrocarpus Steud., Nom. 511 (1821); Solmsiella Borbas in Magyar Bot. Lapok, i. 20 (1902).

Annual or biennial, glabrous or hairy with branched or forked hairs, erect or suberect. Lower leaves pinnatifid to entire, basal rosulate, <sup>†</sup> stalked, very variable; upper leaves sessile, sinuate-dentate to entire, <sup>†</sup> auricled, amplexicaule, very variable. Racemes corymbose above, lax, ebracteate. Flowers small, white; pedicels filiform, ascending. Sepals suberect, oblong, obtuse, almost equal at the base, not saccate. Petals spathulate, short, apex <sup>†</sup> rounded. Stamens six, filaments not appendaged; anthers ovate. Lateral nectariferous glands in pairs <sup>†</sup> with an external process. Ovary oblong, <sup>†</sup> elliptic, 12-24- ovuled; stigma capitate sessile or on very short style. Siliculae <sup>†</sup> obtriangular or obcordate, laterally flattened, not winged, bilocular, dehiscent, glabrous; valves reticulately veined; seeds 6-12 in each loculus, small, not winged, ellipsoid, brown; septum narrowly elliptic, membranous, not veined.

About 5 species chiefly in Mediterranean region, E. Europe and W. Asia.

C. burse-pastoris (L.) Medic., Pflanzengatt, 85 (1792); B.F.O. 340;  
F.B.I. 159; S.E.P. 454; F.B.I. 159.

Syn: Thlaspi Bursa-pastoris L., Sp. Pl. 647 (1753).

Type: Europe (not precisely designated) No. 9 (LS!).

Annual or biennial, 5-45 cm. tall, erect, glabrous or hairy; stem simple or branched; hairs branched, sometimes ciliate; tap root slender rarely branched. Basal leaves rosulate, very variable in size and shape, usually pinnatifid, 5-8- jugate, shortly stalked; apical lobe slightly larger than the lateral lobes. Cauline leaves sessile, <sup>+</sup> clasping the stem and auricled, sinuately toothed to entire; all leaves glabrous or hairy. Racemes 30-80- flowered, corymbose above, ebracteate, increasing up to 30 cm. in fruit. Flowers about 2.5 mm. across, white; pedicels 2-5 mm. long, increasing up to 18 mm. in fruit, filiform, <sup>+</sup> spreading. Sepals 1.4-1.7 x 1 mm. Petals 2-2.6 x 1-1.3 mm., obovate-oblong, cuneate, apex rounded. Stamens about 1.5: 1.8 mm. Siliculae obtriangular, 5-9 x 4.5-6 mm., apex emarginate, glabrous, laterally flattened; style about 0.5 mm. long, hardly or not exceeding the apical notch; seeds 8-12 in each loculus, about 1 x 0.6 mm., oblong-ellipsoid, pale brown, septum about 0.6 mm. broad,

W. Pakistan:

Chitral: Drosh, 1350 m., abundant on waste land, Toppin No. 32 (K!).

N.W.F.P.: Haripur, Drummond No. 20331 (E!,K!).

Punjab: Murree hills, 1950 m. R. Stewart (K!); (without locality), J.L. Stewart (E!,K!); Royle (K!); Edgeworth (K!).

Baluchistan: Quetta, 1680 m., Lace No. 3643 (E!); Jafri (E!); Zahree, Stocks No. 381 (K!).

Afghanistan: (without locality), Griffith (K!); Kurrum Valley, very common near cultivation, Aitchison No. 129 (K!); Kahul, W.R. Hay No. 9 (K!) and 243A (K!).

N.W. Himalayas: Bashahr State, Upper Kunawan 2700 m., Lace No. 245 (E!); Wangtu, 1650 m., Watt No. 4838 (E!); Lahul, Sissu, 3150 m., N.L. Bor No. 12331 (E!); Pangi, 2400 m., Watt No./

No. 947 (E!); Simla, Drummond Nos. 20292 (E!,K!) and 20332 (E!,K!); Watt Nos. 8357 (E!); 715 (E!) and 2059 (E!); Chamba State, Tikri, 1500 m., Watt No. 628 (E!); Kumaon, Anderson No. 1031 (E!); Bashahr State, Murub hills, 3300 m. Watt No. 10110 (E!); Chenab Valley, Purti, 2200 m. R. Ellis Nos. 1006 (K!) 1022 (K!); and 1026 (K!); Almora, 1500 m., Strachey and Winterb. (K!); Chenab Valley, 3000 m. King No. 1311 (K!); Simla, 2100 m., Gamble No. 4192 (K!); H. Collett No. 428 (K!); Mahlog, Drummond No. 20332 (K!); Cliff reed, H. Rich No. 112 (K!); (without locality) 4200 m., Edgeworth No. 102 (K!); Kulu Dist., Parbati Valley, 2700 m., E. Schalpe No. 3271 (BM!); Chamba, Sara, 3300 m., Clarke No. 24120B (BM!); Tihri Garhwal, Nila Valley, 3000 m., Duthie No. 896 (BM!); Kashmir, Baltistan, 1800 m., F. Ludlow No. 272 (BM!); Ladak, Schlagintweit (BM!); Murgan pass, 2700-3300 m. Fuller (K!); Baltistan, Winterbottom (K!); Gilgit, Giles (E!,K!);

Geog. Dist.: Cosmopolitan, mostly in cooler climates.

\*

27 HEDINA Ostenfeld in Sven Hedin, Southern Tibet, 76. fig. 2 (1922);

S.E.P. 454; K.F.U. 457.

Perennial, † prostrate or spreading, hoary-tomentose, branched mostly from the base; branches leafy; hairs simple or forked, white. Leaves pinnatisect, many-jugate; basal shortly stalked, upper sessile or subsessile; lobes short, lanceolate; all leaves hoary tomentose. Racemes corymbose above, bracteate. Flowers small, white, subsessile. Sepals spreading, oblong-elliptic, equal, not saccate. Petals about twice as long as the sepals, spatulate, clawed, apex rounded. Stamens 6; filaments not appendaged; anthers minute, ovoid, obtuse. Lateral nectariferous glands in pairs, minute, at the base of the outer stamens. Ovary oblong, 24-30- ovuled, style minute with short capitate stigma. Siliculae oblong, laterally flattened, often sub-contorted, bilocular, subdehiscent, not winged; valves membranous, glabrous or sub hairy, obscurely veined; seeds 10-16 in each loculus, small,/

small, oblong-ellipsoid, reddish-brown, not winged, septum narrow, membranous.

1 species in Himalayas and C. Asia.

H. tibetica (Thomson) Oestenf. in Sven. Hedin, Southern Tibet, 76, fig. 2. (1922); S.E.P. 455; K.F.U. 547.

Syn: Hutchinsia tibetica Thomson in Hooker, Ic. Pl. ix. t. 900. (1852); Capsella Thomsoni H. f. in Journ. Linn. Soc. Bot. v. 172 (1861) et F.B.I. 159; Smelowskia tibetica (Thom.) Lipsky in A.H.P. xxiii. 76 (1904).

Type: W. Tibet, Thomson (K!).

Perennial, procumbent, 5-30 cm. long, branched mostly from the base, hoary tomentose with simply or forked white hairs; leaves pinnatisect, 5-10- jugate, 1-5 x 0.3-1.5 cm.; lobes short, lanceolate; radical leaves rosulate, shortly stalked; upper leaves subsessile or sessile; all leaves hoary-tomentose. Racemes 10-30- flowered, lax, † bracteate, increasing up to 10 cm. in fruit. Flowers about 3 mm. across, white subsessile; pedicels increasing up to 3 mm. in fruit. Sepals 1.8-2 x 0.8-1 mm. Petals 3-4 x 1-1.4 mm., spatulate, clawed, apex rounded. Stamens 1.8-2: 2-2.3 mm., anthers minute, about 0.2 mm. Siliculae oblong, laterally flattened, 6-10 x 2.8-3.8 mm., often subcontorted, valves membranous, subhairy or glabrous; style 0.4-0.8 mm. long; seeds 10-15 in each loculus, about 1-x 0.5 mm., ellipsoid, reddish-brown; septum about 1 mm. broad.

N.W. Himalayas:

Kashmir: Rupshu, Polokonka La, on hill top, 5100 m., Koelz No. 2164 (K!, R-E!); Khyung Tso, in damp sand, 4950 m., Koelz No. 2257 (K!); Ladak, J.L. Stewart (K!); Lanak pap, 4800-5400 m., Thomson No. 2161 (K!);

W. Tibet/



W. Tibet: Nubra, Strachey (K!).

Geog. Dist.: Tibet and C. Asia.

✱

28. HYMENOLOBUS Nuttall in Torr. and Gray, Fl. North America i. 117 (1838); S.E.P. 457; K.F.U. 549.

Syn: Hinterhubra Reichb. ex Nym., Consp., iii. 66. (1878);

Hutchinsiella O.E. Schulz in Engler, Bot. Jahrb. lxvi 92 (1933); S.E.P. 446.

Annual, minute or small, usually decumbent or suberect, rarely erect, glabrous; branched mostly from below with slender, filiform spreading sparsely leafy branches. Leaves elliptic or oblanceolate, pinnatifid to entire, glabrous, shortly-stalked to sessile but cuneate, acute or obtuse, basal rosulate or subrosulate. Racemes 10-30-flowered, subcorymbose above, lax in fruit, ebracteate. Flowers minute, whitish; pedicels short but conspicuously increasing in length in fruit, filiform, <sup>+</sup> spreading. Sepals <sup>+</sup> spreading, minute, oblong, obtuse with a whitish margin, equal, not saccate. Petals obovate cuneate, about as long as the sepals, apex subemarginate. Stamens 6; filaments not appendaged; anthers minute. Lateral nectari-ferous glands in pairs, very minute, dot like; median absent. Ovary ellipsoid or ovoid, 12 or 20 ovuled; style minute with a short capitate stigma. Siliculae ellipsoid, laterally sub flattened, glabrous, not winged; valves slightly tumid, with a <sup>+</sup> distinct mid-vein; seeds minute, oblong or ellipsoid, pale-brown, not winged; septum narrowly elliptic, membranous, not veined.

About 4 species in Europe, Asia, N. Africa, America and Australia.

O. E. Schulz (1933) described a new genus, Hutchinsiella, with one/

one species, H. perpusilla (Hemsl.) Schulz. A careful observation and the figures given by Schulz, especially those of siliculae, show that it exactly resembles ~~with those of~~ Hymenolobus procumbens (L) Nutt.; even the number of seeds in the two are 6 in each loculus. Schulz regarded it ~~be~~ closely related to Hutchinsia R.Br. But a careful study leaves no doubt that Schulz's new genus is congeneric with Hymenolobus Nutt. and the species is very closely related to Hymenolobus procumbens except that it can be distinguished only by its short, erect, simply or very sparsely branched habit, few-flowered raceme and minute flowers. I have therefore transferred Hemsley's species Hutchinsia perpusilla to Hymenolobus, making a new combination, Hymenolobus perpusillus (Hemsl.) Jafri (Syn: Hutchinsiella perpusilla (Hemsl.) Schulz). (Plate No. XVIII).

Key to the species

1. (a). Stems 6-30 cm. long, often much branched from the base, <sup>+</sup> spreading; racemes 15-30 flowered .... 1. H. procumbens
1. (b). Stems 1.5-5 cm. long, erect, <sup>+</sup> simple, racemes 4-8-  
flowered ..... 2. H. perpusillus

H. procumbens (L.) Nutt. in Torr. and Gray, Fl. North Am. i. 117 (1838); S.E.P. 457; K.F.U. 549.

Syn: Lepidium procumbens L., Sp. Pl. 643 (1753); Capsella elliptica C.A.M., Verz. 194 (1831); F.B.I. 159; C. procumbens Fries, Novit. Suec. i. 14 (1814); B.F.O. 340; Hutchinsia procumbens Desv. in Journ. Bot. iii. 168 (1814).

Type: Montpellier, ?, No. 4 (LS!).

Annual/

Annual, 5-30 cm. long, spreading or decumbent rarely suberect,  
 Glabrous, branched mostly from the base, with slender, filiform  
 branches. Basal leaves † rosulate, oblong-elliptic, short stalked,  
 deeply pinnatifid to entire, 1-4 x 0.2-1 cm. glabrous; acute or  
 obtuse; upper leaves elliptic or linear, pinnatifid to entire, sessile  
 but cuneate at the base. Racemes 15-30- flowered subcorymbose, lax,  
 ebracteate, increasing up to 15 cm. in fruit. Flowers minute, 1-1.5  
 mm. across, whitish; pedicels 1.5-3 mm. long, increasing up to 8 (-12)  
 mm. in fruit, filiform, spreading. Sepals about 0.8 x 0.5 mm., oblong  
 obtuse with white margins. Petals about 1 x 0.5 mm., obovate-cuneate,  
 apex subemarginate. Stamens about 1: 1.2 mm.; anthers very minute  
 Siliculae ellipsoid, laterally subflattened; glabrous 2.5-4.5 x 1.5-  
 2 mm.; valves slightly tumid with a distinct mid-rib; stigma short  
 capitate, subsessile; seeds 6 in each loculus, about 0.6 x 0.4 mm.,  
 ellipsoid, pale-brown; septum about 1 mm. broad, membranous, not  
 veined. (Plate No. XVII).

W. Pakistan:

N.W.F.P.: Peshawar, J.L. Stewart (E!,K!); Aitchison (K!).

Baluchistan: Yaru Karez, 1500 m., Lace No. 3454 (E!,K!);

(without locality), Stocks (K!); Quetta, V. Parkash.

Afghanistan: (without locality), Griffith (K!). No. 16406 (R-E!).

N.W. Himalayas: Kashmir, J.L. Stewart (K!); Naini Tal to Srinagar,  
Benham (K!); Stigar, 2400 m., R.R. Stewart No. 20551 (R-E!)

Geog. Dist.: Europe, N. Africa and Orient, C. and N. Asia.  
 Introduced elsewhere.

‡  
H. perpusillus (Hemsley) Jafri, comb. nov.

Syn: Hutchinsia perpusilla Hemsley in Hooker, Icon. Pl. xvi.

t. 1599 (1887); Hutchinsiella perpusilla (Hemsl.) O.E. Schulz  
 in Engler, Bot. Jahrb. lxvi. 92 (1933) S.E.P. 446.

Type:/

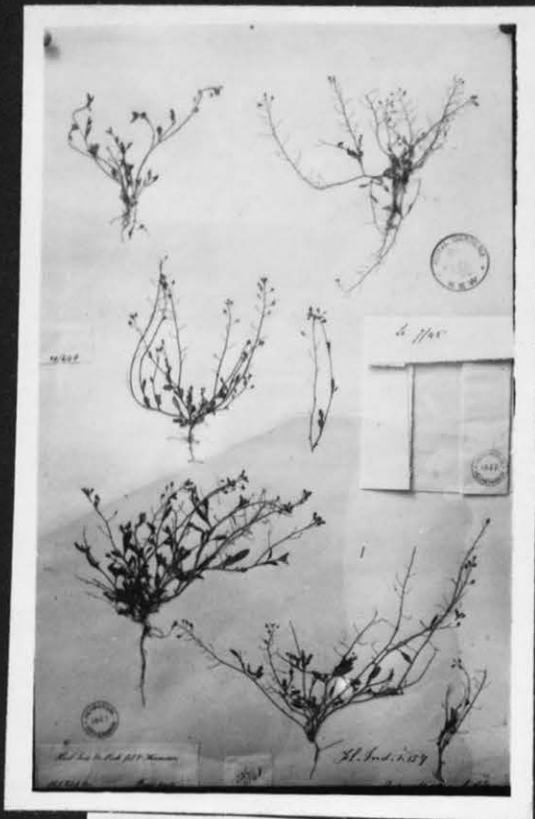


Plate no. XVII.

*Hymenolobus procumbens* (L.) Nutt.

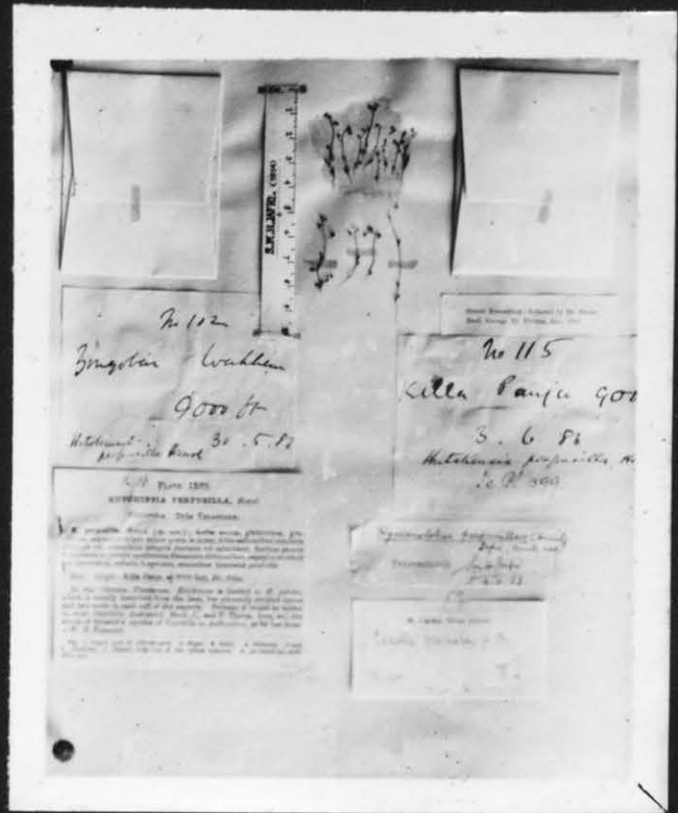


Plate no. XVIII.

*Hymenolobus perpusillus* (Hemsl.) Jafri

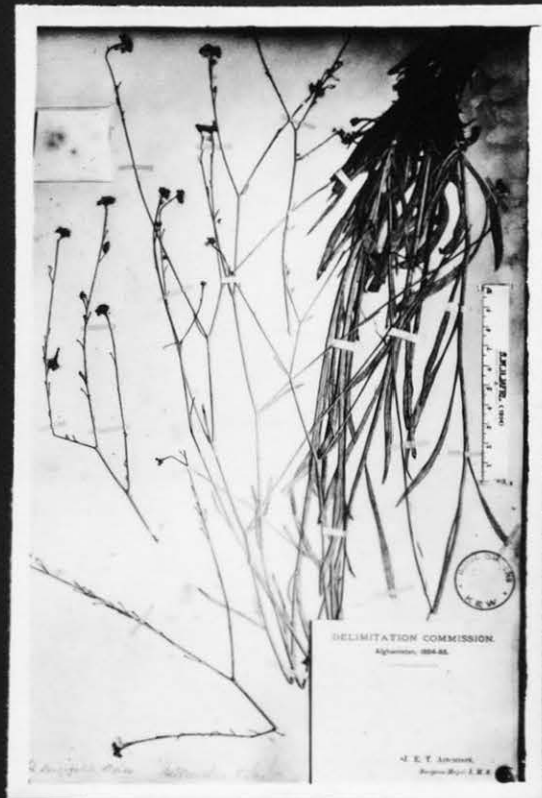


Plate no. XIX.

*Stroganowia afghana* (Boiss.) N. Powl.

Type: Kashmir, Gilgit, Killa Panja, 2700 m. Giles No. 115 (K!).

Annual, 1.5-5 cm. tall, <sup>+</sup> erect, minute herb; stem simple rarely with 1 or 2 short branches, filiform, glabrous, sparsely few leaved. Basal leaves subrosulate, few, elliptic or spatulate, shortly stalked or sessile, 1.5-7 x 1-2.6 mm., entire to sinuate-toothed, acute or obtuse; upper leaves elliptic, 2-5 x 1.2-5 mm., sessile, cuneate, entire or slightly toothed obtuse or acute; all leaves glabrous. Racemes 4-8-flowered, lax, ebracteate, increasing up to 1 cm. in fruit. Flowers minute, about 1 mm. across, whitish; pedicels 0.5-1.5 mm. long, increasing up to 2.5 mm. in fruit, filiform, ascending. Sepals about 0.8 x 0.5 mm. margin whitish. Petals about 0.5-0.6 (-0.8) x 0.3 (-0.5) mm., often shorter than the sepals, narrowly spatulate, apex subemarginate, white. Stamens about 0.6: 0.8 mm.; anthers very minute. Siliculae ellipsoid, laterally subflattened 2-3 x 1-2 mm.; valves slightly tumid, glabrous, with a <sup>+</sup> distinct mid-rib; stigma short, capitate, sessile or sessile; seeds 6 in each loculus, minute, about 0.5 x 0.3 mm., ellipsoid, brown; septum about 0.8 mm. broad, elliptic. (Plate No. XVIII).

Distinguished from H. procumbens (L.) Nutt. by its minute size; absence of lateral, decumbent branches; few-flowered racemes; short petals and pedicels.

Afghanistan: Wakhan, 2700 m., Giles No. 102 (K!).

N.W. Himalayas:

Kashmir: Gilgit, Killa Panja, 2700 m., Giles No. 115 (K!).

Geog. Dist.: Endemic.

29. <sup>\*\*</sup>DILOPHIA Thomson in Hooker, Kew Journ. Bot. v. 19. (1853);

B.H.G.P./

B.H.G.P. 89; F.B.I. 160; S.E.P. 460; K.F.U. 574.

v Perennial, depressed, fleshy, flabrous herbs, - branched mostly from the base, erect or suberect. Leaves densely rosulate, spatulate or linear, entire or sinuate dentate; fleshy, glabrous; cauline leaves often involucrate. Racemes condensed, sub-umbellate. Flowers numerous, small, white; pedicels short, slightly thickened. Sepals spreading, equal, not saccate, often somewhat persistent. Petals spatulate, apex subretuse or subdentate. Stamens 6, filaments not appendaged; anthers short, obriular. Lateral nectiferous glands in semicircular pairs with † equally long curved processes emitting from the base; median absent. Ovary ovate or subquadrate, 4-10- ovuled; stigma sessile, † truncate or subbilobed, broad. Siliculae short, † obcordate, bilocular, laterally flattened, † inflated; valves gibbous at the back, submembranous, usually with double crest, glabrous; seeds biseriate, small, oblong, not winged, brown; septum often incomplete, perforated, rarely absent.

About 5 species in Central Asia and Himalaya.

D. salsa Thomson in Hooker, Kew Journ. Bot. v. 20. t 12. (1853);

F.B.I. 161. S.E.P. 460; K.F.U. 575.

Syn: D. kaschgarica Rupr. Sert. Tianschan. 40 (1869).

Type: W. Tibet, in salt marshes, 3800-5100 m., Thomson (K!).

Perennial small, tufted herbs, 1-6 cm. tall, glabrous, branched mostly from the base; branches suberect or decumbent, Radical leaves rosulate, linear-oblong or narrowly spatulate, 0.7-2.5 x 0.1-0.5 cm., apex rounded, margin entire to bluntly-toothed, shortly stalked or subsessile/

subsessile; cauline leaves <sup>†</sup> involucrate below the inflorescence, linear or narrowly oblanceolate; all leaves glabrous, fleshy. Racemes 10-20- flowered, subumbellate, bracteate below, densely corymbose. Flowers 3-3.5 mm. across, white, often with light violet tinge; pedicels 1.5-4.5 mm. long, not increasing more than this but becoming slightly thickened in fruit. Sepals 1.8-2.2 x 1-1.5 mm. persistent. Petals 2.7-3 x 1-1.8 mm., spatulate, apex subretuse or slightly toothed. Stamens about 2:2.5 mm.; anthers about 0.3 mm. Siliculae about 2.5 x 2.2 mm. Seeds about 0.8 x 0.5 mm., oblong, brown; septum usually perforated or incomplete.

N.W. Himalayas:

Kashmir: Shaksgam Valley, Clifford (K!); Ladak, Kizil Langad, 4320 m., F. Ludlow No. 596 (BM!); Bed of Chipchah river, 4950 m., F. Ludlow No. 463 (BM!); W. Tibet: in Salt marshes, 4200-5100 m., Thomson (K!) Khyung Tso, 4950 m., Koelz No. 2259 (R-E!).

Geog. Dist.: Tibet and C. Asia.

30. COCHLEARIA L., Sp. Pl. 647 (1753); S.E.P. 461; K.F.U. 568.

Annual to perennial herbs, glabrous or hairy with simple hairs, erect or suberect, sparsely branched. Leaves usually simply, entire or pinnatipartite. Racemes short, corymbose, rarely lax, few to many flowered, ebracteate. Flowers small, white or lilac; pedicels filiform, ascending or subspreading often flexuose. Sepals spreading equal, not saccate. Petals shortly clawed elliptic or obovate-oblong. Stamens 6; without appendages. Lateral nectariferous glands in pairs, subtriangular, short; median absent. Ovary ovate or orbicular, 2-32- ovuled, with a short style and capitate stigma. Siliculae ovoid, globose or oblong, <sup>†</sup> inflated bilocular, dehiscent; valves convex not winged with a distinct mid-vein and reticulate venation; seeds/

seeds biseriate, often many, small, oblong, subcompressed, not winged, brown; septum elliptic, membranous.

About 25 species in Europe, Asia and N. America. It is represented by only 3 spp. in the present area.

Key to the species

1. Plants minute, about 2 cm. long ..... 2. C. minutissima
2. Plants 10-30 cm. tall:
3. Racemes 3-4- flowered; flowers 4-5 mm. across .. 3. C. conwayi
3. Racemes 15-45- flowered; flowers 1.5-2.5 mm. across .....
- ..... 1. C. flava.

1. C. flava Ham. in Roxb., Hort. Bengh. 48 (1814) - nomen; H. f. et T. in Journ. Linn. Soc. Bot. v. 154 (1861) et F.B.I. 145.

Syn: Alyssum cochlearioides Roth., Nov. Pl. Sp. 322 (1821);

C.? alyssoides DC., Prodr. i. 172 (1824); Vesicaria micropetala Thomson in Hooker, Ic. Pl. t. 805 (1852).

Type: Bengal, Buchanan (? Herb. Calcutta, E!). No. 1481.

Perennial, 10-30 cm. tall, branched mostly from the base, erect or spreading, glabrous, glaucous. Radical leaves pinnatifid, 4-6-jugate, very variable, stalked, 1.5-15 x 0.5-3 cm., lobes sinuately toothed, short ovate to triangular, acute or obtuse; cauline leaves few distant, subsessile or sessile, cuneate at the base, small, 1-4-jugate; all leaves glabrous glaucous. Racemes 15-45- flowered, ebracteate, lax, increasing up to 12 cm. in fruit. Flowers 1.5-2.5 mm. across, yellow; pedicels 1-1.5 mm. long, increasing up to 3 mm. in fruit, filiform, ascending. Sepals about 1-1.2 x 0.8-1 mm. Petals 1.5-1.8 x 0.8-1 mm., spatulate, apex subemarginate. Stamens about/



about 1: 1.2 mm.; anthers minute, about 0.25 mm. Siliculae 3-4 (-5) mm. long as well as broad, orbicular, inflated, glabrous, with a minute about 0.4 mm. long style; valves membranous, tumid; seeds many, minute, orbicular or suborbicular, brown; septum membranous.

W. Pakistan:

Punjab: Karnal, Drummond Nos. 20370 (K!,E!); 20371 (K!,E!), 20373 (K!,E!), 20383 (K! ), 20384 (K! ), 20385 (K! ); 20386 (K!,E!), 20389 (K! ); 20369 (K!,E!); Sirsa, Drummond 20368 (K! ); near Karnal, Thomson (K!); Pundrak, Drummond No. 20387 (K! ); Dhandur, Drummond No. 20372 (K! ); Hissar dist. Jungle, Drummond No. 20382 (K! ).

Geog. Dist.:

India: Gangetic plain, Allahabad to Patna, Madden (E!,K!); Banda, common on waste land, A.S. Bell No. 98 (K!); Soane, alluvial banks, J.D. Hooker No. 213 (K!); Khandwa, roks of Narbada, Duthie No. 8177 (K!). Hengal, F. (Buchanan) Hamilton No. 1481 (E!); (without locality), Madden (E!).

\*

2. C. minutissima O.E. Schulz in Notizblatt, Berlin, ix. 1073 (1927)

S.E.P. 463.

Type: Kumaon, Soondur Doonga Valley, 4200 m., T. Anderson (K!).

Perennial, minute herb, - procumbent, about 2 cm. long, glabrous.

Basal leaves subrosulate, ovate, long stalked, sub-sinuate-dentate; lamina about 2-3 mm. across; petiole 5-9 mm. long; cauline leaves few, about 5, <sup>†</sup> elliptic, sessile, 3-4 x 1.5-2 mm., about 4-5 dentate, rarely obscurely lobed, obtuse, cuneate at the base; all leaves sub-fleshy, glabrous. Racemes short, corymbose, 8-12-flowered, ebracteate. Flowers about 2 mm. across, yellow; pedicels 1-3 mm. long, filiform, ascending. Sepals about 1 x 0.6 mm., oblong, obtuse. Petals about 2 x 1 mm., obovate-cuneate. Stamens about 1.2: 1.5 mm.; anthers about/

about 0.25 mm. Ovary ellipsoid, 5-ovuled; stigma short, sessile or on about 0.25 mm. long style. Siliculae not known.

Known from the type of locality only.

3. <sup>⌘</sup> C. conwayi Hemsley in Kew Bull. 4. (1894)

Type: Karakorum glaciers, Doyan to Ramghat, Conway No. 305 (K!).

Perennial, about 10 cm. tall, branched mostly from the base, erect, glabrous or minutely puberulous; branches filiform, apparently sparsely forked, flexuose. Radical leaves mostly trilobed, with narrowly oblong or linear lobes, stalked, 1-2 cm. long; lobes 1-2 mm. broad, entire, apex rounded or obtuse. Cauline leaves simple, narrowly linear, 0.4-1 x 0.7-1.2 mm., entire, obtuse. Racemes 3-4-flowered, lax, ebracteate. Flowers 4-5 mm. across, yellow; pedicels 1-2 cm. long, filiform, flexuose, spreading. Sepals about 3 x 1 mm. Petals 5-6 x 1.5-1.8 mm., oblong-ob lanceolate. Stamens about 2.7: 3 mm.; anthers short; filament slightly broad at the base. Ovary oblong, with a depressed sessile stigma. Fruits not known.

Known from the type locality only.

31. <sup>⌘</sup> STROGANOWIA Kar. et Kir. in Bull. Soc. Nat. Mosc. xiv. 386 (1841);  
 ibid. iii. 534 (1842) in add. emend; B.H.G.P. 88.; S.E.P. 463;  
 K.F.U. 524.

Perennial, tall, glabrous herbs, dichotomously branched; root-stock thickened, woody, often dichotomously branched; aerial branches subaphyllous, slender, <sup>+</sup> corymbose. Basal leaves lanceolate, often very elongated, petiolate, entire or obscurely dentate; upper cauline leaves sessile, linear or lanceolate, bases often slightly auricled; entire, acute; all leaves thick, coriaceous. Racemes short often capitate/

capitate, corymbose, ebracteate. Flower small, white; pedicels usually short, filiform but rigid, often subappressed. Sepals spreading, broad, not saccate, apex rounded or subdentate. Petals obovate or suborbicular-cuneate, apex subemarginate or rounded. Stamens 6; filaments not appendaged, those of outer pair  $\frac{1}{2}$  curved at the base; anthers oblong, obtuse. Lateral nectariferous glands in pairs, each semicircular with short basal process; median minute subtriangular. Ovary ovate or suborbicular, 2-ovuled; style minute with a capitate stigma. Siliculae ovoid or broadly ellipsoid, glabrous, bilocular dehiscent apex rounded or obtuse, entire; valves turgid, boat-shaped, not winged, laterally subcompressed; septum thick, often transversely rugose or undulated; seed large, one in each loculus, oblong-ellipsoid, trigonate, not winged.

About 5 species in Central Asia.

Aitchison No. 516 (K!) from Afghanistan was wrongly identified as "Heldreichia longifolia". It is Stroganowia affghana (Boiss.) N. Pavl. (Syn: Lepidium affghanum Boiss.). In Heldreichia the siliculae are indehiscent but break longitudinally into two 1-seeded halves without liberating the seeds. Aitchison's specimens show dehiscing siliculae (Plate No. XIX). Considering the other characters their remains no doubt that it is S. affghana.

Stroganowia Kar. et Kir. is very closely allied to Lepidium, but can be easily distinguished by its large siliculae with subcompressed valves (not keeled or winged) and large seeds (one in each loculus).

S. affghana (Boiss.) N. Pavl. in Komarov, Fl. U.R.S.S. viii. 529

(1939)/

(1939).

Syn: Lepidium affghanum Boiss., Fl. Or. i. 358 (1867);  
 "Heldreichia longifolia" Aitchison in Trans. Linn. Soc.  
 iii. 36 (1888) - non Boiss. in Ann. Sc. Nat. 187 (1842);  
Nasturtium affghanicum O. Ktze., Rev. 937 (1891).

Type: Afghanistan, Keratkuh, Bunge (G - not seen).

Perennial, 40-90 cm. tall, dichotomously branched herb, glabrous, glaucous; rootstock woody, dichotomously branched, covered with brown fibrous remains of leaf bases. Radical leaves rosulate, oblong-lanceolate, 3.8-16 x 0.3-1.5 cm., stalked, entire, rarely obscurely serrate, 1-5- parallel-veined, apex acute, often sharp rigid; cauline leaves variable in size, lower and middle one long sessile or sessile; upper ones sessile, linear-oblong, 1-2.5 x 0.1-0.25 cm., entire; all leaves thick, coriaceous; apex acute, sharp, rigid, glabrous, glaucous. Racemes 25-50- flowered, corymbose and capitate above, ebracteate, increasing up to 15 cm. in fruit. Flowers 3-3.5 mm. across, white; pedicels 2-5 mm. long increasing up to 7 mm. in fruit, filiform, subappressed. Sepals 1-1.3 x 1 mm., suborbicular, spreading, apex rounded or toothed. Petals 2.5-3 x 2-2.5 mm., suborbicular-cuneate, apex obscurely emarginate. Stamens 1.4-1.6: 1.7-2 mm., anthers 0.5-0.7 mm. Siliculae suborbicular or broadly-ellipsoid, 5-6 x 4-5.2 mm., glabrous; valves turgid boatshaped; style very short, about 0.5 mm.; seed large, 3.5-4 x 1.5-1.8 mm., oblong, trigonate, whitish-brown; septum 1.6-2 mm. broad. (Plate No. XIX).

Afghanistan:

Badghis, Mt. Do-Shakh, Aitchison No. 516 (K!)

Geog. Dist.: C. Asia.

Tribe III. Euclidieae - according to O.E. Schulz in Pflanzenfam.  
(17b) 467 (1936).

Lateral nectariferous glands often in pairs, rarely annular, each semi-lunar, or fragmentary; median present or absent. Hairs simple, branched, glandular or absent. Stamen filaments linear, not appendaged; anthers usually short and blunt. Ovary sessile, 1-4- ovuled, often sub-globose; stigma capitate or shortly bilobed rarely with erect or spreading lobes. Fruits indehiscent, neither beaked nor segmented; valves usually hard, often appendaged. Radicle incumbent or accumbent.

Key to the 7 genera of the tribe Euclidieae

1. Valves appendaged:

2. Siliculae cymbiform; valves submembranous with the appendages incurved ..... 35. Taucheria

2. Siliculae ovate-tetragonal or cubical; valves thickened,  $\dagger$  coriaceous with the appendages  $\dagger$  spreading;

3. Plants pubescent with branched or stellate hairs; leaves cuneate at the base, margin sinuate-dentate .... 32. Octoceras

3. Plants glabrous, glaucous; leaves cordate, amplexicaule, entire ..... 34 Boreava

1. Valves not appendaged:

4. Valves membranous, very inflated ..... 37 Hymenophysa

4. Valves thickened, coriaceous, lensoid:

5. Apex of siliculae elongated into a narrow, long variously curved beak-like structure .. 33. Spirorhynchus

5. Apex of siliculae with a distinct style (or short erect beak-like/

beak-like structure):

6. Cauline leaves cuneate at the base; neither auricled nor amplexicaule; ovary 2-ovuled ..... 36. Euclidium.
6. Cauline leaves auricled and semi-amplexicaule; ovary 4-ovuled ..... 36. Neslia.

32. OCTOCERAS Bunge in Arb. Naturf. Ver. zu Riga, i. 172 (1847);

B.H.G.P. 97; B.F.O. 370; S.E.P. 469; K.F.U. 327.

Annual, small, spreading herbs, branched mostly from the base, densely pubescent with branched, stellate hairs. Leaves oblong - elliptic, sinuate-pinnatifid, lower stalked, upper sessile or sessile. Racemes corymbose above, ebracteate, lax and flexuose in fruit. Flowers minute, yellowish, sessile; pedicels becoming thickened and  $\dagger$  appressed in fruit. Sepals oblong, obtuse, equal, not saccate, pubescent, subspreading. Petals narrowly spatulate, apex rounded, about as long as the sepals. Stamens 6, not appendaged but with broad bases. Lateral nectariferous glands in pairs, minute, dot like, median absent. Ovary short,  $\dagger$  with 8 short appendages, 2-ovuled; style short with a sub-bilobed capitate stigma. Siliculae short, cubical or obpyramidate, coriaceous, subdehiscent, bilocular; valves with prominent mid rib and 3 - 6 horn-like ridges; seed one in each loculus, oblong, pendulous, brown.

1 species in Transcaspiian region, Persia, Afghanistan and W. Pakistan (Baluchistan).

O. lehmannianum Bunge in Arb. Naturf. Ver. zu Riga, i. 172 (1847);

H./

H. f. et T. in Journ. Linn. Soc. Bot. v. 179 (1861); B.F.O. 370; S.E.P. 469; K.F.U. 328.

Syn: O. Lehmanianum var. Stockianum Boiss. in Fl. Or. i. 370 (1867).

Type: Persia, Schahrud, Bunge (L,K!).

Annual, 8-25 cm. long, branched, <sup>†</sup> spreading herbs, densely hairy with short branched hairs. Leaves simple, oblong-pinnatifid, to sinnately toothed, 2-4- jugate, 1.5-4 x 0.3-1.4 cm., acute or obtuse, lower stalked, upper sessile or sessile. Racemes 10-18- flowered, lax, ebracteate, increasing up to 20 cm. in fruit. Flowers minute, about 1 mm. across, yellowish, subsessile; pedicels increasing up to 1 mm. and becoming thickened and appressed in fruit. Sepals 1-1.2 x 0.7-0.8 mm. Petals 1-1.3 x 0.6 mm. Stamens about 0.8:1 mm.; anthers minute, about 0.25 mm. Siliculae short, cubical, 2.5-3.2 x 1.6-1.8 mm., scorbiculate, angled with 3-6 prominent horn-like ridges; valves with a prominent mid rib, stigose, <sup>†</sup> rigid; style about 0.5 mm.; seed about 1.8 x 0.9 mm.

W. Pakistan:

Baluchistan: Zeedee, Stocks (K!); Nichara, Stocks (K!); Lace No. 3391 (K!); (without locality), Lace (E!); Sandy and gravelly plains near Quetta, Griffith (K!).

Afghanistan: (without locality) Griffith (K!)

Geog. Dist.: Persia, C. Asia and Trans-Caspian region.

33. <sup>‡</sup> SPIRORRHYNCHUS Kar. et Kir. in Bull. Soc. Nat. Mosc. xv. 159 (1842); B.H.G.P. 95; B.F.O. 385; S.E.P. 469; K.F.U. 241.

Syn: Anguillicarpus Burkill in Proc. Asiat. Soc. Bengal, iii. (8) 559 (1907), et List of Flowering plants of Baluchistan 8 (1909); Parsa, Fl. de'l Iran, 869 (1952).

Annual/

Annual, erect, branched, slender herbs, glabrous. Leaves narrowly linear, lower often runcinnate-pinnati-partite or sinuate-dentate, upper entire, sessile or subsessile. Racemes lax, few flowered, ebracteate. Flowers pale lilac; pedicels flexuose, filiform, <sup>†</sup> deflexed in fruit. Sepals narrowly oblong, suberect, equal, not saccate. Petals linear, more than twice as long as the sepals. Stamens 6, filaments free or those of inner four sometimes connate at the base in pairs; anthers of outer two stamens short blunt, often sterile, those of inner four long and acute, fertile. Lateral nectariferous flands semicircular, open towards the inner side, very narrowed towards the outer side; median present, joining the laterals, thickened in the middle. Ovary narrowly ellipsoid, 2-ovuled, with <sup>†</sup> equally long, sterile, narrowly cylindrical apical part ending in short, subbilobed stigma. Siliculae spindle-shaped with elongated, variously curved, slender ends: apical part looking like a beak, and basal part looking like a long stalk; spindle unilocular, indehiscent, with one mature seed; valves terete, thickened, rugose; seed oblong smooth.

1 species in C. Asia, Persia, TransCaspian region and W. Pakistan (Baluchistan.)

##  
S. sabulosus Kar. et Kir. in Bull. Soc. Nat. Mosc. xv. 159 (1842);  
 B.F.O. 385; S.E.P. 470; K.F.U. 241.

Syn: Anguillicarpus Bulleri Burkill in Proc. Asiat. Soc. Bengal, iii. (8) 559 (1907); S. Bulleri (Burkill) O.E. Schulz in Engler, Bot. Jahrb. lxvi. 98 (1933); S.E.P. 470.

Type:/



Fig. no. 12

*Spirorrhynchus sabulosus*  
Kar. et Kir.

a<sub>1</sub> - a<sub>6</sub>, variation in shape and size of fruits (drawn from a single specimen - P. Sintenis no. 166(K!) from Trans-Caspian region);  
b<sub>1</sub> - b<sub>3</sub>, stamens showing free to connate filaments.

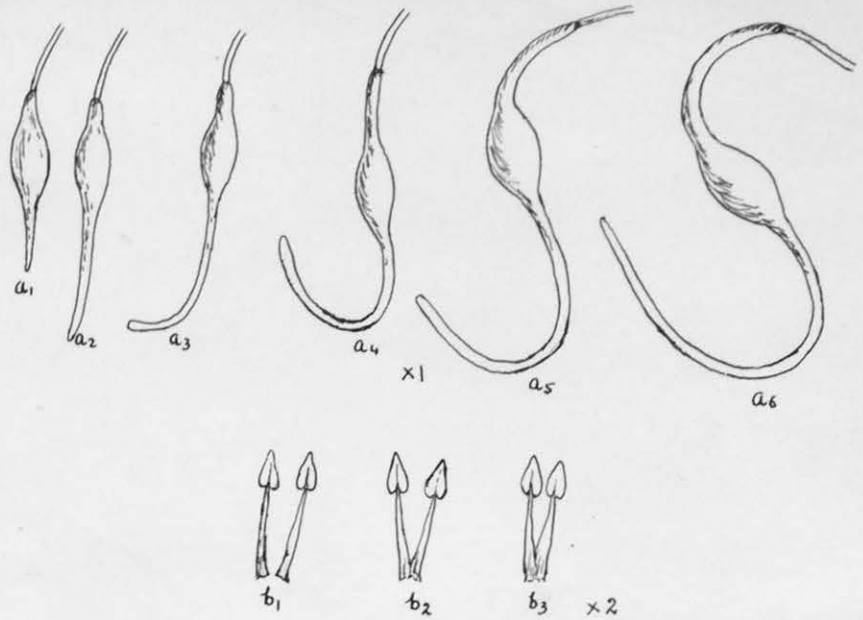


Plate no. XX.

*Boreava orientalis* Jaub. et Spach



Plate no. XXI. *Tauscheria lasiocarpa* F. et M.

Type: C. Asia: Soongaria, Kar. et Kir No. 1262 (L,K!).

Annual, 20-25 cm. tall, erect, branched mostly from the base, glabrous. Lower leaves narrowly runcinate-pinnatipartite, sinuate-dentate or entire, 3-4 x 0.3-0.5 cm., upper leaves linear, entire, 1-2.5 x 0.15-0.25 mm. Racemes 10-15-flowered, lax ebracteate, increasing up to 15 cm. in fruit. Flowers about 5 mm. across, pale lilac; pedicels 3-5 (-10) mm. long, increasing up to 20 cm. in fruit, often deflexed. Sepals about 3 x 1 mm. Petals about 8 x 1 mm., linear. Stamens about 2.8: 3.8 mm. Siliculae spindle-shaped, apex and base variously curved, seed bearing ellipsoid part 7-8 mm. long and about 2 mm. broad; seed about 4 x 1 mm., oblong-ellipsoid, brown.

W. Pakistan:

Baluchistan: Kharan, Quetta, R. Hughes-Buller No. 23193 (Herb. Calcutta - not seen).

Geog. Dist.: Persia and Trans-Caspian region.

This species is very variable in the shape and size of the apical and basal processes of the fruit. But a careful study reveals that these variations are no doubt of one single species, S. sabulosus Kar. et Kir.

Burkill (1907) described a new genus Anguillicarpus from Baluchistan with one species, A. Bulleri Burkill. He distinguished it from Spirorrhynchus by its bisaccate sepals, presence of nectariferous glands, 6 stamens with free filaments and larger fruits. Schulz (1933) regarded this genus as congeneric with Spirorrhynchus and transferred Burkill's species to the latter making a new combination, S. Bulleri (Burkill) Schulz.

A careful study of several specimens shows that all the distinguishing characters as mentioned for S. Bulleri by the above authors disintegrate when we find all those characters even on the same plant of S. sabulosus (P. Sintenis No. 166 (K!) from Trans-Caspian region) - free to connate filaments, small to large fruits. (Fig. No. 12). Therefore, there is no doubt, that there is only one species of Spirorrhynchus, S. sabulosus Lar. et Kir. widespread in Trans-Caspian region, C. Asia, Persia and Baluchistan (W. Pakistan). Therefore, S. Bulleri must be cited as its synonym.

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34. BOREAVA Jaubert et Spach, Illustr. Pl. Orient. i. 3. t. 2 (1842);  
B.F.O. 372; S.E.P. 471.

Syn: Martinsia Godr. in Mem. Acad. Stanisl. 3 ser. xvii.  
378 (1854).

Annual or biennial, erect, glabrous, glaucous, branched above with <sup>+</sup> corymbose branches. Cauline leaves cordate, amplexicaule, entire. Racemes ebracteate, corymbose above, panicled. Flowers pale yellow, small; pedicels spreading, about as long as fruit. Sepals almost equal, spreading, inner pair subsaccate. Petals about twice as long as sepals, spatulate-oblong, apex rounded. Stamens 6, filaments not appendaged, anthers ovoid, blunt. Lateral nectiferous glands annular; median joining the laterals, thickened in the middle. Ovary narrowly flask-shaped, 2-ovuled; stigma depressed-capitate. Siliculæ ovoid-tetragonate, crustaceous, unilocular, indehiscent; valves thick with narrow crimped, thickened wings, apex short conical style-like; seed only one mature, pendulous, ovate brown.

2 species in W. Asia, W. Pakistan, and Asia Minor.

##

B. orientalis Jaub. et Spach, Illustr. Pl. Or. i. 4. t. 2 (1842)

B.F.O. 372; S.E.P. 471.

Type: Asia minor, Taouchanleu, Jaubert (G?- not seen).

Annual, 30-60 cm. tall, erect, corymbosely branched, glabrous, glaucous. Lower leaves 5-12 x 2-4 cm., oblong or oblong-ovate, acute or obtuse, entire or subdentate. Upper leaves ovate-cordate, amplexicaule, 2-6 x 1-3 cm., entire, acute. Racemes paniced, many flowered, increasing up to 15 cm. in fruits. Flowers 3-4 (-5) mm. across, yellow; pedicels 2-4 mm., increasing up to 5 (-7) mm. in fruit, filiform, rigid, spreading. Sepals 2-2.8 x 1 mm. Petals 4-6 x 1-1.5 mm., oblong-obovate, apex rounded. Stamens 2.2 - 2.5: 3-4 mm.; anthers about 0.8 mm. long, oblong, obtuse. Siliculae ovoid-tetragonate, 5-7 x 3.8-5 mm. (excluding 2.5 - 3.5 mm. long beak-like apex), appendages crimped; valves coriaceous, glabrous; seed about 3 x 1 mm. ovate-oblong, brown. (Plate no. XX)

W. Pakistan: N.W.F.P.: Peshawer, Hasan-ud-Din no. 3(R-E!).

Geog. Dist: Asia minor, eastward to W. Pakistan.

35. TAUSCHERIA Fischer in Catal. Hort. Gorenk. 49 (1812) et in DC.

Syst. Nat. ii. 563 (1821); B.H.G.P. 94; B.F.O. 371; S.E.P. 473;

K.F.U. 228.

Annual, erect, branched, glabrous, glaucous. Gauline leaves cordate - amplexicaule, entire. Racemes ebracteate, corymbose above, lax and flexuose in fruit. Flowers small, pale yellow; pedicels filiform, shorter than siliculae, deflexed or spreading. Sepals almost equal, subspreading, not saccate. Petals about twice as/

as long as the sepals, spatulate, apex rounded. Stamens 6, not appendaged; anthers minute, blunt. Lateral nectariferous glands apparently in pairs, semilunar, open towards the inner side, joined towards the outer side by an obscure, thin, connection; median present joining the laterals by thin connection, thickened in the middle. Ovary subovate, 1-ovuled; stigma capitate. Siliculae cymbiform, membranous-crustaceous, unilocular, indehiscent; valves narrowly winged with wings incurved, usually hairy with simple short hairs with somewhat hooked apex; seed one, ovate, brown, † flattened on one side.

1 species in C. Asia.

T. lasiocarpa Fischer in DC. Syst. Nat. 563 (1821) et Prodr. 210 (1824); B.F.O. 371; F.B.I. 164; S.E.P. 474; K.F.U. 228.

Syn: T. desertorum Ledeb., Ic. Fl. Ross. ii. 139 (1830); Royle, Illus. 72 (1839); H. f. et T. in Journ. Linn. Soc. Bot. v. 178 (1861); T. gymnocarpa Fischer, l.c.; T. lasiocarpa var. B. gymnocarpa (Fisch.) Boiss., Fl. Or. i. 372 (1867).

Type: C. Asia, Kirghisora, Fischer (G - not seen).

Annual, 12-30 cm. tall, erect, glabrous, glaucous except siliculae which are usually hairy, branched. Leaves ovate sessile, cordate, amplexicaule, 1-6 x 0.25-2.5 cm., entire, apex obtuse or rounded, glabrous. Racemes 30-40-flowered, lax, subcorymbose above, ebracteate, increasing up to 15 cm. in fruit. Flowers about 2 mm. across, pale yellow; pedicels 1-2 mm. long, increasing up to 4 mm. in fruit, filiform, spreading, often deflexed. Sepals

1-1.3 x 0.5-0.8 mm. Petals 2.2-2.8 x 0.7-1 mm., oblong-cuneate, apex rounded. Stamens about 1.2: 1.4 mm., anthers about 0.25 mm. Siliculae cymbiform, 6-7 x 3-3.5 mm.; <sup>+</sup> hairy rarely glabrous seed one, about 2.5 x 1.4 mm., brown. (Plate No. XXI).

W. Pakistan:

Baluchistan: Ziarat, 2400 m., Lace No. 3358 (E!K!); Kutchlak, Jafri (E!); Ziarat, 2400 m., H. Crookshank No. 302 (K!);

Afghanistan: Harirud Valley, Aitchison No. 1013 (K!); common on cultivated land, Aitchison No. 227 (K!).

N.W. Himalayas:

Kashmir: Baltistan, 3000-3300 m., Duthie No. 11925 (E!K!); (without locality), 1800-2400 m., Thomson (E!); W. Tibet, Thomson (K!); (Without locality), Royle (K!);

Geog. Dist.: C. and W. Asia.

36. EUCLIDIUM R. Br. in Ait. Hort. Kew. ed. 2. iv. 74 (1812);

B.H.G.P. 97; B.F.O. 368; F.B.I. 164; S.E.P. 475.

Syn: Litwinowia Woronow in Acta Hort. Petrop. xliii. (2) 452 (1931); K.F.U. 324.

Annual, rigid, <sup>+</sup> dichotomously branched, suberect or erect, <sup>+</sup> hairy with simple or 2-3- furcate hairs, rarely glabrous. Leaves oblanceolate, lower and those on the main stem comparatively large, <sup>+</sup> stalked, sinuate-toothed to subentire or entire. Racemes spicate, often arising opposite the leaves, ebracteate, lax and flexuose in fruit. Flowers small, white; pedicels very short, subappressed. Sepals almost equal, not saccate, subspreading. Petals slightly to about twice as long as the sepals, narrowly spatulate, apex subemarginate or subrounded. Stamens 6, not appendaged; anthers short, subglobose. Lateral nectariferous glands in pairs, minute, sub-triangular; /

sub-triangular; median absent. Ovary <sup>†</sup> globose, 2-ovuled, with about equally long, narrow, beak-like apical process ending in depressed, subbilobed stigma. Siliculae globose or subglobose, bilocular, indehiscent, with persistent or deciduous beak; valves glabrous or hairy; seeds one in each loculus, suborbicular, pendulous; septum thickened.

2 species in C. and W. Asia.

O.E. Schulz (1936) keeps the two species under two different sections of Euclidium, while N. Busch (1939) recognizes them under two different genera. E. syriacum (L.) R.Br. is the type of species of the genus. The second species was transferred under a separate new genus Litwinowia by Woronow (1931) who did not make the correct valid combination and therefore, his L. tatarica (Willd.) Woronow was replaced by N. Busch's L. tenuissima (Pall.) N. Busch in Komarov, Fl. U.R.S.S. (1939). The primary distinguishing characters as given by Woronow (1931) for his new genus Litwinowia are: hairs simple, siliculae glabrous, style deciduous.

Examination of large number of herbarium specimen reveals that even in E. syriacum (L.) R.Br. sometimes the plants and fruits are glabrous and the style sometimes breaks off in mature fruits.

I have therefore followed Schulz in recognizing them under the two different sections of Euclidium as follows:

Key to the sections (as well as the 2 species):

- 1(a) Plants hairy with branched hairs, sometimes glabrous; style usually persistent ..... Sect. 1. Empedorrhynchus  
 1(b) Plants sparsely hairy with simple hairs, style usually deciduous ..... Sect. 2. Litwinowia.  
 Sect. 1. Empedorrhynchus O.E. Schulz in Engler. Bot. Jahrb. lxvi.

95 (1933); S.E.P. 475.

1. E. syriacum (L.) R.Br.

Sect. 2. Litwinowia (Woronow) O.E. Schulz in S.E.P. 475 (Syn:

Litwinowia Woronow in A.H.P. xliii. 452 (1931); Euclidium

Sect. II. Eclytorrhynchus O.E. Schulz in Bot. Jahrb.

lxvi. 95 (1933)).

2. E. tenuissimum (Pallas) Fedtsch.

1. E. syriacum (L.) R.Br. in Hort. Kew. ed. 2. iv. 74 (1812);

F.B.I. 165; S.E.P. 475; K.F.U. 323.

Syn: Anastatica syriaca L., Sp. Pl. 2 ed. 895 (1763);

Bunias syriaca M.B., Fl. Taur. - Cauc., ii. 88 (1808);

Type: Siberia, Pallas (BM!)

Annual, 10-30 cm. tall, erect or subspreading, branched, hairy with short, somewhat rough, branched hairs. Leaves oblong-elliptic, 1.5-8 (-14) x 0.4-1.5 (-3) cm., acute or obtuse, sinuate-toothed to subentire, lower stalked, upper subsessile or sessile,  $\dagger$  hairy. Racemes 15-30-flowered, subspikate, ebracteate, lax, increasing up to 12 cm. in fruit. Flowers minute, 1-1.5 mm. across, white subsessile; pedicels up-to 1 mm. long appressed and thickened in fruit. Sepals 0.8-1 x 0.4-0.5 mm. Petals 1-1.4 x 0.4-0.5 mm., oblong-spathulate, apex emarginate. Stamens about 1: 1.2 mm.; anthers minute, about 0.2 mm. Siliculae globose or ovoid about 2.5 x 2 mm. (excluding 1-1.5 mm. long  $\dagger$  persistent style),  $\dagger$  hairy with short, branched or simple, rough hairs, rarely glabrous; seeds about 1.8 x 1 mm., dark-brown.

W. Pakistan:

Chitral:/



Chitral: Drosch, 1350 m., Toppin No. 853 (K!).

N.W.F.P.: Peshawar, H. Deane (K!); J. L. Stewart (K!E!).

Punjab: Rawalpindi, Aitchison No. 1015 (K!);

Baluchistan: Quetta, Lace No. 3635 (E!K!); Duthie No. 8604 (K!)  
Stocks No. 794 (K!)

Afghanistan:

(without locality), Griffith (K!); Harirud Valley, Aitchison Nos. 188 (K!) and 280 (K!); Khyber Pass, 1080 m., Johnston No. 53 (E!K!).

N.W. Himalayas:

Lahul, Keylang, 3090 m., N.L. Bor. Nos. 9246 (E!) and 14723 (E!); Keylang, 3690 m., Koelz No. 2036 (E!); N. of Keylang, Drummond No. 20299 (K!); Sirsu, Drummond No. 20300 (K!); Near Domel, 750 m., R. Stewart No. 11073 (R-E!). Kashmir, Baltistan, 3300-3600 m., Duthie (E!); Islamabad, 1500 m., Winterbottom (K!); Marpunullah, 3000-3300 m., Duthie (BM!); Kara Korum, 3600 m., Clarke No. 30153 C (BM!)

Geog. Dist.: Persia to Asia minor, C. and N. Asia.

XX

2. E. tenuissimum (Pallas) Fedtsch. in A.H.F. xxiii. (2) 379 (1904)

et Bull. Herb. Boiss. Ser. II. iv. 915 (1904); S.E.P. 476.

Syn: Vella tenuissima Pallas, Reise, v. (1776) append.

p. 506; Bunias tatarica Willd., Sp. Pl. iii. 413 (1800);

E. tataricum (Willd.) DC., Syst. 422 (1821); H. f. et T.

in Journ. Linn. Soc. Bot. v. 179 (1861); B.F.O. 369;

Litwinowia tatarica (Willd.) Woron. in A.H.F. xliii.

452 (1931); L. tenuissima (Pall.) N. Busch in Komarov,

Fl. U.R.S.S. viii. 327 (1939).

Type: C. Asia, South Jaikum?, Pallas (BM!).

Annual, 20-60 cm. tall, erect, branched, hairy with simple stiff, rough hairs. Basal leaves elliptic-oblong, deeply pinnatifid or sinuate-dentate, stalked, 3-4- jugate, 3-10 x 0.5-2 cm., (including 0.8-2.5 cm. long stalks); apical lobe much larger, ovate-oblong lateral lobes narrowly triangular, linear, acute; upper leaves narrowly/

narrowly-elliptic or linear, 1-6 x 0.2-1 cm., subsessile or sessile sinuate-toothed to entire; all leaves <sup>†</sup> hairy. Racemes 15-30-flowered, lax, ebracteate, increasing up to 25 cm. in fruit. Flowers 2-3 mm. across, white, subsessile, pedicels increasing up to 1 mm. in fruit, filiform, ascending or subappressed. Sepals 2-2.4 x 0.5-1 mm. Petals 3.6-4 x 1 mm., spatulate, apex subemarginate. Stamens about 2.5: 3 mm.; anthers about 0.6 mm. Siliculae <sup>†</sup> orbicular, about 3 mm. in diam. (excluding about 2.5 mm. long deciduous style), glabrous, obscurely wrinkled in the middle of the valves with a <sup>†</sup> distinct midvein; style deciduous in fruit, jointed at the base; seeds 1-1.2 mm. in diam., almost orbicular, flattened, light brown.

W. Pakistan:

Baluchistan: Shelabagh, Khojak Pass, 1800 m., Lacey No. 3540 (E!); Khojak Pass, Duthie No. 8592 (K!)

N.W. Himalayas: Bashahr State, Pandrabis, 1950 m., Lacey No. 883 (E!) Simla, 2850 m., weed in cultivation, R.N. Parker No. 2919 (K!); Sarhan, 2100 m., Parkar No. 3335 (K!)

Afghanistan: (without locality), Griffith No. 1500 (K!); Alikhel, Aitchison No. 190 (K!)

Geog. Dist.: Persia and C. Asia.

~~XXX~~

37. HYMENOPHYSA C.A.M. in Ledeb., Fl. Alt. iii. 180 (1831);

B.H.G.P. 88; B.F.O. 362; S.E.P. 476; K.F.U. 535.

Perennial, erect or suberect, branched, leafy, pubescent with short, simple or branched hairs. Cauline leaves lanceolate, auricled, amplexicaule, <sup>†</sup> dentate, rarely entire or subentire. Racemes ebracteate, corymbose above, paniced. Flowers small, white; pedicels filiform, spreading or ascending in fruits. Sepals subequal, not saccate, pubescent. Petals about twice as long as the sepals, obovate-cuneate, apex rounded. Stamens 6, not appendaged; anthers/

anthers short, subglobose. Lateral nectariferous glands in fused pairs, each semilunar, open towards the inner side; median present joining the laterals, thickened in the middle. Ovary subglobose or oblong, 4-ovuled, with about equally long style ending in a capitate stigma. Siliculae, subglobose, inflated, bilocular, indehiscent; valves hemispherical, membranous, - pubescent; <sup>+</sup> seed usually 1 mature in each loculus, ellipsoid, pendulous, redish brown; septum membranous.

3 species in Central Asia.

✖✖

H. pubescens C.A.M. in Ledeb., Fl. Alt. iii. 181 (1831); S.E.P. 477; K.F.U: 536.

Type: C. Asia, Altai, Ledebour (L,K!).

Perennial, 20-45 cm. tall, erect or suberect, branched mostly from the base, pubescent with short simple or 2-3- furcate hairs. Radical leaves oblong-obovate, stalked; cauline leaves oblong-lanceolate, 1-9 x 0.3-2 cm., dentate to entire, sessile, auricled, amplexicaule, acute; all leaves <sup>+</sup> pubescent. Racemes 15-25- flowered, paniced, corymbose above, ebracteate, increasing up to 5 cm. in fruit. Flowers about 3 mm. across, white; pedicels 3-10 mm. long increasing up to 12 mm. in fruit, filiform, spreading. Sepals 1.2-1.5 x 0.8-1 mm. Petals 2-3.5 x 0.8-1 mm., obovate-cuneate, apex subtruncate. Stamens 2-2.5: 2.5-3 mm.; anthers about 0.7 mm. long. Siliculae suborbicular or globose, 3.5-5 x 3-5 mm. (excluding about 1 mm. long style), much inflated; valves hemispherical, membranous, pubescent; seeds about 2 x 1 mm., redish-brown; septum not veined.

W./

W. Pakistan:

Chitral: Drosh, 1450 m., common, Toppin No. 89 (K!)

N.W. Himalayas: Gilgit, Sher Killa, 1800 m., Giles No. 518 (K!);

Geog. Dist.: C. Asia: Songaria, Kar. et Kir. No. 113 (K!); Altai, Ledebour (K!); Schrenk (K!); Yarkand, Henderson (K!)

38. NESLIA Desvaux in Journ. de Bot. iii. 162 (1814); B.H.G.P. 95; B.F.O. 371; S.E.P. 477; K.F.U. 602.

Annual, erect, branched, hairy with 2-3- furcate hairs, especially below. Cauline leaves auricled, semi-amplexicaule, oblong-lanceolate, entire or toothed, pubescent. Racemes ebracteate, corymbose above, flexuose in fruit. Flowers small golden yellow; pedicels filiform, flexuose, spreading or ascending, much longer than the siliculae. Sepals almost equal, not saccate. Petals about twice as long as the sepals, spathulate, apex rounded. Stamens 6, not appendaged, anthers short, ovoid, blunt. Lateral nectariferous glands in fused pairs, each semilunar with a short basal process; median absent. Ovary globose, 4-ovuled, with equally long style ending in short capitate retuse/ stigma. Siliculae subglobose-compressed, coriaceous, indehiscent, bilocular; style filiform, rigid, about half as long as the siliculae, persistent; seed usually only one mature, suborbicular, brown; septum membranous, not veined.

2 species in Mediterranean region extending up to C. Asia and W. Pakistan.

N. paniculata (L.) Desv. in Journ. de Bot. iii. 162 (1814); B.F.O. 371; F.B.I. 164; S.E.P. 478; K.F.U. 602.

Syn: Myagrum paniculatum L., Sp. Pl. 641 (1753); Vogelia paniculata/

paniculate Hornem, Hort. Hafn. ii. 594 (1819).

Type: Europe - (not precisely designated) No. 7 (LS!).

Annual, 20-60 cm. tall, erect, branched, † hairy with branched, somewhat rough short hairs. Basal leaves oblong-lanceolate, stalked, 3-10 x 0.8-2 cm., toothed or subentire, acute or obtuse. Upper leaves linear-oblong, 1-8 x 0.3-1.5 cm., sessile auricled, amplexicaule, entire or subentire. All leaves hairy with short branched, † stellate hairs. Racemes 30-50-flowered, corymbose above, ebracteate increasing up to 30 cm. in fruit. Flowers 3-4 mm. across, yellow; pedicels 2-3 mm. long increasing up to 10 (-14) mm. in fruit, filiform, spreading. Sepals about 2 x 1 mm. Petals about 3 x 1 mm., spatulate, apex rounded. Stamens about 2: 2.5 mm., anthers about 0.5 mm. long. Siliculae subspherical or globose, 1.5-2 mm. in diam. (excluding about 0.7 mm. long style) glabrous; valves inflated, with a distinct midrib and reticulate venation; seed about 1.4 x 1 mm., ovoid, brown.

W. Pakistan:

Chitral: Drosh, 1350 m. Toppin No. 216 (K!).

N.W.F.P.: Abbottabad, common cornfield weed, Barrett No. 100 (K!); Kaghan, 2100 m. Inayat No. 19203 (K!); Peshawar, J.L. Stewart (K!); H. Deane (K!).

Punjab: Salt Range, Aitchison No. 60 (K!); Rawalpindi, Hasan Abdal, Aitchison No. 323 (K!); Martand, Drummond No. 13974 (E!, K!); (without locality), Drummond No. 21571 (K!); J.L. Stewart (E!); Aitchison (K!), Rawalpindi, R. Stewart No. 16251 A (R-E!).

Baluchistan: Quetta, 1680 m., Lace No. 3522 (E!K!);

Afghanistan: (without locality), Griffith (K!); Khyber Pass, 1980 m., Johnston Nos. 144 (E!K!) and 56 (E!); Harirud Valley, Aitchison No. 219 (K!); Karrum Valley, Habib Kella, Aitchison No. 181 (K!).

N.W. Himalayas: Kashmir (without locality), Hooker (K!); Srinagar, 1560 m., field weed, R. Stewart No. 12563 (K!); Between Ravi and Beas, J.L. Stewart (K!).

Geog. Dist.: Europe, N. Africa and Orient, C. Asia and N. America.

Tribe IV Lunarieae O.E. Schulz in Pflanzenfam. (17b) 481 (1936).

Lateral nectariferous glands various; median present or absent. Hairs simple or absent. Stamen filaments not appendaged; anthers blunt or pointed. Ovary often elliptic with very short gynophore; stigma capitate or bilobed. Fruit large, broadly-elliptic, latiseptate siliculae (sometimes looking like a siliqua); dehiscent or indehiscent. Radicle accumbent.

(\*\*)

39. LUNARIA L., Sp. Pl. 653 (1753); B.F.O. 256; S.E.P. 481; K.F.U. 335.

Annual to perennial, erect, branched, subglabrous or hairy with simple hairs. Leaves ovate often cordate, dentate, acute, lower long petioled. Racemes short, ebracteate, lax. Flowers large, purple to white; pedicels filiform, flexuose, spreading. Sepals subequal, erect, inner pair saccate. Petals about twice as long as the sepals, obovate, long clawed. Stamens 6, not appendaged; anthers long, obtuse. Lateral nectariferous glands annular, bilobed towards the outer side and trilobed towards the inner side; median absent. Ovary/short gynophore, lanceolate or elliptic, 4-6-ovuled, with short style and bilobed stigma. Fruit large † broadly elliptic on a distinct carpophore, compressed, bilocular, latiseptate, dehiscent; valves membranous, reticulately veined; seeds large, compressed, orbicular, winged, biseriate; septum membranous, broad, not veined.

3 species in C. and S.E. Europe. Introduced and cultivated widely as an ornamental plant.

The genus is known only from the cultivated species in the present/

present area.

(\*\*)

L. annua L., Sp. Pl. 653 (1753) et 2 ed. 911 (1763); Hayek, Prod.

Fl. Penn. Balc. 424 (1927); S.E.P. 482.

Syn: L. biennis Moench, Meth. 261 (1794); B.F.O. 256.

Type: Germany (not precisely designated) No. 2 (LS!).

Annual or biennial, 30-100 cm. tall, erect, branched  $\pm$  hairy with simple hairs. Lower leaves long stalked (stalk up to 8 cm. long), up to 16 cm. long and 9 cm. broad; upper leaves shortly stalked or sessile; all leaves with broadly cordate lamina, coarsely toothed,  $\pm$  hairy, acute. Racemes 10-20-flowered, lax, ebracteate, increasing up to 20 cm. in fruit. Flowers large, 2-3 cm. across, purple, violet, pink or white; pedicels 10-12 mm. long, increasing up to 15 mm. in fruit, filiform, spreading. Sepals 8-12 x 2.2-3.2 mm. Petals 20-30 x 8-10 mm., obovate, long-clawed, conspicuously veined. Stamens 8-10: 10-15 mm.; anthers 2.5-3 mm. long. Siliculae oblong, or suborbicular, apex rounded or obtuse; seeds few, biseriate, 5-8 mm. in diam., compressed, winged (wing about 1 mm. broad), reddish brown; septum membranous, not veined.

(Plate No. XXII).

W. Pakistan:

Baluchistan: Ziarat, 2400 m. garden escape, mauve flowers, about 3 feet maximum height, lower part very leafy, H. Crookshank No. 243 (K!).

N.W. Himalayas: Dalhousie, 2100 m. cultivated, Watt No. 1232 (E!).

Geog. Dist.: Europe.

Cultivated as an ornamental plant in the gardens in some parts of the present area. Sometimes found as an escape from cultivation.

Tribe V. Alysseae - according to O.E. Schulz in Pflanzenfam. (17b)  
486 (1936).

Lateral nectariferous glands often in pairs and small, sometimes one and  $\pm$  horseshoe-shaped; median absent. Hairs bipartite, stellate or branched, appressed or subappressed. Stamen filaments appendaged or not appendaged, sometimes toothed; anthers short and blunt. Ovary elongated or short, sessile or on a short gynophore; stigma usually shortly bilobed. Fruit usually a small latiseptate silicula (sometimes looking like a siliqua), mostly dehiscent, sometimes indehiscent, 1-2-locular. Radicle accumbent.

Key to the 7 genera of the tribe Alysseae

- 1. Fruits unilocular, indehiscent, 1-seeded ..... 46. Clypeola
- 1. Fruits bilocular, dehiscent, 2- many seeded:
  - 2. Flowers axillary and solitary ..... 45. Buchingera
  - 2. Flowers in ebracteate racemes:
    - 3. Hairs bipartite - appressed:
      - 4. Ovary 10-40- ovuled; fruits often large (siliquae); seeds broadly winged; lateral nectariferous glands horse-shoe-shaped ..... 40. Farsetia
      - 4. Ovary 2-10- ovuled; fruits small (siliculae); seeds narrowly winged; lateral nectariferous glands in pairs, short, filiform (or stalk-like) ..... 44. Lobularia
    - 3. Hairs stellate or branched, subappressed or appressed:
      - 5. Siliculae ovoid or subglobose with inflated valves; seeds not winged. (flower white or rose) .... 43. Ptilotrichum
      - 5. Siliculae broadly elliptic or suborbicular, compressed with or without tumid valves; seeds obscurely to narrowly winged, (flowers yellow, white or purple):



6. Fruits broadly elliptic, (large), with plane, flattened valves ..... 41. Fibigia
6. Fruits mostly suborbicular (small) with often biconvex, tumid valves with narrow flattened margin (valves plane-compressed in Alyssum linifolium)..... 42. Alyssum

40. FARSETIA Turra, Diss. Farsetia l. t. 1. (1765); B.F.O. 157; F.B.I. 140; S.E.P. 486; K.F.U. 332.

Perennial 15-90 cm. tall, sometimes woody below, very branched, erect, rigid, hoary-tormentose; hairs bipartite, appressed, white, rough. Leaves linear-oblong, sessile, hairy. Racemes lax, ebracteate. Flowers small or large, purple, orange, white or pale yellow, pedicellate. Sepals erect, equal, obtuse, hairy, lateral two not saccate at the base. Petals slightly longer to twice as long as the sepals, narrow, oblong-linear, clawed, apex rounded, margin often crimped, and lamina coiled in when old. Stamens 6; filaments linear, simple; anthers oblong-linear, often long (1-3 mm.) Lateral nectariferous glands horseshoe-shaped, open towards the inner side, median absent. Ovary elongated, 10-40- ovuled, hairy. Fruits (siliquae) oblong, narrow to broad, compressed, canescent with bipartite, appressed hairs, bilocular, dehiscent, sessile or shortly stalked; valves with distinct mid-vein; style short rarely long, filiform or slightly thickened; stigma often shortly conical, <sup>+</sup> bilobed, lobes somewhat decurrent. Seeds uniseriate to biseriate, orbicular or reniform, winged, compressed; septum membranous, with a distinct mid-vein and obscure reticulate venation.

About 10 spp. in N. Africa and Orient, Central Africa, W. Pakistan and/

and India.

Farsetia Turra, is a small genus with about 10 species mostly in N. Africa and Orient. Formerly it included about 20 species, but Medikus transferred some of them to a new genus Fibigia (Pflanzengatt, i. 90. (1792)). The remaining species have ~~often~~ been a subject for interesting discussions among the taxonomists (B.L. Burtt in Kew Bull. (3) 1948; Burtt and Lewis in Kew Bull. 290 (1949); Rechinger f. in Phytom. iii (3) 52 (1951)).

H. f. and T. in Journal Linn. Soc. Bot. v. 147-148 (1861) recognize 4 species of Farsetia from the present area, out of which two, F. Jacquemontii and F. Edgeworthii were newly described. H. f. and T. Anderson in Fl. Brit. India i. (1872) reduced the number of species to three by sinking F. Edgeworthii H. f. et T. in "F. aegyptiaca" H. f. et T. (non F. Aegyptia<sup>\*</sup> Turra). Boissier in Fl. Or. i. (1867), record F. Jacquemontii H. f. et T. from Baluchistan, F. aegyptiaca var. gracilior Boiss. from Afghanistan and "F. linearis" Boiss. (non Decaisne) from Afghanistan and Baluchistan. Blatter and Hall. in Journ. Bombay Nat. Hist. Soc. xxvi. 220 (1819), described a new species, F. macrantha, from Rajputana (in Indian desert), a region adjacent to W. Pakistan.

The taxonomic status of F. Jacquemontii H. f. et T., "F. aegyptiaca" H. f. et T., F. Edgeworthii H. f. et T., F. aegyptiaca var. gracilior Boiss., F. heliophila Bunge, F. macrantha Blatt. and Hall. and "F. linearis" Boiss. has always been confusing. Although Boissier (Fl. Or. 1867) does not record typical F. aegyptia Turra from Afghanistan/

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\*

See Burtt and Lewis in Kew Bull. 290 (1949).

Afghanistan, he certainly recognized one variety, gracilior Boiss., of this species from this area. On the other hand, Burt and Lewis (1949) took the right step in excluding the present area and Persia when giving the geographical range of F. aegyptia Turra. They left "F. aegyptiaca" H. f. et T., F. aegyptiaca var. gracilior Boiss. and F. Edgeworthii H. f. et T. with their status undecided.

Accumulation of enough herbarium specimens of Farsetia from the present area has encouraged me to attempt a clarification of this taxonomic problem on a statistical basis.

There could be no doubt that F. hamiltoni Royle and F. Jacquemontii H. f. et T. are distinct species, the latter being more common and widespread. F. linearis Decaisne. has rightly been excluded from Afghanistan and Baluchistan (as recorded by Boissier in Fl. Or. 1867) by B.L. Burt (Kew Bull., 1948). Therefore the only complicated group to be clarified, from the present area, was F. Jacquemontii H. f. et T., and the other so-called taxa mentioned above.

Before I discuss the statistical studies I would like to say a word about the validity of the name, F. Jacquemontii H. f. et T. While describing this new species, H. f. and T. doubtfully quoted Arabis heliophila DC. as its synonym, while H. f. and T. Anderson in Fl. Brit. India (1872, p. 140) excluded A. heliophila DC. from its synonymy remarking, "It is impossible to determine from Burman's figure whether this is the Arabis heliophila DC." Earlier Boissier in Fl. Or. (1867) includes both A. heliophila DC. and Heliophila incana Burm. (on which DC based his A. heliophila) as synonyms of F.

F. Jacquemontii H. f. et T. I have seen Burman's figure and description of his H. incana, and De Candolles' very good description of A. heliophila, and have come to the conclusion that they are nothing but F. Jacquemontii H. f, et T. Bunge in Coss., Fl. Atl. ii. 227 (1884) described a new species, Farsetia heliophila with which, no doubt, A. heliophila DC is conspecific, but he did not quote A. heliophila DC. as its synonym. Seeing that all these are nothing but one species, as will also be evident from the following statistical studies, I have made a new combination, Farsetia incana (Burm.) Jafri, which was long needed according to the nomenclatorial rules.

The following statistical studies are based on flower and fruit characters. Examining specimens of the true F. aegyptia Turra, one can distinguish the "F. aegyptiaca" H. f. et T. by the shape of the calyx, size and width of the seed and wing: in the latter the calyx is oblong, the seed smaller (about 3 mm. diam.) including a narrow wing (about 0.6-0.9 mm. broad), while in the former the calyx is oblong-subovate, broadest at the base, the seed larger (about 4 mm. in diam.), including a broader wing (about 2 mm. broad). (Fig. No. 16). Moreover, the calyx, seed and wing measurements of "F. aegyptiaca" H. f. et T. closely resemble F. incana (Burm.) Jafri, with which it has been merged as will be evident from the following studies.

Table No. III, shows 58 specimens formerly included under F. Jacquemontii H. f. et T. and the other so-called taxa mentioned above. I could not see any specimen of F. macrantha Blatt. and Hall, but from the measurements given in the specific description it fits easily within the limits of the same group.

The/

TABLE NO. III

Farsetia incana (Burm.) Jafri: showing measurements of petals, siliquae and seeds.

Specimen	Length of petal in mm.	Mean petal length in mm.	Length of siliquae in mm.	Breadth of siliquae in mm.	Length breadth ratio of siliquae	Seriation of seed. 1 - uniseriate S - subbiseriate 2 - biseriate	Width of seed wing in mm.
<u>Kew Herb.</u>							
1. <u>Pind Dad Khan, Jacquemont</u>	11-12	11.5	32	3.5	9.1	S	0.75
2. <u>Ludhiana, Thomson</u>	11-12	11.5	31	2.9	10.7	S-1	0.75
3. <u>Ferozepur, Thomson</u>	10	10	-	-	-	-	-
4. <u>Multan, Edgeworth</u>	14	14	-	-	-	-	-
5. <u>Drummond No. 20374</u>	-	-	23	3.3	6.9	S	0.5
6. <u>Drummond No. 14T</u>	14	14	-	-	-	-	-
7. <u>Punjab, J.L. Stewart</u>	14	14	31	3.5	8.9	S	0.6
8. <u>Jhelum, Aitchison</u>	11	11	24	3.5	7	S	0.7
9. <u>Multan, Inayat</u>	-	-	35	3	11.7	S	0.6
10. <u>Drummond No. 20381</u>	14	14	-	-	-	-	-
11. <u>Drummond No. 20364</u>	13	13	-	-	-	-	-
12. <u>Drummond No. 20361</u>	14	14	28	3.5	8	S	0.7
13. <u>Drummond No. 20362</u>	10-11	11	24	3.3	7.3	S	0.7
14. <u>Ludhiana, Thomson</u>	13-14	13.5	30	3.8	8	S-2	0.75
15. <u>Drummond No. 20380</u>	13-14	13.5	-	-	-	-	-
16. <u>Drummond No. 20378</u>	13	13	-	-	-	-	-
17. <u>Drummond No. 20379</u>	14-17	15.5	25	3	8.3	S	0.7
18. <u>Drummond No. 20376</u>	14-17	15.5	32	3.3	10	S	0.7
<u>Sind</u>							
19. <u>Dalzell</u>	14-15	14.5	-	-	-	-	-
20. <u>Dalzell</u>	9-13	11	35	4	9	S	0.7
21. <u>Dalzell</u>	-	-	43	4.4	10	S-2	0.8
<u>Baluchistan</u>							
22. <u>Stocks No. 432</u>	10-11	10.5	38	4.3	8.8	S-2	0.9

TABLE NO. III cont'd.

Farsetia incana (Burm.) Jafri: showing measurements of petals, siliquae and seeds.

Specimen	Length of petal in mm.	Mean petal length in mm.	Length of siliquae in mm.	Breadth of siliquae in mm.	Length breadth ratio of siliquae	Seriation of seed. 1 = uniseriate S = subbiseriate 2 = biseriate	Width of seed wing in mm.
23. <u>Persian Baluchistan, Reehinger F. No. 3913 (V-KI)</u>	14 10-11	14 10.5	48 36	3.5 4.3	14 8	S-2 S-2	0.8 0.9
24. <u>Persia, Bunge</u>	10-14	12	36.5	2.7	13.4	1-S?	0.6
25. <u>Persia, Bornmuller No. 89 Punjab</u>	11-13 12	12 12	- 45	- 3	- 15	- S	- 0.6
26. <u>Salt Range, Edgeworth No. 112</u>	17-19	18	19	5.9	3.2	2	0.75
27. <u>Salt Range, Edgeworth No. 140</u>	18-20	19	20.5	6.8	3	2	0.7
28. <u>N.W.F.P. Khyber, Qazilbash, No. 2466</u>	15 13-14	15 13.5	18 -	6 -	3 -	2 -	0.9 -
29. <u>Peshawar, Deane Afghanistan</u>	14 12 13-17	14 12 15	20 20 -	5 5 -	4 4 -	2 2-S -	0.7 0.9 -
30. <u>Griffith No. 1497</u>	17-18	17.5	21	6.5	5.2	2	0.8
31. <u>Griffith No. 1495</u>	10	10	-	-	-	-	-
32. <u>H. Johnston No. 131 Punjab</u>	10-12	11	-	-	-	-	-
33. <u>Edgeworth No. 1012</u>	10-11	10.5	-	-	-	-	-
34. <u>Drummond No. 20365</u>	10-11	10.5	-	-	-	-	-
35. <u>Drummond No. 20366</u>	10-11	10.5	-	-	-	-	-
36. <u>Drummond No. 20367</u>	10-11	10.5	-	-	-	-	-
37. <u>Griffith No. 1498 Herb. Edinburgh Punjab</u>	10-11	10.5	20	3	6.7	S	0.8
38. /							

TABLE NO. III cont'd.

Farsetia incana (Burm.) Jafri: showing measurements of petals, siliquae and seeds.

Specimen	Length of petal in mm.	Mean petal length in mm.	Length of siliquae in mm.	Breadth of siliquae in mm.	Length breadth ratio of siliquae	Seriation of seed.. 1 - uniseriate S - subbiseriate 2 - biseriate	Width of seed wing in mm.
38. <u>Drummond</u> No. 30362	12	12	25	3	8.3	S	0.7
39. <u>Drummond</u> No. 20378	12	12	25	3	8.3	S-1	0.7
40. <u>Drummond</u> No. 20365	10	10	-	-	-	-	-
41. <u>Drummond</u> No. 20361	14	14	24	3	8	S	0.7
42. <u>Drummond</u> No. 20364	14-15	14.5	45	3	15	1-S	0.7
43. <u>Drummond</u> No. 20374	-	-	24	3	8	1-S	0.7
44. <u>Thomson</u>	12-13	12.5	27	3	9	1-S	0.7
45. <u>Multan, Edgeworth</u> No. 29	13-14	13.5	50	4	12.5	S	0.85
46. <u>Montgomery, Lacey</u>	12-13	12.5	40	3	13.3	1-S	0.7
	15-16	15.5	36	3	12	1-S	0.7
47. <u>Baghanwalla, Fleming</u>	-	-	28	3	9.3	S	0.75
48. <u>J.L. Stewart</u>	-	-	28	3	9.3	S	0.75
49. <u>Lahore, S. Das</u> No. 12	13	13	28	2.8	10	1-S	0.7
50. <u>Anderson</u> No. 63	-	-	27	3	9	1-S	0.7
51. <u>Ferozepur, Madden</u>	14-15	14.5	-	-	-	-	-
52. <u>J.L. Stewart</u>	-	-	18	5	3.6	2	0.85
Afghanistan							
53. <u>H. Johnston</u> No. 131	18-21	19	18	5	3.6	2	0.8
54. <u>H. Johnston</u> No. 109	18-22	20	-	-	-	-	-
N.W.F.P.							
55. <u>Landikotal, DL.</u> No. L691	17-18	17.5	-	-	-	-	-
56. <u>Landikotal, DL.</u> No. L691	15-17	16	19	5	3.8	2	0.8
Baluchistan							
57. <u>Lacey</u> No. 3504	10	10	-	-	-	-	-
Persia							
58. <u>Bornmuller</u> No. 89	10-12	11	-	-	-	-	-

The seven columns in the table show: 1. Length of petal in mm., 2. mean length of petal in mm., 3. length of siliqua, 4. breadth of siliqua, 5. length-breadth ratio of siliqua, 6. seriation of seeds in fruit, and 7. width of the membranous wing of seeds.

As size of siliquae and length of petals are the primary characters on which the various so-called taxa were distinguished by their corresponding authors, the measurements given in the table would justify using these characters for separating taxa from the above mentioned group.

Fig. No. 13, Histogram, shows the frequency distribution of the length of petals. The curve obtained is somewhat skewed but shows that the length of petals varies continuously from 10-21 mm., with most of the specimens (83%) having 10-15 mm. long petals. Any separation of taxa on the length of the petals (flower size) would be, therefore, valueless.

Fig. No. 14, Histogram, shows the frequency distribution of length/breadth ratio of siliquae. The curve obtained shows a definite break and suggests that two taxa are involved, one with 17% of the specimens having short and broad fruits with l/b ratio 3-4, and the other with 83% of the specimens with long and narrow pods with l/b ratio of 6.7-15.

Figure No. 15, a scatter diagram to show the relation of length of petal (flower size) to l/b ratio of fruit, also indicates that two taxa are involved. The small group with a low l/b ratio of fruit tends to have longer petals than the larger group with a higher l/b ratio. There is, however, an over-lap in petal length between the two groups, though not in l/b ratio of fruit. The larger group/



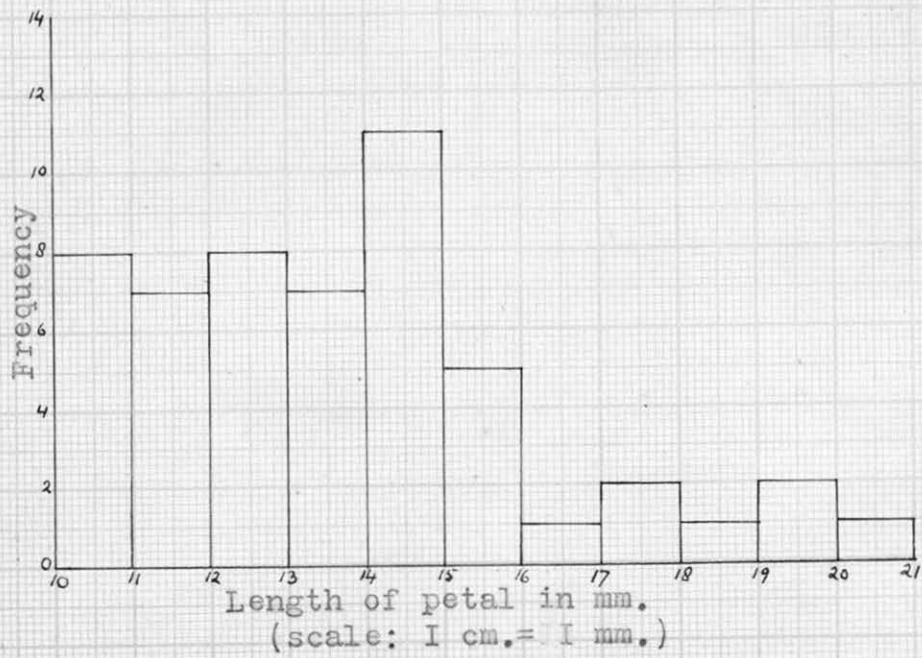


Fig. no. 13

Farsetia incana (Burm.) Jafri

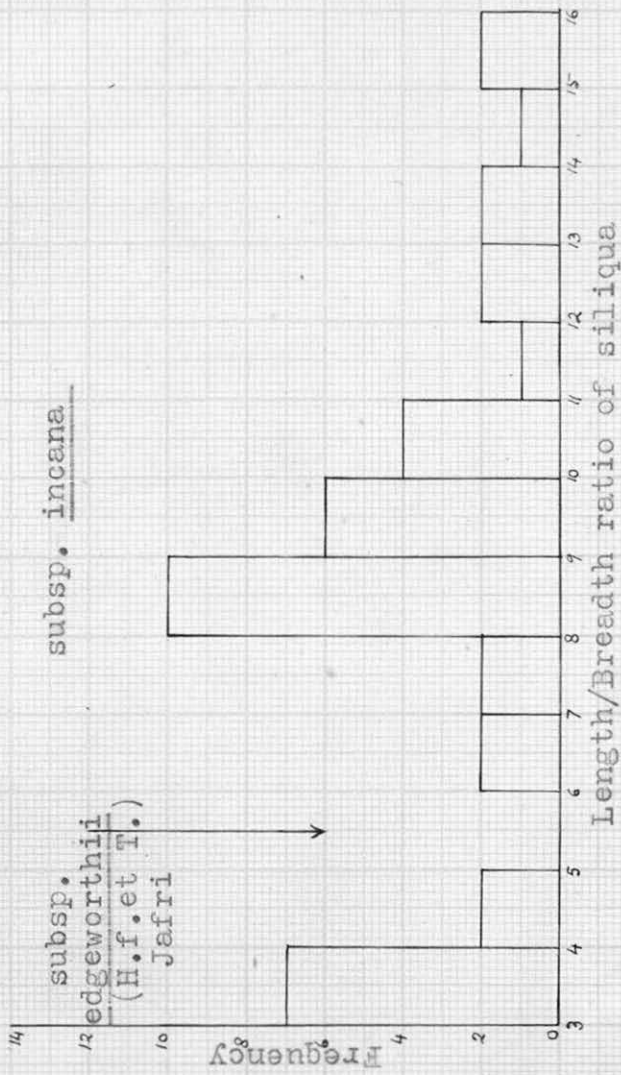


Fig. no. I4

Parsetia incana (Burm.) Jafri

subsp.  
incana

subsp.  
edgeworthii

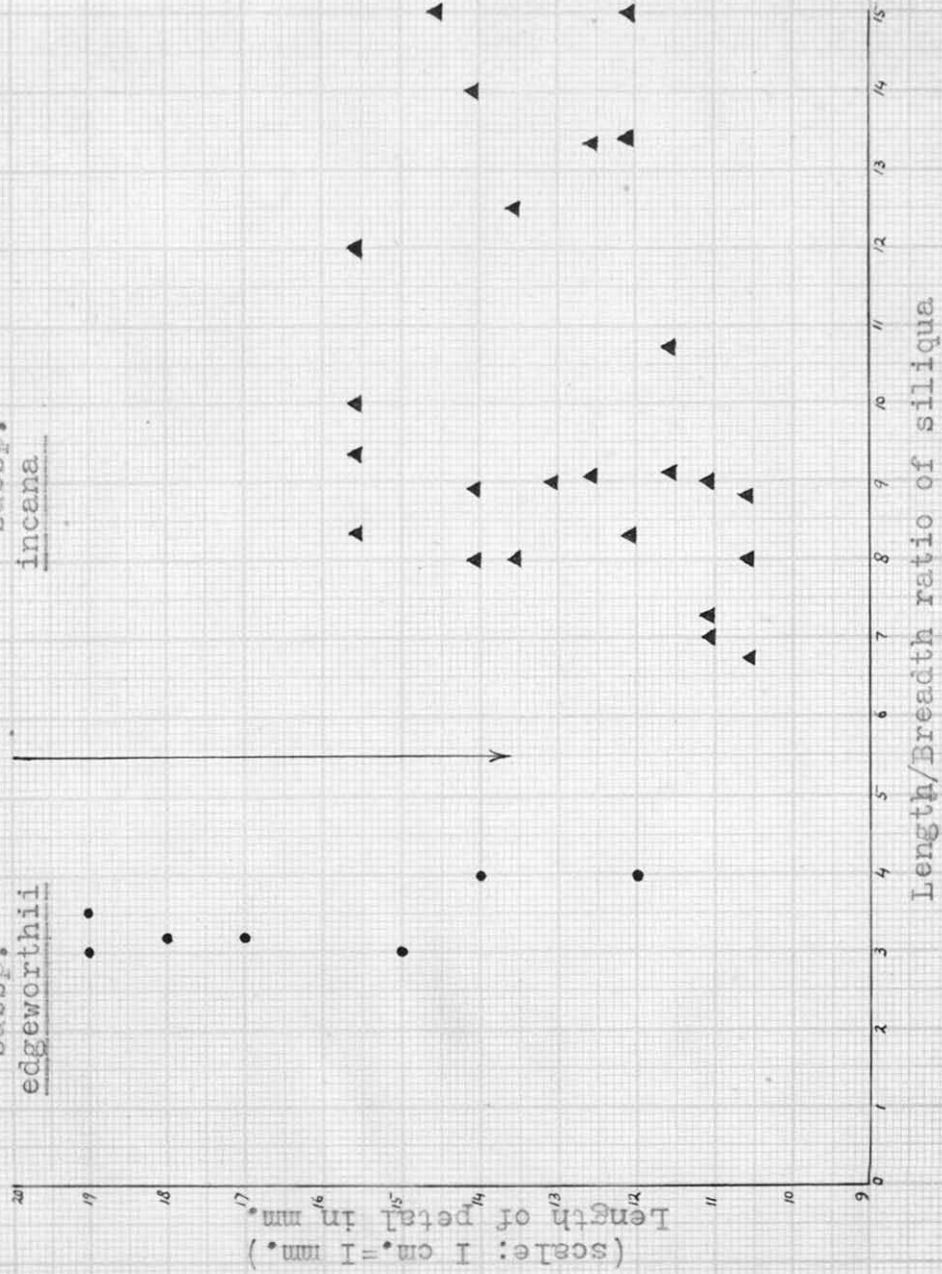
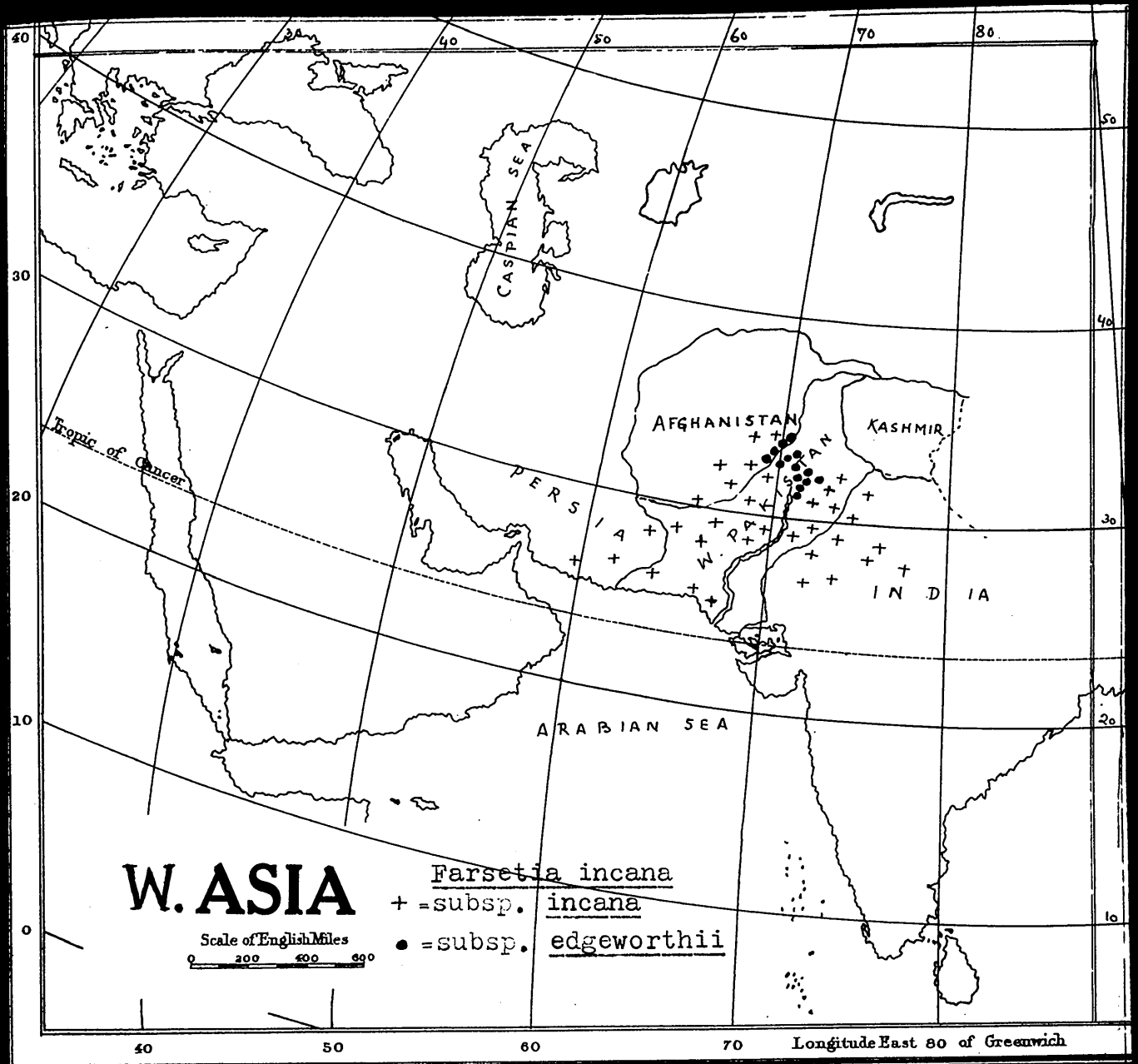


Fig. no. 15



Map no. 2

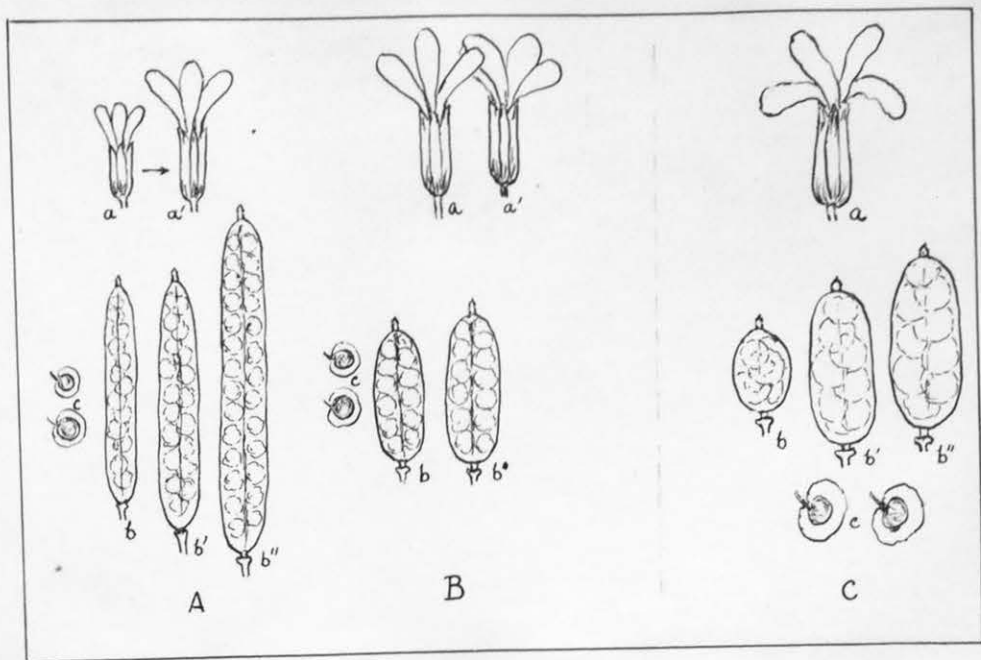


Fig. no. 16

Flower, fruit and seed characters of:

A - *Farsetia incana* (Burm.) Jafri, subsp. *incana*

B - *F. incana* subsp. *edgeworthii* (H.f. et T.) Jafri

C - *F. aegyptia* Turra

[a - flower; b - fruits; c - seeds]

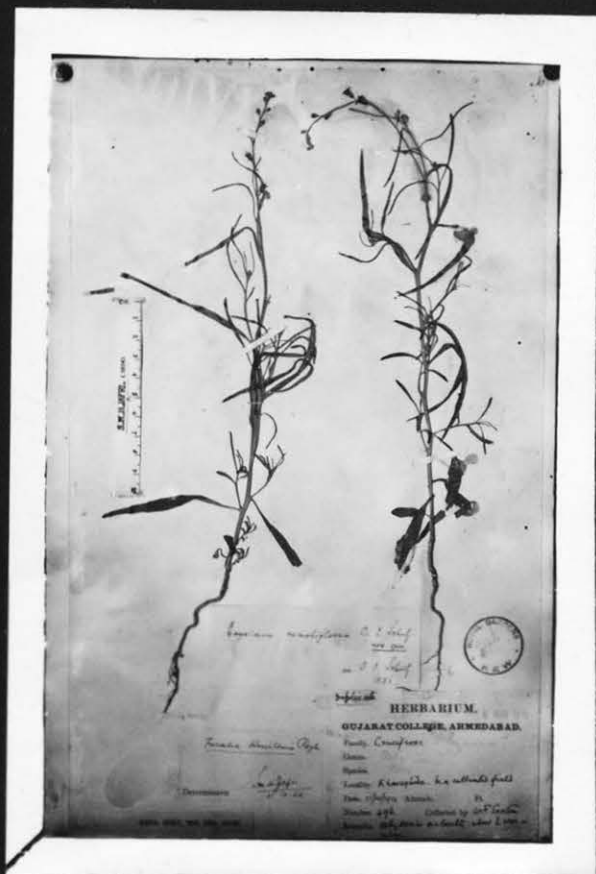


Plate no. XXIII.

*Farsetia hamiltoni* Royle



Plate no. XXIV.

*Farsetia incana* (Burm.) Jafri  
Subsp. *edgeworthii* (H.f. et T.) Jafri

group (incana) shows a slight positive correlation between l/b ratio of fruit and petal length, i.e. the longer petals tend to be associated with the higher l/b ratio of siliquae; in the smaller group (edgeworthii) the petal length varies considerably within a narrow range of fruit shape.

Looking into the regional distribution of these two groups in the present area, I find that the bigger group with 83% specimens has a wide range of distribution throughout the present area and represents typical F. incana (Burm.) Jafri, including as synonyms F. Jacquemonti H. f. et T., F. heliophila Bunge, a part of "F. linearis" Boiss. (non Decaisne), F. macrantha Blatt. and Hall., and of course, Heliophila incana Burm. and Arabis heliophila DC. The smaller group with ~~rest of the~~ 17% of the specimens is confined to Punjab (Salt Range,) N.W.F.P. and Afghanistan, and includes specimens of the so called "F. aegyptiaca" H. f. et T., F. edgeworthii H. f. et T. and F. aegyptiaca var. gracilior Boiss. As the specimens of this latter group closely resemble F. incana (Burm.) Jafri in habit, calyx shape, seed size and width of the wing (Fig. 16), I prefer to recognize it as a subspecies edgeworthii (H. f. et T.) Jafri of F. incana (Burm.) Jafri, with a localised distribution (See map No. 2.). The two taxa show some over-lap in petal length, but not in fruit shape.

Thus, the present area has only two species of Farsetia, 1. F. hamiltoni Royle, and 2. F. incana (Burm.) Jafri, the latter with a subspecies edgeworthii (H. f. et T.) Jafri in addition to the typical race.

It is interesting to note that the monographer O.E. Schulz was so badly foxed by a young specimen of F. hamiltoni Royle from W. India/

India, Kharghoda (Saxton No. 496 (K!)), a dry hot place - that he described it as a new species of Erysimum - E. remotiflorum O.E. Schulz (Notizblatt, Berlin, xi. 226; 1931) (Plate No. XXIII)! Erysimum is a genus of cooler climates in our area, occurring mostly in the Himalaya and at high altitudes in Baluchistan and Afghanistan, while Farsetia is common in the warmer parts. It suggests that Schulz, when describing his new species, did not look into the climatic and geographical distribution of the genus, which can be so valuable in providing taxonomic clues in such cases. So far as the bipartite appressed hairs are concerned, Farsetia and Erysimum are alike and could be mistaken for one another in the absence of flowers and fruits. Although the present specimen of Schulz's new species (Saxton No. 496 (K!)) does not bear fruits, it can be recognized as a Farsetia by its other characters: racemes lax (with small flowers); inner sepals not saccate; petals narrow and slightly longer than the sepals; stigma conical, short, bilobed with lobes  $\dagger$  decurrent.

Key to the species:

- I(a). Flowers 2-3 mm. across; petals short ..... I. F. hamiltonii  
 I(b). Flowers 6-10 mm. across; petals long ..... II. F. incana  
 1. F. hamiltonii Royle, Illustr. Bot. Himal. 71 (1834); H. F. et T.

in Journ. Linn. Soc. Bot. v. 148 (1861); F.B.I. 140.

Syn: Erysimum remotiflorum O.E. Schulz in Notizblatt, Berlin, xi. 226 (1931).

Type: N.W. India, W. bank of Jamuna from Delhi to Agra, Hamilton (K!).

Perennial, 10-90 cm. tall, very branched, often woody at the base, densely pubescent with bipartite-appressed white hairs; branches slender, virgate, somewhat rough. Leaves oblong-linear, very variable, 1-6.5 x 0.1-0.5 cm. (rarely 7-8 x 0.7 cm.), much smaller in dry arid regions/

regions, sessile, entire, strigose. Racemes 5-20-flowered, lax, ebracteate, elongating up to 40 cm. in fruit. Flower buds small, 3-5 mm. long, subglobose. Flowers 2-3 mm. across, orange-coloured; pedicels 1-2 mm. long, increasing up to 4 mm. in fruit, filiform, ascending, pubescent. Sepals 3.5-4 x 0.8-1 mm., oblong, subobtusate, equal, strigose, lateral two not saccate. Petals 4.5-5 x 0.8-1 mm., slightly longer than the sepals, oblong-cuneate, apex rounded. Stamens about 3: 4 mm.; anthers about 1 mm., oblong-ovoid, obtuse. Siliquae 1-2 x 0.25-0.4 cm., oblong, compressed, <sup>†</sup> rounded towards both ends, densely hairy with bipartite appressed hairs; valves <sup>†</sup> 1-veined, subtorulose; style 1-1.5 mm. long, very thin, filiform, with minute, <sup>†</sup> conical, bilobed stigma; seeds uniseriate, large, <sup>†</sup> orbicular, compressed, about 3 mm. across including the membranous wing about 1 mm. broad; septum membranous, with a <sup>†</sup> distinct mid-vein.

W. Pakistan:

Punjab: Multan, Ritchie (E!); G. Cunningham (E!); Hissar, Drummond No. 20358 (E!); Gurgaon, Drummond No. 20375 (E!); Sirsa, Drummond No. 20360 (E!); (without locality), J.L. Stewart (E!K!).  
Baluchistan: Sibi, 90 m., Lace No. 3426 (E!K!); Quetta, Lace No. 3400 (E!).

Geog. Dist.

India: Banks of Jamuna, Hamilton No. 1482 (E!); Khargoda, by a cultivated field, only seen in one locality, Saxton No. 496 (K!).

I do not find any F. hamiltonii Royle from Afghanistan; those specimens of Griffith and Stocks quoted under "F. linearis" Boiss. (non Decaisne) in Boissiers' Fl. Or. belong to F. incana (Burm.) Jafri (see discussion). I find F. hamiltonii only in the Indo-Pak. sub-continent, its occurrence being doubtful in Afghanistan. The same conclusion of its being endemic in 'India' has been drawn by Burt (Kew/



(Kew Bull. No. 3. (1948)). There is every possibility of its occurring in Sind and Karachi, but till now no one has recorded it except Woodrow from Sind (Cooke, Fl. Bombay Pres. i. 31 (1903)), whose specimens I have not seen.

2. F. incana (Burm.) Jafri, Comb. nov.

Syn: Heliophila incana Burm., Fl. Ind. 140, t. 46 (1768); Arabis heliophila (DC.) DC., Syst. ii. 237 (1821) et Prodr. i. 147 (1824); F. Jacquemontii H. f. et T. in Journ. Linn. Soc. Bot. v. 148 (1861) (excl. syn. F. longisiliqua Decne.) et Fl. Brit. India i. 140 (1872); B.F.O. 158; "F. linearis" Boiss., Fl. Or. i. 158 (1867) - partim (only Griffith and Stocks); F. heliophila Bunge ex Coss., Compend. Fl. Atlant. ii. 227 (1884); Rechinger f. in Phyt. iii. 52 (1951); F. macrantha Blatter and Hall. in Journ. Bombay Nat. Hist. Soc. xxvi. 220 (1918).

Type: India, Burman (G? - not seen).

Subsp. 1. incana

Perennial, 15-45 cm. tall, erect, much branched, hoary-tomentose with bipartite, appressed, white, rough hairs; branches slender, spreading. Leaves 1-6 x 0.1-0.7 (-1.2) cm., linear-oblong, or linear, sessile, acute or subobtuse, densely hairy with bipartite appressed hairs. Racemes 5-15-flowered, lax, ebracteate, increasing up to 20 cm. in fruit. Flower buds oblong-ellipsoid, (-5) 7-9 mm. long. Flowers 6-10 mm. across, orange-yellow or pale purple; pedicels 1-2 mm. long, increasing up to 5 mm. in fruit, filiform, hairy. Sepals

(-5)/

(-5) 6-9 x 1-2 mm., oblong, acute or subobtuse, strigose, equal.  
Petals 10-15 (-20) x 1.5-2 mm., about twice as long as the sepals,  
 oblong-linear, clawed, apex rounded, margin entire, often crimped.  
 Stamens 5-6: 7-8 mm., anthers about 3 mm. long, narrow, linear-  
 oblong, subcordate, subobtuse. Siliquae 2-4.8 x 0.27-0.44 (-0.5) cm.,  
oblong, compressed, subsessile, with l/b ratio of 6.7-15, densely hairy  
 with bipartite appressed hairs; valve submembranous, with a distinct  
 mid-vein; style short, about 0.5 mm. long, slightly thickened with  
 conical, bilobed stigma; seeds uniseriate to biseriate, <sup>+</sup> orbicular,  
 2.5-3 mm. in diam. including 0.6-0.9 mm. broad, membranous, white  
 wing; septum with distinct mid-vein and reticulate venation.

Very variable in leaf size, flower size and fruit shape and  
 size.

W. Pakistan:

N.W.E.P.: (without locality) J.L. Stewart (K!);

Punjab: Pind Dad Khan, Jacquemont (K!); Multan, Edgeworth (K!E!);  
 Montgomery, Lace (E!); Lahore, S. Das No. 12 (E!); Multan,  
 Anderson No. 63 (E!); Feroze-pur, Madden (E!); Hissar,  
 Drummond No. 20362 (E!K!); Khanak, Drummond No. 20378 (E!K!);  
 Katwahi, Drummond No. 20365 (E!K!); Sirsa, Drummond No.  
 20361 (E!K!); Shahpur, Drummond No. 20364 (E!K!); Fusham,  
 Drummond No. 20374 (E!K!); Bhiwani, Drummond Nos. 20376  
 (K!), 20379 (K!); 20380 (K!); Ludhiana, Drummond No. 20403  
 (K!); Ludhiana, Thomson (K!); Ferozepur, Thomson (K!);  
 (without locality), Thomson (E!); Multan, Inayat (K!);  
 Dadun, near Fusham, Drummond No. 14T (K!); Jhelum, Aitchison  
 (K!); Shahpur, Drummond No. 20366 (K!), and 20367 (K!);  
 Baghanwalla, Fleming (E!); Cambellpur, E. Nasir No. 1509  
 (R-E!).

Sind: (without locality) N.E. Dalzell (K!).

Karachi: Drig road, mound, Jafri (E!).

Baluchistan: (without locality), J.E. Stocks No. 432 (K!), Hurnai,  
 Lace No. 3504 (E!). Persian Baluchistan, Rechinger f.  
 No. 3913 (V-K!). Pathankok near Loralai, M. Nath No.  
 6110 (R-E!).

Afghanistan: Dogh, Griffith No. 1498.

Geog. Dist.:

Orient: Persia: Bunge (K!); J. Bornmuller No. 89 (K!).

Subsp./

Subsp. 2. edgeworthii (H. f. et T.) Jafri, comb. et stat. nov.

Syn: F. Edgeworthii H. f. et T. in Journ. Linn. Soc. Bot. v. 147 (1861); "F. aegyptiaca" H. f. et T. l.c. (non F. aegyptia Turra, Farsetia Nov. Gen. 5, t. 1. (1765)); F.B.I. 140; F. aegyptiaca var. gracilior Boiss., Fl. Or. i. 159 (1867).

Type: Punjab (W. Pakistan), Salt Range, Edgeworth No. 1012 (K!).

Perennial, woody at the base; branches flexuose, erect, covered with bipartite appressed hairs. Leaves linear oblong, covered with similar hairs as on branches. Racemes 5-10-flowered, lax. Flowers often large; petals usually 14-20 mm. long. Siliquae short and broad, usually 18-21 x 5-6.8 mm., with a length-breadth ratio of 3-4., oblong, compressed; seeds <sup>†</sup> biseriate, about 3 mm. in diam., including 0.7-0.9 mm. broad wings. (Plate No. XXIV).

W. Pakistan:

N.W.F.P.: Peshawar, H. Deane (K!); Khyber pass, Qazilbash No. 2466 (K!); Landikotal, 1050 m., Flowers rosy-mauve, leaves grey-green, a shrubby plant up to 2 ft. 6 inches high; rocky hillside, No. L691 (E!).

Punjab: Salt Range, Edgeworth Nos. 1012 (K!), 140 (K!) and 1112 (K!); Ferozepur, Madden (K!); (without locality), J.L. Stewart (K!).

Afghanistan: Khyber pass, Johnston No. 131 (E!K!) and No. 109 (E!); (without locality), Griffith Nos. 1495 (K!) and 1497 (K!);

Geog. Dist.: Endemic in the present area.

‡

41. FIBIGIA Medikus, Pflanzengattungen, i. 90 t. 2. fig. 23 (1792);

B.F.O. 256; S.E.P. 489; K.F.U. 336.

Perennial or shrubby, tomentose with stellate or branched hairs, erect or suberect, branched mostly from the base. Leaves usually oblanceolate, spatulate or linear, entire. Racemes spicate, lax  
in/

in fruit, ebracteate. Flowers mediocre yellow, rarely purple; pedicels usually short in fruit. Sepals erect, almost equal, inner pair saccate at the base. Petals obovate-oblong, clawed, often about twice as long as the sepals, apex rounded or subtruncate. Stamens 6; filaments not appendaged or those of outer 2 stamens slightly dentate; anthers usually elongated often blunt. Lateral nectariferous glands in pairs, small, triangular; median absent. Ovary small, broadly elliptic, 4-18- ovuled; style short with minute capitate stigma. Siliculae broadly elliptic or orbicular, compressed, bilocular, dehiscent; valves plane, often densely pubescent, and with an obscure mid-vein below; seeds few, biseriate, <sup>†</sup> orbicular, often narrowly winged; septum membranous not veined.

About 12 species mostly in Mediterranean region.

\*\*

F. pendula (Boiss.) Boiss., Fl. Or. i. 260 (1867);

Syn: Farsetia pendula Boiss. in Ann. Sc. Nat. 90 (1842);

Fibigia membranacea Rech. f. in Phyt. iii. 53 (1951).

Type: Persia, (without locality), Aucher Eloy No. 4086 (G,K!).

Perennial, caespitose, 5-15 cm. tall, branched from the base, erect or suberect, tomentose with stellate white hairs. Radical leaves densely rosulate, small, narrowly spatulate, 0.5-1.5 x 0.1-0.3 cm., entire, apex acute or obtuse, densely hairy; cauline leaves comparatively small, few, distant. Racemes 8-10- flowered, ebracteate, subcorymbose, slightly increasing in length in fruit. Flowers violet, mediocre; pedicels 2-4 mm. long, increasing up to 5 mm. in fruit, often becoming recurved. Sepals about 4 mm. long. Petals about twice as long/



12676 Minjan Pass,  
Afghanistan 12000 ft.  
July 26-31, 1907  
Walters  
Koele

UNITED STATES NATIONAL MUSEUM



PLANTS OF AFGHANISTAN  
*Fibigia membranacea* Koch. f.

Minjan Pass  
El. 12,000 ft. July 26, 1907  
Fl. gold, fragrant.  
WALTER KOELE No. 12676

Plate no. XXV. Fibigia pendula Boiss.

long as the sepals. Stamens not dentate. Siliculae 10-15 x 7-10 mm., suborbicular or broadly obovate, compressed; valves tomentose with minute stellate hairs, submembranous with an obscure mid-vein distinct below; style 2-3 mm. long; seeds usually 1-2 mature in each loculus, suborbicular, 2.5-3 mm. in diam., obscurely winged. (Plate No. XXV).

Afghanistan:

Minjan pass, 3600 m. Koelz No. 12690 (V,U-E!).

Geog. Dist.:

Persia: (without locality), Aucher Eloy No. 4086 (K!).

This species is very little known. Boissier (1867) quotes only one specimen - the type - Aucher Eloy No. 4086 from Persia. This is the only specimen present at Kew and is in fruit. The small leaves of this species are very distinct from the other species of Fibigia. Rechinger (1951) regards Koelz's specimen No. 1269 (U-E!) (Plate No. XXV) from Afghanistan as a different new species, F. membranacea Rech. f. The fruits are immature in Koelz's specimens, but the habit, small leaves and 1-2- ovuled ovary leaves no doubt that it is F. pendula Boiss. Thus, Rechinger's new species, F. membranacea, is conspecific with F. pendula Boiss. And now. its geographical range extends to Afghanistan although it was formerly known only from the type locality in Persia.

42. ALYSSUM L., Sp. Pl. 650 (1753); B.F.O. 263; S.E.P. 490; K.F.U. 340; E.J. Nyarady in Bull. Gard. Cluj (1927-1938); Burt and Davis in Kew Bull. 99 (1949).

Syn: Adyseton Adans., Fam. ii. 420 (1763); Alysson Crantz, Stirp. Austr. 2 ed., 15 (1769); Aurinia Desv. in Journ. de/

de Bot. iii. 162 (1814); Meniocus Desv. l.c. 173;  
Adysetum Link, Enum. ii. 157 (1822); Anodontea Sweet,  
 Hort. Brit. 467 (1827); Psilonema C.A.M. in Ledeb., Fl.  
 Alt. iii. 50 (1831); Odontarrhena C.A.M., l.c. 58;

Annual to perennial, often with decumbent branches, clothed with stellate, short hairs. Leaves usually linear entire. Racemes ebracteate, flexuose in fruit. Flowers small, yellow or white; pedicels short, ascending or spreading in fruit. Sepals erect or suberect, equal, not saccate, pubescent. Petals narrowly spatulate, slightly to about twice as long as the sepals, apex often subemarginate. Stamens 6; filaments of outer two or all appendaged, rarely not appendaged; anthers short, blunt. Lateral nectariferous glands in pairs often triangular; median absent. Ovary broadly elliptic or suborbicular, (1-) 2-16- ovuled; style often short with a minute subbilobed stigma. Siliculae suborbicular, broadly ovate or elliptic, bilocular, dehiscent; valves often tumid with narrow flattened margin, glabrous or hairy, apex usually subemarginate; style often persistent; seeds often narrowly winged, suborbicular, compressed; septum broad, membranous, not veined.

About 100 species mostly in Mediterranean region, C. Europe and W. and C. Asia.

Alyssum, a big genus and taxonomically very difficult, is represented by only 8 species in the present area.

Hooker f. and Thomson (1861) recognize 5 species from the present area. Of these, A. canescens DC. must be transferred to Ptilotrichum C.A.M.; A. minimum Willd. should be called A. desertorum Stapf and "A. Szovitzianum" H. f. et T. (non F. et M.) is A. marginatum Steud./

Steud.

Aitchison regarded his specimens Nos. 826 (K!), 394 (K!) from Afghanistan and No. 680 (K!) from Persia as "A. persicum". Haussknecht (1907) correctly separated Bunge's specimens included under "A. Mulleri" Boiss. (1867) under a separate new species, A. iranicum. During 1910, Bornmüller was right in including Aitchison's specimen (No. 680) from Persia under A. iranicum Haussk. and in my opinion Aitchison's specimens from Afghanistan (Nos. 826 and 680) also belong to this species. A. iranicum Hausskn. is distinguished from A. Mulleri Boiss. primarily by its ovate-orbicular siliculae and winged seeds. It is also distinguished from A. persicum Boiss. by its short habit (not conspicuously elongating in fruits), very small leaves and spreading pedicels (not erect and strict).

The eight species are classified into 3 sections as follows:

Key to the sections:

1. Siliculae biconvex; 2- ovules in each loculus; (filaments dentate or edentate):
  2. Filaments dentate-appendaged rarely edentate .. Sect. 1. Eualyssum
  2. Filaments edentate ..... Sect. 2. Psilonema
1. Siliculae plane-compressed; 4-6 ovules in each loculus, (filaments dentate) ..... Sect. 3. Meniocus

Sect. 1. Eualyssum Griseb, Spicileg. Fl. Rumel, i. 274 (1842);

S.E.P. 491; K.F.U. 348.

(a) - Perennial - 1. A. iranicum Hausskn.

(b) - Annual - 2. A. desertorum Stapf; 3. A. afghanicum Rech. f.; 4. A. marginatum Steud.; 5. A. campestre L.

Sect./



Sect. 2. Psilonema (C.A.M.) Hook. f. in B.H.G.P. i. 74 (1862); S.E.P. 491; K.F.U. 358.

6. A. dasycarpum Steph.; 7. A. homalocarpum (Fisch. et Meyer) Boiss.

Sect. 3. Meniocus (Desv.) Hook. f., l.c.; S.E.P. 492.

8. A. linifolium Steph.

Key to the species

1. Siliculae <sup>†</sup> - biconvex with 2- ovules in each loculus:

2. Perennial (caespitose) ..... 1. A. iranicum

2. Annuals:

3. Valves glabrous:

4. Siliculae <sup>†</sup> orbicular; filaments appendaged ,, 2. A. desertorum

4. Siliculae <sup>†</sup> - obovate; filaments not appendaged .....

..... 7. A. homalocarpum

3. Valves clothed usually with stellate hairs:

5. Filaments not appendaged ..... 6. A. dasycarpum

5. Filaments appendaged:

6. Branches usually leafy above only giving an involucrate appearance to the racemes; petals small, 1.5-1.8 x 0.5

mm. .... 4. A. marginatum

6. Branches leafy throughout; petals (2.2-) 2.5-2.8 x 1 mm.:

7. Siliculae about 3 mm. in diameter, (valves homotrichous)

..... 3. A. afghanicum

7. Siliculae 4-5.5 mm. in diameter; (valves heterotrichous, rarely homotrichous) ..... 5. A. campestre

1. Siliculae plane-compressed with 4-6 ovules in each loculus .....

..... 8. A. linifolium

XX

1. A. iranicum Hausskn. ex Baumgartner in Jber. Niederösterr.

Lehrerseminars Wiener Neustadt. xxxvi, 14 (1907); Bornm. in

Bot. Centralbl. xxvii. (2) 303 (1910);

Syn: " A. Mulleri" Boiss., Fl. Or. i. 279 (1867) (only Bunge's Persian plant); "A. persicum" Aitchison in Trans. Linn. Soc. iii. 33 (1888) - non Boiss. in Ann. Sc. Nat. 152 (1842).

Type: Persia, Mt. Elbrus, Bunge (G,K!).

Perennial, caespitose, branched mostly from the base, suberect or spreading, 2.5-10 cm. long, clothed with stellate, white, shining rough hairs. Radical leaves densely rosulate, oblanceolate or linear 0.5-1.5 x 0.1-0.25 mm., sessile, cuneate, entire, apex rounded to acute; cauline leaves distant, <sup>†</sup> similar to basal leaves. Racemes 12-20-flowered, corymbose above, ebracteate, increasing up to 3.5 cm. in fruit. Flowers about 4 mm. across, yellow; pedicels 2-5 mm. long, increasing up to 7 mm. in fruit, ascending. Sepals 2.5-3 x 1.2-1.5 mm. Petals 5-6 x 1.5 mm., narrowly spatulate, shortly clawed, apex subtruncate. Stamens 3-4: 4-5 mm.; filaments not appendaged; anthers about 1 mm. long. Siliculae ovate-suborbicular, apex obscurely retuse; valves tumid with obscurely flattened narrow margin, canescent; style 2-3 mm. long, tapering with minute stigma; seed one in each loculus, 2-3 mm. in diam., suborbicular, with a narrow about 0.4 mm. broad, brownish wing; septum not veined.

Afghanistan:

Kurram Valley, Seratgah, Aitchison No. 826 (K!); Paropamisus range, Aitchison No. 394 (K!).

Geog. Dist.:

Persia: Mt. Elbrus, Bunge (K!); Khorassan, Aitchison No. 680 (K!).

2. A. desertorum Stapf in Denkschr. Akad. Wien. 302 (1886); Schulz in Notizblatt, Berlin ix. 1058 (1927); K.F.U. 354.

Syn: A. minimum Willd., Sp. Pl. iii. 464 (1800) - pro parte;  
B.F.O. 281; F.B.I. 141;

Type: not precisely designated.

Annual, 5-30 cm. long, spreading or suberect, branched mostly from the base, densely covered with stellate, rough hairs. Leaves oblanceolate or oblong-elliptic, 1-3 x 0.1-0.5 cm., acute or obtuse, sessile, cuneate, entire, hairy. Racemes <sup>30-40</sup> flowered, ebracteate, subcorymbose above, increasing up to 10 cm. in fruit. Flowers 1.5-2 mm. across, white; pedicels 1-1.5 mm. long, increasing up to 3 mm. in fruit, not thickened, densely pubescent, ascending. Sepals 1.5-1.8 x 0.6-0.8 mm., hairy. Petals oblong-cuneate, 2.2-2.8 x 0.8-0.9 mm., broadest in the middle, apex obscurely emarginate, sparsely hairy at the back especially on the veins. Stamens about 1.8: 2 mm.; filaments of the outer two stamens with scale-like notched appendages; anthers about 0.25 mm. Siliculae 3.5-4 mm. in diam., with about 0.5 mm. long style, <sup>+</sup> orbicular, apex slightly emarginate; valves glabrous, tumid with a flat narrow margin; seeds 2 in each loculus, about 1.2 x 1 mm., subovate, very narrowly winged, brown, finely tuberculated; septum not veined.

W. Pakistan:

Chitral: Drosh, 1350 m., Toppin No. 48 (K!).

N.W.F.P.: Peshawar, Vicary (K!); H. Deane (K!); Falconer (K!); Dazara, Falconer (K!); Kohat, J.L. Stewart (K!); (without locality), J.L. Stewart (E!); Hazara, Swat, Herb. R. Stewart No. 46 (R-E!)

Punjab: Rawalpindi, Hasan Abdal, Aitchison Nos. 314 (K!) and 1008 (K!);

Baluchistan: Zahree, Stocks (K!); Peshin, Lace No. 3309 (E!K!).

Afghanistan: Khyber pass, Forsapper, 1560 m., Johnston No. 72 (E!); Stony nullah, 1980 m., Johnston No. 35 (E!); (without locality)/

locality), Griffith Nos. 1515 (K!) and 1516 (K!); Kurrum Valley, common on stony ground from Thal to Habibkalla, Aitchison No. 142 (K!); Parachenar, Harsukh No. 14731 (K!) (with A. afghanicum Rech. f.). Zebak-Badakshan, 1800-2400 m., Giles No. 161 (K!E!).

N.W. Himalayas: Kashmir, Baltistan, 3000-3300 m., Duthie No. 11946 (E!, BM!); (without locality), 1200-1800 m., Thomson (K!, E!); V. Jacquemont (K!); Falconer (K!); Takht-e-Sulaiman, Srinagar, 1680 m., P.M. Pinfold No. 101 (BM!).

Geog. Dist.: S.E. Europe, N. Africa and Orient, and C. Asia.

\*

3. A. afghanicum Rech. f. in Phyton iii. 55 (1951).

Type: Afghanistan, Chandau, 2400 m., Koelz No. 11758 (V-K!).

Annual, 6-10 (-15) cm. tall, suberect, branched mostly from the base, clothed with stellate rough hairs. Leaves oblanceolate, 0.5-2 x 0.2-0.4 cm., sessile, cuneate, entire, acute or obtuse. Inflorescence and flowers as in A. desertorum Stapf. Siliculae suborbicular, about 3 mm. in diam.; valves tumid with narrow flattened margin, clothed with short stellate, appressed hairs; seeds about 1.3 mm. in diam., two in each loculus, narrowly winged.

Afghanistan: Kurrum Valley, Parachenar, Harsukh, No. 1473 (K!) (with A. desertorum Stapf.); Paghman, 17 miles West of Kabul, 2400-2700 m., Chaworth-Musters (BM!); Chandau, 2400 m., Koelz No. 11758 (V-K!).

Geog. Dist.: Endemic.

This species is remarkably like A. desertorum Stapf except that the valves are clothed with minute, stellate, appressed hairs. So far<sup>as</sup> the herbarium records show there are no intermediate forms between the two species, and even in the same gathering (See Harsukh No. 1473) the two species remain very distinct from each other in the glabrous and hairy condition of the valves. Experimental works might prove in future the two to be one taxon, but under the present day knowledge/

HERB. MUSEI HIST. NATUR. VINDOB.  
NO. 2223  
Aug. 1864 No. 2

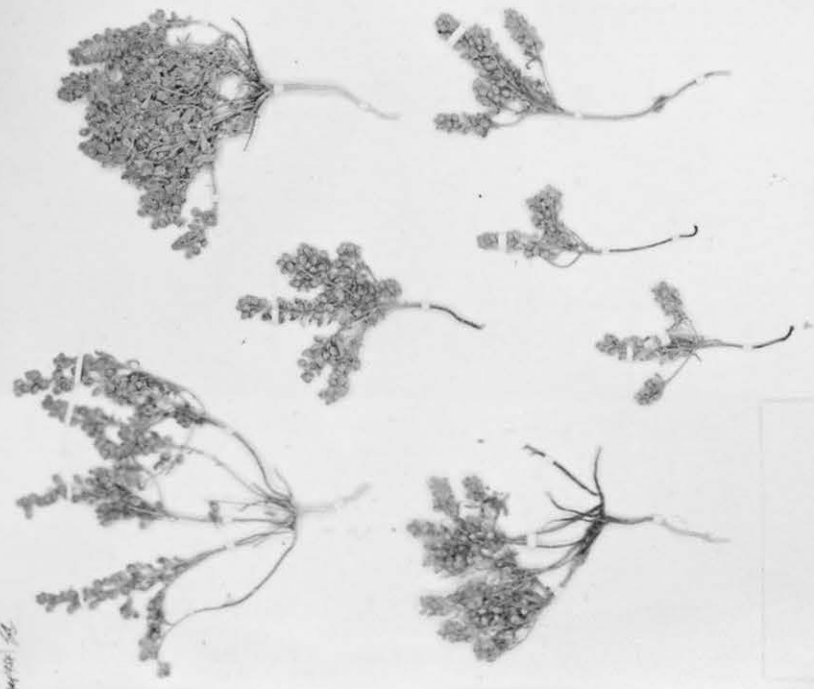
HERB. MUSEI HIST. NATUR. VINDOB.  
NO. 2223  
Aug. 1864 No. 2



PLANTS OF AFGHANISTAN  
*Alyssum homalocarpum* Boiss. & Heldr.  
From L.A.B.  
No. 13722  
Typus

HERB. MUSEI HIST. NATUR. VINDOB.  
NO. 2219  
Aug. 1864 No. 7

HERB. MUSEI HIST. NATUR. VINDOB.  
NO. 2219  
Aug. 1864 No. 7



PLANTS OF AFGHANISTAN  
*Alyssum afghanicum* Rech. fil.  
From L.A.B.  
No. 13720  
Typus

Plate no. XXVII. *Alyssum homalocarpum* (F. et M.) Boiss.  
Plate no. XXVI. *Alyssum afghanicum* Rech. fil.

knowledge I have preferred to recognize them as two different species.

4. A. marginatum Steud. ex Boiss. in Ann. Sc. Nat. 157 (1842); B.F.O. 282; O.E. Schulz in Fedde, Rep. xxxi. 163. (1935);  
 Syn: A. cryptopetalum Bunge in Arb. Naturf. Riga, i. 142 (1847);  
 "A. Szovitsianum" H. f. et T. in Journ. Linn. Soc. Bot. v. 148 (1861) (non F. et M. in Ind. Sem. H.P. iv. 31 (1837)).  
 Type: Mt. Sinai, W. Schimper No. 126 (G,E!).

Annual, 6-12 cm. long, spreading or suberect, clothed with stellate, appressed rough hairs; branches often only leafy above. Leaves oblanceolate or oblong-linear, 1-2.5 x 0.2-0.6 cm., sessile, entire, obtuse, stellately hairy. Racemes 10-20- flowered, short, increasing up to 5 cm. in fruit, with involucrate leaves at the base. Flowers about 1.5 mm. across, yellowish-white; pedicels 1-1.5 mm. long, elongating up to 5 mm. in fruit, spreading, slightly thickened. Sepals about 1 x 0.6 mm. Petals 1.5-1.8 x 0.5 mm., spatulate, apex emarginate, often sparsely hairy on veins. Stamens about 1: 1.6 mm.; filaments appendaged; anthers about 0.35 mm. Siliculae orbicular-ovate, 4-5 x 3.5-4.5 mm., apex subemarginate; valves tumid with flattened narrow margin, covered with minute, stellate, appressed, rough hairs; seeds 2 in each loculus, about 2 x 1.7 mm., ovate, dark brown; septum not veined.

W. Pakistan:

N.W.F.P.: Waziristan, Blatter and Fernandez No. 617 (B - not seen).

Baluchistan: Peshin, 1530 m., Lace No. 3383 (E!,K!); Urak, 2100 m., Lace No. 3742 (E!); Zahree, Stocks No. 181 (K!); Killa Abdulla, Duthie No. 8575 (K!,BM!); Ziarat, 2400 m., limestone Hillside, H. Crookshank No. 174 (K!); Ziarat, 2400 m., in dry beds of nullah, H. Crookshank No. 287 (K!).

Afghanistan: Sinab, Griffith (K!).

Geog./

Geog. Dist.: Persia and C. Asia.

A. marginatum Steud. and A. Szovitzianum F. et M. are very closely allied species. The former is distinguished from the latter by its condensed short branches, crowded leaves, small flowers with short petals. H. f. et T. (1861) regard these two species conspecific and quote Griffith and Stocks specimen under "A. Szovitzianum". On the other hand Boissier (1867) correctly recognizes these specimens under A. marginatum and does not quote any specimen under A. Szovitzianum from Afghanistan or Baluchistan. The present studies also show that A. Szovitzianum does not occur in the present area.

\*  
5. A. campestre L., Sp. Pl. ed. 2., 909 (1763); B.F.O. 283; S.E.P. 491; K.F.U. 357.

Type: Europe (not precisely designated) No. 4 (LS!).

Annual, 5-20 cm. tall, branched, spreading or erect, clothed with stellate hairs. Leaves oblanceolate, or oblong-elliptic, sessile, cuneate, 1-2.5 x 0.25-0.8 cm., entire, apex rounded, obtuse or acute. Racemes 15-40-flowered, subcorymbose above, ebracteate, increasing up to 6 cm. in fruit. Flowers about 1.5 mm. across, pale yellow; pedicels 1-1.8 mm. long, increasing up to 5 mm. in fruit, slightly thickened, ascending. Sepals 1.5-2 x 1mm., sometimes persistent. Petals 2.5-2.8 x 1 mm., oblong-cuneate, apex emarginate. Stamens 1.8-2: 2-2.2 mm.; filaments appendaged; anthers about 0.3 mm. Siliculae † orbicular, 4-5.5 mm. in diam. apex subemarginate; valves tumid with flattened narrow margin, canescent with stellate to forked, often unequal hairs; style about 1 mm. long, tapering, somewhat thickened below; stigma minute; seeds 2 in each loculus, ovate, about 1.5 x 1 mm., brown; septum not veined.

Afghanistan:/

Afghanistan: Harirud Valley, Aitchison No. 194 (K!); Kurrum Valley, Alikhal, Aitchison Nos. 0 (K!) and 107 (K!); Tangi Gharu, 1650 m., W.R. Hay No. 46 (K!).

Geog. Dist.: Westward to Mediterranean region; also in C. Asia.

A very polymorphic species especially in indumentum character of siliculae and stamen appendages. Status of varieties and forms are not definitely known. Siliculae vary from heterotrichous to homotrichous condition. Afghanistan plants have homotrichous condition but sometimes all stages from heterotrichous to homotrichous condition may be found even on the same plant on Persian plants.

6. A. dasycarpum Steph. in Willd., Sp. Pl. iii. 469 (1800); B.F.O. 285; K.F.U. 358.

Syn: Psilonema dasycarpum (Steph.) C.A.M. in Ledeb., Fl. Alt. iii. 51 (1831).

Type: Siberia, Kamam, Willd.? (B - not seen).

Annual, 10-20 cm. long spreading or suberect, branched, clothed with stellate, appressed, rough hairs. Leaves elliptic-obovate, 1-2.6 x 0.25-0.8 cm., sessile, entire, acute. Racemes 15-30-flowered, subcorymbose above, ebracteate, increasing up to 12 cm. in fruit. Flowers 1.5-2 mm. across, pale yellow; pedicels about 1 mm. long, increasing up to 2 mm. in fruit, ascending. Sepals 2-2.5 x 1 mm. Petals 3-3.5 x 1 mm., oblong-cuneate, apex emarginate. Stamens about 2.5: 2.8 mm.; filaments not appendaged; anthers about 0.3 mm. Siliculae broadly elliptic or suborbicular, 2.7-3 x 2-2.6 mm., valves tumid with obscurely flattened narrow margin, hairy; style about 1 mm. long, strong with a subbilobed stigma; seeds 2 in each loculus, about 1-1.3 x 0.7-0.9 mm., ovate, brown; septum not veined.



W. Pakistan:

Baluchistan: Peshin, 1560 m., Lace No. 3574 (E!,K!).  
 Nichara, Kelat, Stocks No. 910 (K!).

Afghanistan: Sinab, Griffith No. 1518 (K!); (without locality),  
Aitchison No. 194 (K!).

Geog. Dist.: Westward to Asia minor, also in C. Asia.

✖✖

7. A. homalocarpum (Fisch et Meyer) Boiss., Fl. Or. i. 285 (1867);

Syn: Psilonema homalocarpum Fisch. et Meyer in Ind. Sem. Hort.

Petrop. vi. 63 (1839); A. Horebicum Boiss. in Ann. Sc.

Nat. 156 (1842); A. nomismocarpum Rech. f. in Phyt. iii.  
 56 (1951).

Type: Cultivated in Hortus Petropolitanus from seed collected  
 by Schimper in Arabia Petraea (L - not seen).

Annual, 5-15-(-20) cm. tall, branched mostly from the base, erect  
 or spreading, clothed with stellate, white hairs. Leaves oblanceolate,  
 or oblong-linear, 1-4 x 0.2-0.6 cm., sessile, cuneate, apex rounded,  
 margin entire rarely obscurely 1-3- dentate. Racemes 20-30- flowered,  
 corymbose above, ebracteate, increasing up to 6 cm. in fruit. Flowers  
 minute, about 1 mm. across, white, subsessile; pedicels increasing up  
 to 2 mm. in fruit, slightly thickened, spreading. Sepals 1-1.5 x  
 0.6-0.8 mm. Petals 1-1.4 x 0.5 mm., oblong-cuneate, apex subtruncate.  
 Stamens about 1: 1.2 mm.; filaments not appendaged; anthers minute,  
 about 0.2 mm. Siliculae broadly obovate, 4-5.5 x 4-6.5 mm., apex  
 † truncate; valves slightly tumid, with compressed margin (margin often  
 coarsely veined), glabrous; style about 0.7-1 mm. long, with minute  
 stigma; seeds 2 in each loculus, 1.2-2 x 1-1.8 mm., ovate, brown;  
 septum not veined. (Plate No. XXVII).

W. Pakistan:

Baluchistan: (without locality), Savage Landor (BM!).

Geog./

## Geog. Dist.:

N. Africa and Orient:

Persia: Baluchistan, Lar, Rechinger f. et al No. 3272 (V-K!); Desert on the margin of Zahedan, Rechinger f. et al No. 196 (V-K!); Shershab, Bunge (K!).

Iraq: Sabicha, Gillett and Rawi No. 6276 (K!)

Arabia: Hafaral Batin, Dickson No. 576 (K!); Kuweit, Dikson No. 511 (K!); Arabia Petraea, J. Gay (K!);

Egypt: Mergheb, R. Muschler (K!); Middle Egypt, G. Schweinfurth No. 127 (K!).

A species widely distributed from Baluchistan to Arabia and Egypt, represented by few specimens in the British herbaria. It is for the first time recorded from Baluchistan of W. Pakistan. Rechinger's A. nomismocarpum recently described (1951) from Persian Baluchistan is conspecific with A. homalocarpum (F. et M.) Boiss. Rechinger mentions siliculae up to 7 mm. broad for his new species. (Plate No. xxvii). The type specimen of his species borrowed from Vienna and seen at Kew does not show a single fruit with more than 6.4 mm. breadth. The siliculae are even broader, up to 6.5 mm., in Gillett and Rawis' specimen's from Iraq. Burt and Lewis: (1949) give the geog. distribution for A. homalocarpum as Egypt and Arabia. Perhaps Bunge's specimen from Persia was overlooked by them at the Kew Herbarium. Now its range extends to Iraq and Baluchistan also.

8. A. linifolium Steph. in Willd., Sp. Pl. iii. 467 (1800); B.F.O. 286 S.E.P. 492.

Syn: Meniocus linifolius (Steph.) DC., Syst. ii. 325 (1821); K.F.U. 359. A. heterotrichum Boiss., Diagn. (6) 15 (1842); Burkill, List of flowering plants of Baluchistan, 6 (1909); A. cupreum Freyn et Sint. in Bull. Herb. Boiss., 695 (1903).

Type: Armenia, Willdenow? (B - not seen).

Annual, 4-30 cm. long, spreading or suberect, branched mostly

from/

from the base, clothed with stellate, appressed, rough hairs. Leaves oblanceolate or linear-oblong, 1-3 x 0.1-0.3 cm., sessile, cuneate, entire, apex rounded, obtuse or acute. Racemes /<sup>10-25</sup> flowered, corymbose above, ebracteate, increasing up to 18 cm. in fruit. Flowers about 1.5 mm. across, white; pedicels 1-2.5 mm. long, increasing up to 3.5 mm. in fruit, filiform, spreading. Sepals 1-1.3 x 0.7-0.8 mm. Petals 1.7-2 x 0.7-0.8 mm., oblong-cuneate, apex emarginate. Stamens about 1: 1.3 mm.; filaments appendaged; anthers about 0.3 mm. Siliculae broadly elliptic, 4-6.5 x 3-4 mm.; valves compressed, membranous, plane, with a distinct mid-vein, glabrous; stigma minute on about 0.4 mm. long style; seeds 4-6 in each loculus, 1-1.3 x 0.8-1 mm., ovate-orbicular, brown; septum not veined.

W. Pakistan:

Baluchistan: Peshin, 1560 m., Lace No. 3308 (E!,K!); Killa Abdulla, Duthie No. 8578 (K!); Munquchur, Stocks No. 942 (K!); Quetta, Duthie No. 8577 (K!).

Afghanistan: Kurram Valley, Para chenar, Harsukh No. 14738 (K!); Sandy grounds, Choky Akrobat, Griffith No. 1519 (K!); Harirud Valley, Aitchison No. 160 (K!); Kabul, H. Collett No. 12 (K!).

Geog. Dist.: Europe, N. Africa and Orient, C. and N. Asia. Introduced in Australia.

43.\* PTILOTRICHUM C.A.M. in Ledeb., Fl. Alt. .iii. 64 (1831); B.F.O. 287; S.E.P. 493; K.F.U. 360.

Perennial, often shrubby, hoary-tomentose with stellate or fruncate white hairs, branched mostly from the base. Leaves usually small, linear or narrowly oblanceolate, entire. Racemes ebracteate, corymbose above. Flowers small, white or rose; pedicels flexuose in fruit, filiform, <sup>+</sup> spreading. Sepals erect, equal, not saccate, tomentose. Petals about twice as long as the sepals, long clawed. Stamens not dentate or appendaged; anthers minute, blunt. Lateral nectariferous/

nectariferous glands in pairs, <sup>+</sup> triangular with somewhat, elongated apex; median absent. Ovary ovoid, ellipsoid or rounded, sessile, 2-4 ovuled with a distinct style and minute capitate stigma. Siliculae usually ovoid or subglobose, bilocular, dehiscent; valves pubescent, inflated; seeds 1-2 in each loculus, ovate, brown; septum membranous, not veined.

About 12 species in C. Asia, N. Africa and orient.

Distinguished from Alyssum primarily by its flower, fruit and <sup>ar</sup>nectiferous glands characters.

P. canescens (DC.) C.A.M. in Ledeb., Fl. Alt. iii. 66 (1831); S.E.P. 493; K.F.U. 360.

Syn: Alyssum canescens var. abbreviatum DC., Syst. ii. 322 (1821); F.B.I. 141;

Type: C. Asia, Altai, Ledebour (L,K!).

Perennial, 3-10 cm. tall, erect or suberect, laxly caespitose, branched mostly from the base, clothed with stellate or branched, subappressed hairs. Leaves linear, sessile, cuneate, obtuse, 5-15 x 1-2.5 mm. Racemes 10-20- flowered, corymbose above, increasing up to 5 (-8) mm. in fruit, ebracteate. Flowers 3-4 (-4.5) mm. across, white or pale pink; pedicels 1-3 mm. long, increasing up to 8 mm. in fruit, filiform, pubescent. Sepals 1.8-2.5 x 1-1.5 mm. Petals 3-3.5 x 2-2.5 mm. Stamens 1.5-2: 2-3 mm.; filaments not appendaged; anthers about 0.3 mm. Siliculae 3-5 x 2-3.5 mm. (excluding 1-1.5 mm. long style), ovate-oblong, subinflated; apex acute, entire; valves densely hairy with stellate or branched short hairs; stigma minute, capitate; style glabrous or sometimes sparsely hairy; seed one in each/

each loculus, about 1.5-2 x 1-1.2 mm., ovate-oblong, brown; septum not veined.

N.W. Himalayas: Lahul, Brandis (K!); Naini Tal to Srinagar, Near Pangong Lake, 4200 m., Benham (BM!).  
Kashmir, Ladak, 4500-4800 m. Strachey (K!); J.L. Stewart (E!,K!); Chong Kundam, 4740 m., F. Ludlow No. 564 (BM!); Shyok, 4650 m., Schomburg No. 49 (BM!); Foot of Rimu glacier, 4800 m., F. Ludlow No. 464 (BM!); Ladak, Schlagintweit (BM!); Parang Valley, Thomson (K!E!).

Geog. Dist.:

Tibet: Rangbur Valley, 5100 m., Hingston No. 361 (K!); Tesu, 4500 m. Strachey and Winterb. (K!); N.W. Tibet, C. 4800 m., Pike No. 837 (K!); Tibet, Welby and Malcolm (K!).

C. Asia: Altai, Politow (K!); Herb. Bunge (K!); N. Mongolia, Kirghiz nor, Potanin (K!,E!); W. Mongolia, Przewalski (E!); S. Altai, Potanin (K!). Yarkand Expedition, Henderson (K!).

✱

44. LOBULARIA Desv. in Journ. de Bot. iii. 162 (1814) - nomen conservandum.; S.E.P. 494.

Syn: Konig Adans., Fam. ii. 420 (1763); Koniga R.Br. Observ. Pl. Denham a. Clapperton, App. 214 (1826), B.F.O. 289; Glyce Lindl., Synops. Brit. Fl. 26 (1828); Octadinia R.Br. ex Fisch. et Meyer, Index Sem. Hort. Petropol. iii. 41 (1836).

Annual to perennial, sometimes shrubby, erect or suberect, branched, clothed with bipartite appressed hairs. Leaves narrowly oblong-elliptic or linear-lanceolate. Racemes ebracteate, corymbose above, flexuose in fruit. Flowers mediocre, white; pedicels flexuose, spreading. Sepals erect, equal, not saccate. Petals about twice as long as the sepals, short clawed, broadly suborbicular or obovate. Stamens 6, not appendaged; anthers short and blunt. Lateral nectariferous glands in pairs, short, stalk-like, and ~~between those~~ and the long stamens, small rudimentary ones also present. Ovary ovate or suborbicular/

suborbicular, with 2-10 ovules; style short with capitate stigma. Siliculae suborbicular or ovate, compressed, bilocular dehiscent; valves flat with a distinct mid-vein; seeds suborbicular, narrowly winged; septum obscurely veined.

About 5 species in Mediterranean region and Macaronesia.

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L. maritima (L.) Desv. in Journ. de Bot. iii. 169 (1814);

O.E. Schulz in Notizblatt, Berlin, ix. 1087 (1927); S.E.P. 495;

Syn: Clypeola maritima L., Sp. Pl. 652 (1753) Alyssum maritimum (L.) Lam., Encycl. i. 98 (1783); Koniga maritima (Desv.)

R.Br. in App. Denh. et Clapp. Nar. Exp. Afr. ii. 214 (1826);

K.F.U. 364.

Type: Europe (not precisely designated) (LS!).

Annual to perennial, 10-35 cm. tall, erect or suberect, branched mostly from below, <sup>+</sup> hairy with bipartite-appressed hairs. Leaves oblanceolate, or linear, 2-4 x 0.3-1 cm., sessile, cuneate, entire or obscurely toothed, acute or subobtuse. Racemes 15-25-flowered, corymbose above, increasing up to 20 cm. in fruit. Flowers 3-5 mm. across, white ebracteate except one or two lower most which are sometimes bracteate; pedicels 4-7 mm. long, increasing up to 12 mm. in fruit, filiform, spreading or ascending. Sepals about 2 x 1 mm. Petals 3.5-4 x 2-2.5 mm., suborbicular, cuneate, apex obscurely retuse or rounded. Stamens 1.4-1.6: 1.8-2 mm.; filaments not appendaged; anthers about 0.3 mm. Siliculae ovate-oblong, 3-3.5 x 1.8-2 mm. (excluding about 1 mm. long style); valves with a distinct mid-vein, sparsely hairy; seed one in each loculus, 1.2-1.5 mm. in diam., suborbicular, compressed with a narrow obscure wing, brown; septum not veined./

veined.

N.W. Himalayas: (without locality), Royle (K!); N.W. India, Thomson (K!).

Geog. Dist.: C. and S.E. Europe. Introduced elsewhere.

Rarely cultivated in gardens in the present area. The fragrant nectar-bearing flowers are much visited by insects and are said to be self sterile.  $2x = 24$ .

✕✕

45. BUCHINGERA Boiss. et Hohenacker in Boiss., Diagn. (8) 29 (1849); B.H.G.P. 72; B.F.O. 305; S.E.P. 496; K.F.U. 368.

Annual, sparsely branched, erect or suberect, clothed with minute branched hairs. Cotyledons often persistent, somewhat enlarged, spatulate, glabrous. Leaves ovate-oblong or broadly elliptic, stalked or sessile, dentate. Flowers small, solitary and axillary, white; pedicels filiform becoming deflexed in fruit. Sepals equal, not saccate. Petals slightly longer than the sepals, spatulate. Stamens 6, not appendaged; anthers minute, subquadrate. Lateral nectariferous glands in pairs, minute, sometimes obscure; median absent. Ovary suborbicular, with 2-ovules; style short with retuse stigma. Siliculae suborbicular, compressed, bilocular, dehiscent; valves scabrous or asperous with simple or glochidiatous rough hairs; seed one in each loculus, large, suborbicular, winged; septum membranous, not veined.

1 species in C. Asia, Chitral (W. Pakistan), Persia and Armenia.

✕✕

B. axillaris Boiss. et Hohenacker in Boiss., Diagn. (8) 29 (1849); B.F.O. 305; S.E.P. 496; K.F.U. 368.

Type/

Type: Persia, Tehran, Kotschy No. 10 (G,K!).

Annual, 5-25 cm. tall, erect, simple or branched, hairy with minute, branched or substellate hairs. Leaves scattered, 1-5.5 x 0.5-2 cm., ovate-oblong or broadly elliptic, stalked or sessile, dentate, rarely subentire, apex acute to rounded, often slightly mucronate; bases of the lower most leaves broad but not auricled; cotyledons usually persistent, much enlarged, 2-3.2 x 0.5-1 cm., spatulate, apex emarginate, glabrous, subfleshy. Flowers solitary and axillary, small, 2-2.6 mm. across, white; pedicels 2-3 mm. long, increasing up to 6 (-9) mm. in fruit, filiform, subdeflexed or spreading. Sepals about 2 x 1 mm. Petals about 2.5 x 1 mm., narrowly spatulate, apex emarginate. Stamens 1.6-1.8: 1.8-2 mm.; filaments not appendaged; anthers about 0.25 mm. Siliculæ broadly suborbicular broader than long, 4.5-6 x 6-7 mm. (excluding 1-2 mm. long style); valves obscurely tumid with narrow compressed margin, strigose; seed one in each loculus, large, slightly smaller than the size of the fruits, narrowly winged, brown; septum not veined. (Plate No. XXVIII).

W. Pakistan:

Chitral: Pattissum nullah, 2100 m., Toppin No. 195 (K!).

Geog. Dist.:

Persia: Tehran, Kotschy No. 10 (K!); Between Ispahan and Tehran, Bunge (K!); Mt. Schimran, Bornmuller No. 6230 (K!); Yezd, Bornmuller No. 2249 (K!); Mt. Elbrus, Rechinger No. 300 (K!);

C. Asia: Turkestan, Seravaschan, Komarov (K!); Mt. Borotag, Dist. Hissar, Regel (K!); Samarkand, Popov et Vvedensky No. 92 (K!).

This species is for the first time recorded for the present area. Therefore, its geog. range now extends up to Chitral (W. Pakistan). Still there is no record of it from Afghanistan, although it has been recorded/



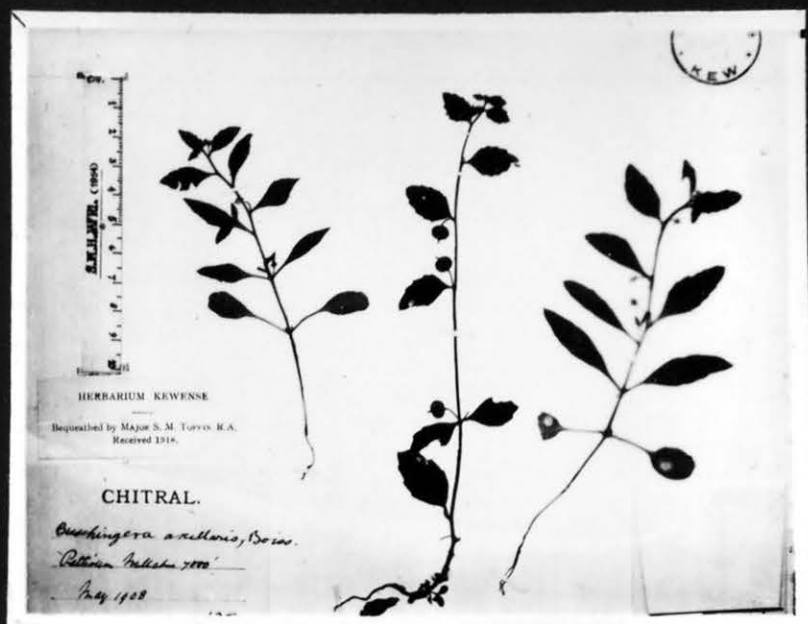


Plate no. XXVIII. Buchingera axillaris Boiss. et Hohen.



Plate no. XXII. Lunaria annua L.

recorded from Persia and Turkestan, the two adjoining areas.

46. CLYPEOLA L., Sp. Pl. 652 (1753); B.H.G.P. 93; B.F.O. 308; S.E.P. 497; K.F.U. 364.

Syn: Jonthlaspi Adans., Fam. ii. 423 (1763); Orium and Bergeretia Desv. in Journ. de Bot. iii. 161 (1814).

Annual, branched mostly from the base, sub-erect or erect, sometimes procumbent; clothed with short stellate hairs. Leaves oblanceolate or linear, small, subsessile or sessile. Racemes ebracteate, lax, flexuose. Flowers minute, white or yellow; pedicels filiform recurved in fruit. Sepals equal, not saccate. Petals slightly longer than the sepals, narrowly spatulate. Stamens 6, filaments appendaged-dentate; anthers minute, blunt. Lateral nectariferous glands in pairs, minute; median absent. Ovary suborbicular or broadly ovate, 1-ovuled; stigma minute, sub-retuse, sessile or on short style. Siliculae orbicular or suborbicular, biconvex, usually hairy, asperous, or subbarbellate, rarely glabrous, unilocular, indehiscent; valves narrowly winged or not; seed one, suborbicular, pendulous, not winged.

8 species in N. Africa and Orient and C. Asia.

The three species are classified under three sections as follows:

Key to the sections (as well as to the species):

1. Plants alternately branched; branches flexuose; leaves with a mid-vein:
  2. Valves membranous, narrowly winged, glabrous or hairy with simple short hairs ..... Sect. 1. Jonthlaspi
  2. Valves coriaceous, rigid, not winged, covered with barbellate setaceous/

setaceous hairs ..... Sect. II. Bergeretia

1. Plants dichotomously or trichotomously branched, with short ascending branches prominently leafy above; leaves with 3-5-

parallel veins ..... Sect. III. Pseudoanastatica

Sect. I. Jonthlaspi DC., Syst. 326 (1821); B.F.O. 308; S.E.P. 497.

1. Clypeola jonthlaspi L.

Sect. II. Bergeretia DC., l.c. 328; B.F.O. 309; S.E.P. 497.

2. C. aspera (Grauer) Turrill.

Sect. III. Pseudoanastatica Boiss., Fl. Or. i. 310 (1867); S.E.P. 497.

3. C. dichotoma Boiss.

1. C. jonthlaspi L., Sp. Pl. 652 (1753); B.F.O. 308; S.E.P. 497;

K.F.U.

Type: Italy? (not precisely designated) (LS!).

Annual, 5-20 cm. tall, erect or suberect, branched mostly from the base, clothed with short, stellate, appressed hairs. Leaves narrowly oblanceolate or oblong rarely spatulate, sessile, cuneate, 5-20 x 1.5-4 mm., apex acute, obtuse or rounded, entire. Racemes 20-50-flowered, corymbose above, increasing up to 10 cm. in fruit, ebracteate. Flowers 1-1.5 mm. across, white; pedicels 1-2 mm. long, increasing up to 4.5 mm. in fruit, filiform, deflexed. Sepals 1-1.5 x 0.6-0.8 mm. Petals about as long as the sepals, linear-oblong, cuneate, about 0.5 mm. broad, apex subemarginate. Stamens about 1.2: 1.5 mm.; filament appendaged; anthers about 0.2 mm. Siliculae orbicular, (1.75-) 4-5 x (1.5-) 4-5 mm., biconvex, apex notched with a short capitate, subsessile stigma; valves membranous convex, narrowly winged, usually covered with simple † verruculose hairs, sometimes glabrous; seed 1-1.8 x 0.8-1.5 mm. in diam., suborbicular or broadly elliptic/

elliptic, compressed, biconvex, not winged. .

W. Pakistan:

Baluchistan: Quetta, Urak, 2100 m., in dry stony soil under the shade of bushes and rocks, Lace No. 3311 (E!,K!).

Afghanistan: (without locality), Griffith (K!).

Geog. Dist.: Westward to Mediterranean region, and C. Asia.

A very polymorphic species especially in fruit size and degree of indumentum. Several forms have received different specific and varietal ranks by different authors. D.A. Chaytor and W.B. Turrill in their paper, "The genus Clypeola and its intraspecific variation" (K!) have done a very useful statistical study of this species to solve this problem. And now it is generally accepted that the species, C. jonthlaspi L., is very polymorphic with short and tall plants, smaller and larger fruits with densely hairy to glabrous valves etc.

2. C. aspera (Grauer) W.B. Turrill in Journ. Bot. lx. 269 (1922).

Syn: Peltaria aspera Grauer, Pl. Min. Cogn. Dec. 6 (1784);

C. echinata DC., Syst. 328 (1821); H. f. et T. in Journ.

Linn. Soc. Bot. v. 178 (1861); B.F.O. 309; S.E.P. 497;

K.F.U. 367.

Type: Not precisely designated.

Annual, 5-20 cm. tall, suberect or decumbent, branched, clothed with stellate hairs. Leaves oblanceolate or oblong-elliptic, 5-25 x 1.5-4 mm., sessile, cuneate, entire, acute with a mid-vein. Racemes 15-30-flowered, subcorymbose above, ebracteate, increasing up to 8 cm. in fruit. Flowers about 2 mm. across, white; pedicels 1-2 mm. long, increasing up to 4 mm. in fruit, filiform, deflexed. Sepals about 1.2 x 0.8 mm. Petals about 1.5 x 0.6 mm., spatulate; apex subtruncate. Stamens/

Stamens about 1: 1.2 mm.; filaments appendaged; anthers about 0.2 mm. Siliculae suborbicular or broadly ovate, 3.5-4.5 x 3-4 mm., apex sub retuse or entire with a minute, subsessile, capitate stigma; valves coriaceous barbellate with simple, rough, strong hairs; seed about 1.5 mm. in diam., suborbicular, not winged, brown.

W. Pakistan:

Baluchistan: Quetta, Surkhab Valley, China bagh, 1800 m., Lace No. 3734 (E!,K!); Quetta, Stocks No. 879 (K!); Kelat, Stocks (K!); Quetta, Duthie No. 8601 (K!).

Afghanistan: Chokey, Griffith No. 1514 (K!).

Geog. Dist.: Westward to Syria and Palestine; C. Asia.

\*

3. C. dichotoma Boiss. in Ann. Sc. Nat. 175 (1842); B.F.O. 310;

S.E.P. 497; K.F.U. 367.

Syn: Pseudoanastatica dichotoma Grossheim, Fl. Kavk. ii. 212 (1930).

Type: Persia, Azerbaijan, Aucher Eloy No. 4082 (G,K!).

Annual, 2-12 cm. tall, erect or spreading, branched, stellately hairy; branches short, ascending † corymbose and dichotomous with leaves crowded and prominent at the apices. Leaves broadly elliptic or oblong-obovate, 4-28 x 2-10 mm., subsessile or sessile, entire, acute or obtuse, with 3-5 parallel veins, covered with stellate hairs. Racemes 10-20- flowered, increasing up to 3 cm. in fruit. Flowers 1.5-2 mm. across, yellowish; pedicels about 1 mm. long, increasing up to 3 (-4) mm. in fruit, ascending. Sepals 1.5-1.7 x 0.8-1 mm., sparsely hairy. Petals 1.5-2 x 0.5-0.8 mm., oblong-cuneate, apex subtruncate. Stamens about 1: 1.5 mm.; filaments appendaged; anthers about 0.2 mm. Siliculae ovate-orbicular, 3-3.5 x 2-2.7 mm., (excluding about/

about 1 mm. long style), biconvex, densely hairy with long, simple (somewhat clavate at the apex) rigid hairs; seed 1.5-1.8 x 1.2-1.4 mm., ovate-orbicular, not winged.

Afghanistan: Harirud Valley; flowers yellow, Aitchison No. 1155 (K!).

Geog. Dist.:

Persia; Azerbaijan, Aucher Eloy No. 4082 (K!); Yezd and Ispahan, Bunge (K!); W. of Ispahan, flowers yellow, Cowan and Darlington No. 1103 (K!).

C. Asia: Armenia, Szovits No. 281 (K!).  
Caucasus, Erivan, A. Grossheim No. 65 (K!).

Tribe VI. Drabeae O.E.Schulz in Pflanzenfam. (I7 b) 497 (1936).

Lateral nectariferous glands various, often in pairs, small, sometimes semiannular or annular; median present or absent. Hairs simple, branched or absent. Stamen filaments usually not appendaged (rarely appendaged); anthers usually blunt, Ovary sessile rarely shortly stipitate, often short and elliptic; style present with shortly bilobed or capitate stigma. Fruits usually short (siliculae) rarely elongated (siliqua-like), latiseptate, ovate, orbicular to elliptic-oblong or lanceolate, bilocular, dehiscent; seeds biseriate (rarely sub-biseriate), not winged rarely obscurely to slightly winged; radicle accumbent.

Key to the three genera of the tribe Drabeae:

- I. Petals deeply bifid .....48. Erophila  
 I. Petals entire, apex emarginate to entire:  
 2. Radical leaves long petioled; lamina + kidney shaped, much shorter than the petiole in the basal leaves; fruits indehiscent (rarely subdehiscent); septum usually incomplete (windowed) .....  
 .....49. Graellsia  
 2. Radical leaves shortly stalked or sessile (except in D. hederifolia); lamina much longer than the stalk ; fruits dehiscent; septum complete .....47. Draba.

47. DRABA L., Sp. Pl. ii 642 (1753)- excl. D. verna et D. pyrenacia; B.H.G.P. 74; B.F.O. 292; F.B.I. 141; B.F.S. 292; S.P.(86)1927; S.E.P. 500; K.F.U. 369; Pohle, Drab. Asiat. in Fedde, Rep. Beih xxxii (1925).  
 Syn: Consana Adans., Fam. ii 420 (1763) pro parte; Moenchia Roth, Tent. Fl. Germ. i 273 (1788); Holarges Ehrh., Beitr. iv 148 (1789); Tomostima Raf., Neogenyton 2 (1825); Holargidium Turcz. in Bull. Soc. Nat. Mosc. 87 (1838); Odontocyclus Turcz. l.c. 65 (1840); Dolichostylis Turcz. l.c. xxvii 305 (1854); Stenonema Hooker in Benth. et Hooker, Gen. Pl. i 75 (1862); Aizodraba Fourr. in Ann. Soc. Linn. Lyon, Nouv. xvi 335 (1896);

Drabella Fourr. l.c.; Pseudobrara Korsh. in Mem. Acad. Sc. St. Petersburg. ser. IV (4) 88 (1896); Nesodraba Greene in Pittonia iii 252 (1897); Abdra Greene l.c. iv 205 (1900); Pseudodraba Korsh. ex Fedtsch. in Beih., Bot. Centralb. xix (2) 307 (1906).

Annual to perennial, often caespitose, usually pubescent with branched hairs. Stems scapose or leafy. Basal or radical leaves usually densely rosulate, shortly stalked to sessile (very rarely long stalked); cauline leaves usually sessile. All leaves simple, entire to sinuate-dentate. Racemes usually ebracteate, corymbose. Flowers small or mediocre, white or yellow, rarely lilac; pedicellate. Sepals subequal, apex obtuse or rounded; outer oblong or elliptic; inner broad, often ovate, subsaccate. Petals obovate-cuneate (sometimes rudimentary or suppressed), apex often subemarginate. Stamens 6 (sometimes outer two abortive), without appendages (rarely filaments of the outer stamens unidentate), filaments sometimes broad at the base; anther ovoid or oblong, obtuse. Nectariferous glands various, laterals 2-4 lobed, often lobes joined forming a horse-shoe shaped structure, sometimes lobes elongated and acute; median present or absent. Ovary broad or narrow, often flask-shaped or elliptic, rarely cylindrical, 4-80-ovuled; style distinct, sometimes lacking; stigma capitate or short, often subbilobed or slightly retuse. Fruits usually short (siliculae), sometimes elongated (siliquae like), latiseptate, usually ovate-oblong, suborbicular, elliptic or lanceolate, bilocular, dehiscent, straight or contorted, compressed or subcompressed; valves plane to subconvex, often with a distinct midvein; seeds + biseriate, ovate or elliptic, often pale brown, not mucilaginous when wet; septum membranous, complete, not veined (rarely 1-veined).

About 270 species, chiefly of Arctic and alpine regions, extending also in temperate zone and at higher elevations into the tropics.

It is represented by only 24 species in the present area. Taxonomically Draba in the present area has ~~gone~~ undergone considerable changes since the publication of Fl. Brit. India (1872). The two indispensable monographs: 1. Pohle's Draba Asiatica in Fedde, Rep. xxxii (1925), and 2. Schulz's in Pflanzenreich (89) 1927, clarified to a greater extent the problems of Draba species in the present area, but the taxonomic status of certain species was still not made clear or was left without any mention. For example, the status of "D. armena" H.f. et T. (non Boiss.) and "D. muralis"



H.f.et T. (non Linn.) etc. remained undecided in these monographs. Similarly the huge number of unnecessary infra-specific units described and recognized in these monographs needed clarification. It is surely unnecessary for a taxonomist to describe a species<sup>and</sup> at the same time to describe one or more 'varieties' of it in the same one gathering, when those 'varieties' are part of the natural variability inherent in the population [For example see D.tenerrima Schulz and var. trichocarpa Schulz in Notizblatt xi 640 (1932)]. There are numerous such valueless infra-specific units recognized by Schulz (1927), that instead of solving any problem become a nuisance when one finds all the distinguishing characters breaking down when one examines a large number of herbarium specimens. I have recognized only those whose status was definite or were geographically isolated.

Hooker f. and Thomson recognized 13 species of Draba in Journ. Linn. Soc. Bot. v (1861), and Hooker f. and T. Anderson 12 species in Fl. Brit. India (1872). Out of these, D.ellipsoidea H.f.et T. and D.elata H.f.et T. are east Himalayan and have not been recorded yet from N.W.Himalayas. One, D.verna L., is no doubt Erophila and has been correctly recognized under this genus as E.verna (L.) Besser in Fl. Brit. India. Most of the remaining species have undergone considerable changes and should be treated as follows:

1. "D.glacialis" H.f.et T. (non Adans.) var. a = D.setosa Royle  
var. B = D.cashemirica Gandoger
2. "D.glacialis" H.f.et T. Anders. (No.) = D.setosa Royle (partly) and  
D.cachemirica Gandoger
3. "D.alpina" H.f.et T. (non L.) = D.oreades Schrenk (partly) and  
D.affghanica Boiss.
4. "D.alpina" H.f.et T. Anders. (non L.) = D.oreades Schrenk, D.affghanica  
Boiss. and D.radicans Royle
5. "D.incana" H.f.et T. (non L.) = D.lanceolata Royle.
6. "D.incana" H.f.et T. Anders. (non L.) (excl. syn. D.himalayensis Klotz.  
which is a misidentification of Thlaspi cochlearioides H.f.et T.) =  
D.lanceolata Royle.
7. Exclude D.glomerata Royle from the synonym of "D.lasiophylla" H.f.et T.  
(non Royle) because the two are distinct species.

8. "D. Wahlenbergii" H.f. et T. (non Hart.) = D. altaica (C.A.M.) Bunge  
 9. "D. fladnitzensis" H.f. et T. Anders. (non Wulf.) = D. altaica (C.A.M.) Bunge  
 10. "D. Armena" H.f. et T. (non Boiss.) = D. tibetica var. chitralensis  
 (Schulz) Jafri, comb. nov.  
 11. D. tibetica var. a. Thomsoni H.f. = D. tibetica H.f. et T.  
 12. D. tibetica var. B. Sikkimensis H.f. et T. = D. sikkimensis (H.f. et T.)  
 Pohle.  
 13. D. tibetica var. r. Winterbottomi H.f. et T. = D. winterbottomi (H.f. et T.)  
 Pohle, and D. glomerata Royle.  
 14. "D. muralis" H.f. et T. Anders. (non L.) = D. nemorosa L.  
 15. "D. linearis" H.f. et T. Anders. (non Boiss.) = D. stenocarpa H.f. et T.  
 16. "D. incompta" H.f. et T. Anders. (non Stev.) = D. winterbottomi (H.f. et T.)  
 Pohle

Dunn in Kew Bull. 383 (1924) described a new species, Draba obscura, from N.W. Himalayas. Schulz also regarded it as a Draba in Pflanzenreich [(89) 329 (1927)], but later on he correctly transferred it to Aphragmus making a new combination, A. obscurus (Dunn) Schulz [Fedde, Rep. xxxi 330 (1933)].

Schulz (1927) described four new species of Draba from the present area: D. trinervis, D. falconeri, D. amoena and D. nubigena. Of these the last one is conspecific with D. lasiophylla Royle (1839). He described another new species, D. tenerrima [Notizblatt xi 640 (1932)] from Kashmir. This species is remarkably distinct from the rest of the species of the present area in having no petals. During 1935 [Fedde, Rep. xxxviii 108 (1935)] he described another new species, D. laujarica, which is conspecific with Christolea lanuginosa (H.f. et T.) Jafri (see full discussion under Christolea).

D. olgae Regel et Sch., D. pamirica (O. Fedtsch.) Pohle, and D. melanopus Kom., the three Central Asian species, have also been recorded from the present area.

Two new species, D. aubrætioides Jafri and D. ludlowiana Jafri, have been described.

Figure no. 17 shows the range of variation and habit in most of the species of the present area.

The 24 species of the present area are classified into the following 5 sections:

Key to the 5 sections:

- I. Flowering branches aphyllous, scapiform:
2. Leaves rigid, narrowly linear (needle shaped); funicle elongated .....sect. I. Aizopsis
2. Leaves not rigid, oblanceolate, obovate or elliptic; funicle short ..... .. sect. II. Chrysodraba
- I. Flowering branches + leafy:
3. Cauline leaves many ..... sect. III. Phyllodraba
3. Cauline leaves few:
4. Plants perennial or biennial; petals white, rarely yellow ...  
..... sect. IV. Leucodraba
4. Plants primarily annually branching and flowering, but parts sometimes perennating; petals yellow rarely white .....  
..... sect. V. Drabella

Sect. I. Aizopsis DC., Syst. 332 (1821); B.F.O. 293; S.P. 19; S.E.P. 505.

1. D. hystrix H.f. et T.

Sect. II. Chrysodraba DC., l.c. 337; B.F.O. 297; S.P. 72; S.E.P. 506.

2. D. setosa Royle

3. D. oreades Schrenk

4. D. cachemirica Gandoger

5. D. pamirica (O.Fedt.) Pohle

6. D. affghanica Boiss.

7. D. olgae Regel et Schmalh.

8. D. trinervis Schulz.

Sect. III. Phyllodraba Schulz in Pflanzenreich (89) 173 (1927); S.E.P. 509.

9. D. radicans Royle

10. D. amoena Schulz

Sect. IV. Leucodraba DC., l.c. 342; B.F.O. 301; S.P. 200; S.E.P. 510.

11. D. altaica (C.A.M.) Bunge

12. D. glomerata Royle

13. D. ludlowiana Jafri

14. D. winterbottomi (H.f. et T.) P.

15. D. lasiophylla Royle

16. D. lanceolata Royle

17. D. tibetica H.f. et T.

18. D. falconeri Schulz.

Sect. V. Drabella DC., l.c. 351; B.F.O. 302; S.P. 302; S.E.P. 510.

19. D. nemorosa L.

20. D. melanopus Kom.

21. D. saherrima Schulz

22. D. stenocarpa H.f. et T.

23. D. aubrietoides Jafri

24. D. gracillima H.f. et T.

Key to the species

- I. Flowering shoots aphyllous, scapose (rarely I-2-leaved):
2. Annual; petals absent .....2I. D.tenerrima
2. Perennials; petals present:
3. Seeds large, about 3 mm. long; fruits 15-28 mm. long..I.D.hystrix
3. Seeds small, 0.5-Imm.(rarely upto 1.8 mm.)long; fruits 2-10 mm.  
(rarely upto 18 mm.) long:
4. Petals (4.5) 5 - 6 mm. long:
5. Racemes 5-10-flowered (rarely 3 or 12 flowered); seeds  
0.7-1 mm. long:
6. Plants + floccose-hairy with short, branched, soft, white  
hairs; siliculae (6)10-18 mm. long .....17. D.tibetica
6. Plants + ciliate hairy with simple and furcate hairs;  
siliculae 3-6(-8) mm. long:
7. Leaves with + 3 longitudinal veins .... 8.D.trinervia
7. Leaves with 1 mid-vein .....6.D.affghanica
5. Racemes (10)15-30-flowered; seeds about 0.5 mm. long ...  
..... .7. D.olgae
4. Petals (1.5) 2.5 - 4 mm. long:
8. Plants floccose-hairy with short, branched or simple, soft,  
white hairs:
9. Flowers about 5 mm. across; petals about 4x2 mm.; style  
long(1-1.5 mm.); siliculae 5-8 mm. long, lanceolate or  
oblong-elliptic, contorted, compressed ....14.D.winterbottomi
9. Flowers 3-4 mm. across; petals 3-3.5x1-1.3 mm; style  
short(about 0.4 mm.); siliculae 2.5-3.5(-6) mm. long,  
ovate, inflated .....5. D. pamiica
8. Plants + ciliate hairy with simple or furcate hairs:
10. Flowers 2.5 mm. across ..... 20. D.melanopus
10. Flowers 3-4(-6) mm. across:
- II. Siliculae compressed, oblong-elliptic, 5-10 mm  
long ..... 2. D. setosa
- II. Siliculae subinflated or subcompressed, + ovate,  
(1,5)2-4(-8) mm. long:

I2. Petals about 2.5 mm. broad .....4. D. cachemirica

I2. Petals about 1.5 mm. broad .....3. D. oreades

I. Flowering shoots leafy, 3-many leaved (rarely 1-2-leaved):

I3. Annuals:

I4. Flowers 2 mm. across; petals 1.6-1.8x0.5-0.7 mm.; siliculae  
5-8 mm. long .....I9. D. nemorosa

I4. Flowers 3.5-4 mm. across; petals 3.5-4x1-1.2 mm; siliculae  
8-20 mm. long .....22. D. stenocarpa

I3. Perennials:

I5. Seeds sub-biseriate, large, about 2 mm. long, obscurely  
winged .....23. D. aubrietioides

I5. Seeds biseriate, small, about 1 mm. long, not winged:

I6. Plants not caespitose; stems erect or procumbent, sparsely  
branched:

I7. Flowers 4-10 mm. across, white or yellow:

I8. Flowers 4-5.5 mm. across, white; fruits 10-20 mm.  
long .....I8. D. falconeri

I8. Flowers 6-10 mm. across, yellow; fruits 8-10 mm.  
long .....9. D. radicans

I7. Flowers 10-14 mm. across, lilac ....10. D. amoena

I6. Plants caespitose, usually erect and branched from the base:

I9. Plants tomentose with short, branched, white hairs  
(mixed with long simple or forked hairs in D. lasiophy-  
-lla Royle):

20. Sepals persistent in fruit; siliculae 3-4x2.5-3  
mm., ovate-orbicular, compressed, not contorted,  
glabrous .....I3. D. ludlowiana

20. Sepals caducous; siliculae (3.5)6-14x1.5-2 mm.,  
oblong-linear, + pubescent and contorted:

21. Homotrichous (with short and branched hairs):

22. Seeds 30-40. ....I6. D. lanceolata

22. Seeds 6-12 .....I2. D. glomerata

21. Heterotrichous (short and branched hairs mixed  
with simple or forked long hairs) .....

.....I5. D. lasiophylla

19. Plants hairy with simple or furcate, + ciliate hairs:

23. Branches + procumbent; racemes lax, increasing upto 15 cm. in fruit; pedicels 5-25(-30) mm. long; siliculae 6-14 mm. long .....24. D. gracillima

23. Plants erect or suberect; racemes corymbose, capitata or slightly increasing (rarely upto 5 cm. ) in fruit; pedicels 1-6 mm. long; siliculae 2-5 mm. long .....

.....II. D. altaica

I. D. hystrix H.f. et T. in Journ. Linn. Soc. Bot. v 149 (1861); B.F.O.296; S.P.70; S.E.P. 505.

Type: Afghanistan: Koshuk pass, 2190 m., Griffith(K!).

Perennial, caespitose; rootstock woody, about 1 cm. thick, densely covered with barbellate, needle-shaped leaves (lower ones withered). Leaves 2-4x0.1 cm., needle-shaped, covered with ciliate, rigid, 1-2 mm. long, simple rarely forked hairs. Scapes 2-4 cm. long, erect, hairy with simple hairs not as prominent as on leaves, increasing upto 8 cm. in fruits. Racemes about 10-flowered, lax. Flowers 5-7 mm. across, yellow; pedicels 4-6 mm., increasing upto 8 mm. in fruit, spreading, slightly thickened, hairy. Sepals 3-3.8x1.5-2.2 mm. Petals 6-6.5x2.5-3 mm., obovate-oblong, apex rounded. Stamens about 4.5 : 5 mm.; anthers about 1.2 mm. long. Fruits lanceolate or elliptic, 15-28x3-4 mm., compressed, often slightly curved, apex acute; valves rigid, rough, hairy with simple or forked subequal hairs, 1-veined; style about 2 mm. long, filiform with depressed-capitate stigma; seeds usually 2 in each loculus, sub-biseriate or biseriate, large, about 3 x 1.5 mm., oblong-ovoid, subcompressed, dark brown, smooth; septum membranous, veined.

W. Pakistan:

Baluchistan: Khojak pass, 1800-2100 m., Lace no. 3528(E!);

Shelabagh, Lace no. 3327(E!); Khojak pass, Duthie no.

8574(K!, BM!); near Killa Abdulla, Duthie(K!).

Afghanistan:

Top of Koshuk pass, 2190 m., Griffith(K!); Kelah Gehyari to Ghurma, Aitchison no. 101(K!).

Geog. Dist:

Endemic.

2. D. setosa Royle, Illustr. i 7I (1839); S.P.I04.

Syn: "D. glacialis" W. & A. N. S. P. a. H.f. et T. in Journ. Linn. Soc. Bot. v I05 (1861) [non Adams in Mem. Soc. Nat. Mosc. v I06 (1817)]; "D. glacialis" H.f. et T. Anders. in Fl. Brit. Ind. i I42 (1872) (excl. syn. Boiss.) - non Adams. l.c.; D. pyriformis Pohle in Fedde, Rep. xxxii I54 (1925).

Type: N.W. Himalayas: Kunawar, Sungam, Royle (K!).

Perennial, densely caespitose; shoots 6-15 cm. long, aphyllous (rarely 1-leaved at the branching point); erect or ascending. Radical leaves densely rosulate, narrowly linear, 10-15 x 1-1.5 mm., sessile, rigid, entire, 1-veined, subobtusate or acute, subglabrous, margin setose with simple to furcate hairs. Racemes 3-10-flowered, corymbose above, becoming lax in fruits. Flowers 3-4 mm. across, yellow; pedicels 1.5-4 mm., increasing upto 6 mm. in fruit, filiform, glabrous. Sepals 1.8-2 x 1 mm. Petals about twice as long as the sepals, obovate-cuneate. Stamens 6, about 2.2 : 2.5 mm. Siliculae 5-10 x 2.5-3.4 mm., oblong-elliptic, apex acute, compressed, subcontorted, glabrous; valves with an obscure mid-vein and reticulate venation; style 0.5-0.75 mm. long with short, subretuse stigma; seeds 6-8 in each loculus, about 0.8 mm. long, oblong-ovate, compressed, brown; septum not veined.

N.W. Himalayas:

Bashahr state, 3500 m., Lace no. 255 (E!, K!); Kunawar, Royle (K!); Kum, Royle (K!); Kunawar, Jacquemont (K!); Lahul, beyond Baralacha pass, 4500 m., S.R. Kashyap no. 4 (K!); (without locality), Thomson (K!); Yotse glacier, Drummond nos. 20260 (K!), and 20253 (K!).

Kashmir: Baltistan, 4200-4500 m., Duthie (K!); Deosai, 3900 m., 3900 m., Clarke no. 29808 A (K!) and no. 29808 B (BM!); Baltistan, Shatung La, 4200-4500 m., Duthie (BM!); Sasin pass, R. Meinertzhagen no. 64 (BM!); Ladak, Skyangpoche, 4650 m., Ludlow no. 559 (BM!); Baltistan, Tsorbat La, Schlagintweit (BM!); Sassir pass, 4800 m., Ludlow no. 437 (BM!); Ladak, J.L. Stewart (K!); Dras valley, Inayatno. 25501 (K!); Baltistan, Takpe La, 3150 m., Winterbottom (K!);

Karakorum: glaciers, c. 4500 m., Conway (K!);

W. Tibet: (without locality), Falconer Herb. East Ind. C. no. I54 (K!).

Geog. Dist: Endemic to N.W.Himalayas.

3. D. oreades Schrenk in F. et M., Enum. Pl. Nov. ii 56 (1842); S.P.106; S.E.P.506; K.F.U. 393.

Syn: "D. alpina" H.f. et T. in Journ. Linn. Soc. Bot. v 150 (1861) et H.f. et T. Anders. in Fl. Brit. India i 142 (1872)-p. parte [non Linn., Sp. Pl. ii 642 (1753)]; Pseudobrayera Kizyl-Arti Korsh. in Mem. Ac. Sc. St. Petersb. ser. VIII(iv) 88 (1896); D. Tianschanica Pohle in A.H.P. xxxi 486 (1914); D. Kizyl-Arti (Korsh.) Busch, Fl. Sib. 309 (1919).

Type: C. Asia: Mt. Dschabyk, Schrenk (L- not seen).

Perennial, caespitose; caudex covered with withered leaf bases; scapes 1-9 cm. long, aphyllous, erect or suberect. Radical leaves rosulate, very variable in size, and degree of indumentum, usually lanceolate or obovate-oblong, 2.5-25 x 1-5 mm., entire to subdentate, apex obtuse, rounded or acute, hairy with simple or furcate, often ciliate hairs. Racemes 5-15-flowered, corymbose. Flowers 2.5-4.8 mm. across, yellow; pedicels 1-5 mm. long, increasing upto 8 mm. in fruits, hairy rarely glabrous, subspreading or spreading. Sepals 1.3-2.6 x 1-1.3 mm. Petals 3-4 x 1.2-1.7 mm., obovate-cuneate, apex subemarginate. Siliculae (1.5) 3-8 x (1) 2.5-5 mm., ovate, subcompressed, flattened or subcontorted, acute, bases rounded or obtuse, glabrous rarely sparsely hairy; valves obscurely veined, sometimes with a faint mid-vein; style upto 1 mm. long with a short, depressed, retuse or subretuse stigma; seeds 3-6 in each loculus, 0.7-1.2 x 0.5-0.8 mm. ovate, brown; septum not veined.

A very polymorphic species. The status of the infra specific units is very obscure. Distinguished from D. alpina L. by its somewhat turgid pods, linear style and usually many flowered raceme.

W. Pakistan:

Chitral: Sulikho, 3000 m., Toppin no. 855(K!).

N.W.F.P.: Hazara, J.L. Stewart no. 43(K!).

N.W. Himalayas:

Chamba state, Thomson(K!); Between Satrundi and Sanch pass, 3300-4200 m., Harsukh(K!); Tihri-garhwal, 3600-4800 m.,

Duthie nos. 925(K!) and 926(K!); Kumaon, c. 4200 m., Strachey & Winterbottom(K!)(mixed); Lahul, Jaeschke no. 222(K!);



Ascent to Sanch pass, 3600 m., R. Ellis nos. I558(K!) and I646 (K!); Lahul, N.L. Bor no. I5223(E!); Cleghorn(E!); N.L. Bor no. I3957(E!); (without locality), J.L. Stewart(E!);  
Kashmir: Ladak, 5000 m., in watered gravels, Koelz no. 2839 a(E!K!);  
 Mt. Kolahoi, c.4200 m., R. Stewart no. 9370 A(K!); Mt. Apharwat, near Gulmarg, c.4200 m., R. Stewart no. 8859(K!); Astor, 4200m., Duthie(K!); Deosai, c.4500 m., R. Stewart nos. 22297 a(K!) and 22275(K!)(with Thlaspi cochlearioides H.f.et T.), and 22295 a(K!); Ajog, valley, 3300 m., R. Ellis no. I4I9(K!); Baltistan, 3300 m., Winterbottom(K!); Strachey & Winterbottom(K!); Sonmarg, c.3900 m., R. Stewart no. 734 I/2(K!); Tragbol, RRand I.D. Stewart n. 44I(K!); Suru, 4500 m., Qsmaston nos. 20I(K!) and 4I(K!); Upper Lidder valley, c.4200 m., R. Stewart no. 8388(K!); Pahlgam, c.4200 m., R. Stewart no. 8I59(K!); Astor, 4200 m., Duthie no. I2I72(K!); Astanmarg, c.3600 m., Drummond no. I43I5(K!); Marpo La, Dras, 4500 m., rocky ground near top, R. Stewart no. 22295 a (K!); Sheshnag, 3900-4500 m., Drummond no. I4254(K!); Zojila, Duthie no. II653(E!,K!BM!); Masjid valley, 4000-4300 m., Duthie no. I3I94(E!,K!); Sinthan pass, 3900 m., Ludlow no. I55(BM!); Sangam valley, 4200 m., Duthie no. I3278(BM!); Apharwat, near Gulmarg, 3900 m., Pinfold no. 2I9(BM!); Kishtwer, Bongar, 3750 m., Ludlow & Sherriff no. 9278(BM!); Ladak, Meshu nullah, 4800 m., Ludlow & Sherriff no. 8450(BM!); Upper Bringhi, Rajparyan, 3600 m., Ludlow & Sherriff no. 8450(BM!); Baltistan, Thalle La, 4500-4800 m., R. Stewart no. 20757(R-E!);  
Karakorum: Zangia Harar, Hunza valley, 4200 m., Russell no. I02I (BM!); Barpur glacier, 3900-4500 m., Russell no. II3I(BM!); Hispar glacier, 4500 m., Russell no. I582(BM!){with Thlaspi cochlearioides H.f.et T.}; Hispar glacier, 4500-4800 m., Russell no. I483(BM!); Karakorum, c.4500 m., Clarke no. 30227(K!);  
W. Tibet: (without locality), Thomson(K!).

Geog. Dist:

Tibet, C. Asia, China and Japan.

4.\*D. cachemirica Gandoger in Bull. Soc. Bot. France xlvii 418 (1899); S.P. II3; P. Wendelbo in Nytt Mag. Bot. i 83 (1952).

Syn: "D. glacialis" var. B. H.f.et T. in Journ. Linn. Soc. Bot. v I50 (1861) et H.f.et T. Anders in Fl. Brit. Ind. i I42 (1872) -p. parte (excl. syn. Boiss.) [non Adams in Mem. Soc. Nat. Mosc. v I06 (1817)].

Type: Kashmir, Baltistan, Marpu nullah above Dras, 3600-3900 m., Duthie no. II800(P?,K!).

Perennial, densely or loosely caespitose; scapes 2-4 cm. long, aphyllous; rootstock often very branched, densely covered with withered

leaf bases. Radical leaves oblong-linear, 3-5x1-1.2 mm., obtuse, 1-veined, entire, hairy with intermixed branched to simple hairs, + ciliate at the margins. Racemes 8-15-flowered, corymbose, slightly elongating in fruits. Flowers 4.5-6 mm. across, yellow; pedicels 1-2.5 mm., increasing upto 5(-7) mm. in fruits, glabrous. Sepals 2-3x1.5-1.9 mm. Petals 4-6x2.5-2.8 mm., obovate-cuneate, apex subemarginate. Stamens 6, about 2 : 3 mm.; anthers about 0.6 mm. Siliculae 2-4x1.5-2.8 mm., ovate, inflated, apex acute, base rounded, glabrous; valves obscurely reticulately veined; seeds 2-4 in each loculus, about 1 mm. long, brown, septum not veined.

W. Pakistan:

Chitral: Tirich Mir, c.4500 m., ex P.Wendelbo(Herb. Oslo - not seen).

N.W. Himalayas:

Kashmir: Baltistan, 3600-3900 m., Duthie no. II800(E!,K!); Rangdum, 3900 m., Osmaston no. 207(K!);(without locality), Thomson(K!); Deosai pass, 3900 m., R.Stewart no. 20050(R-E!).

Geog. Dist: Endemic.

5. \*D. pamirica (O.Fedtsch.)Pohle in A.H.P. xxxi 485 (1914); S.P.II3.

Syn: D.alpina L. var. pamirica O.Fedtsch. in A.H.P. xxi 266 (1903).

Type: C.Asia: Pamir, O.Fedtschenko(L- not seen).

Perennial, densely caespitose; scapes 1.5-4.5 cm. long, aphyllous; rootstock much branched, covered with withered leaf bases. Radical leaves densely rosulate, narrowly spatulate, 5-10x1-1.8 mm., obtuse, + floccose-hairy with soft, white, branched or simple hairs. Racemes 5-10-flowered, corymbose. Flowers 3-4 mm. across, yellow; pedicels 1.5-3 mm., increasing upto 4.5 mm. in fruit, glabrous. Sepals 1.6-1.8x1 mm. Petals 3-3.5 x1-1.3 mm., obovate-cuneate, apex obscurely emarginate. Stamens 6, about 2 : 2.4 mm.; anthers about 0.4 mm. long. Siliculae 2.5-3.5(-6)x1.6-2 mm., ovate, inflated, glabrous, apex acute, base rounded often subsaccate; style very short, about 0.4 mm. long, with a depressed-capitate, short stigma; seeds 4-6 in each loculus, about 0.7 mm. long, oblong-ovate, brown; septum not veined.

Afghanistan:

(without locality), Griffith no. 1369(K!).

N.W.Himalayas:

Kashmir: Gilgit, Drash pass, 3900-4200m., Giles no. A200(K!).

Karakorum: Rocks above Niskikola, 5100m., Russell no. 1384  
(BM!).

Geog. Dist:C.Asia:

Pamir, 3900-4200 m., Alcock no. 17683(K!).

Turkestan, Fedtschenko(K!).

6. \*D. affghanica Boiss., Fl. Or., suppl. 55 (1888); S.P. II 7.

Syn: "D. alpina" H.f. et T. in Journ. Linn. Soc. Bot. v 150 (1861)  
et H.f. et T. Anders. in Fl. Brit. Ind. i 142 (1872) - partim  
[non Linn., Sp. Pl. ii 642 (1753)]; D. rostrata Pohle in  
Fedde, Rep. xxii 136 (1925).

Type: Afghanistan: Aitchison no. 99(G, K!).

Perennial, loosely caespitose; rootstock flexuose, + pro-  
-cumbent; scapes 1-5 cm. long, aphyllous rarely 1-leaved, pubescent. Radical  
leaves subrosulate or rosulate, oblanceolate, 4-18x1.5-5.5 mm., sessile,  
acute or obtuse, entire rarely 1-3-subdentate, hairy with somewhat rough,  
simple or branched hairs, 1-veined. Racemes (3) 5-12-flowered, corymbose,  
increasing upto 12 mm. in fruits. Flowers 5-6 mm. across, yellow; pedicels  
2-5 mm., increasing upto 10 mm. in fruit, + upcurved or spreading, hairy.  
Sepals 2.8-3x1-1.5 mm. Petals 4.8-6x1.8-2.2 mm., obovate, shortly clawed,  
apex + emarginate. Stamens 6, about 2.8 : 3.8 mm.; anthers about 0.5 mm.  
long. Siliculae 3-8x2.5-4.2 mm., ovate, subinflated, apex acute, base round-  
-ed rarely cuneate; valves faintly veined, hairy or glabrous; style 0.5-0.8  
mm. long with depressed-capitate stigma; seeds 2-4 in each loculus, about  
1 mm. long, oblong-ovate, subcompressed, dark redish-brown; septum not  
veined.

Afghanistan:

Kurram valley, H. Deane(K!); Safed koh, 4500 m., H. Collett  
no. 93(K!); Kurram valley, Shendtoi, 3300 m., Aitchison no.  
464(5)(K!); Seratgah, 3300-3900 m., Aitchison no. 825(K!);

Sikaram, 4500 m., Aitchison nos. 99(K!), I26(K!), I22(K!) and I-6 (K!); Sikaram, Harsukh no. I4995(K!).

N.W.Himalayas:

Chamba state, above Padoban, 3450-4500 m., Harsukh(K!); Kumaon, ~~Le~~ Lebung pass, 5100 m., Duthie no. 5338(BM!);  
 Kashmir: Sonmarg, 3900 m., R.Stewart no. 6554(K!);  
 Karakorum: Makerum, Hispar glacier, 4500 m., Russell no. I462(BM!)  
 W.Tibet: Kyungar pass, 4710 m., Strachey & Winterbottom(K!).

Geog. Dist: Endemic.

7. \*D. olgae Regel et Schmalh. ~~ap~~ Regel, Descrip. Pl. Nov. in Fedtsch.,  
 Reise nach Turkest. (I8) 8 (I882); Pohle in Fedde, Rep. xxxii  
 I38(I925); S.P.II9; K.F.U.400.

Type: C.Asia: Turkestan, Olga Fedtschenko(L-K!).

subsp. 1. olgae

Perennial, caespitose; scapes 5-10 cm. long, erect, aphyll-  
-ous. Radical leaves rosulate, oblanceolate or obovate-cuneate, 5-10x2-4.5  
 mm., entire, acute, densely hairy with simple or furcate, rough, ciliate  
 hairs especially at the margins. Racemes (10)15-30-flowered, corymbose  
 above, subtax, increasing upto 5 cm. in fruits. Flowers about 5 mm. across,  
 deep yellow; pedicels 5-10(-14) mm., increasing upto 16 mm. in fruit. Sepals  
 2-2.4x1.2-1.4 mm. Petals 4.5-5.7x2.4-4 mm., obovate-cuneate, apex subemarg-  
 -inate. Stamens 6, about 2 : 2.6 mm.; anthers about 0.5 mm., obtuse. Ovary  
 ellipsoid, 10-14-ovuled, hairy with simple or furcate short hairs. Siliculae  
4-6x2-3 mm., ellipsoid or oblong-ellipsoid, often slightly curved, subhairy;  
 valves obscurely veined; seeds about 0.5 mm. long.

N.W.Himalayas:

Kashmir: Baltistan, Satpura pass above Skardu, 4500-4800 m.,  
R.Stewart no. 20216(R-E!).

Geog. Dist:

C.Asia: Turkestan, O.Fedtschenko(K!); Regel(K!); Pasrud and  
 Pinchon, 1800 m., Komarov(K!); Ansob pass, 3000 m.,  
Komarov(K!).

Subsp. 2. chitralensis(Schulz)Jafri, stat. nov.

Syn: D.olgae var. Chitralensis Schulz in Pflanzenreich (89)  
 I20 (I927).

Type: Chitral(W.Pakistan), 3650 m., S.A.Harriss no. I5909(B,K!).

Perennial, caespitose, subhairy below and glabrous above. Pedicels 2-5 mm. long in flowers, subspreading. Flowers light yellow. Petals 5-6x1.2-1.4 mm. (much narrower than in the type race), oblong-obovate, apex prominently emarginate, claw about 1 mm. long. Ovary 8-ovuled.

Known from the type locality only. Distinguished from the type race by its subhairy habit, light yellow flowers, much narrower petals with emarginate apex, and only 8-ovuled ovary.

8. \*D. trinervis Schulz in Pflanzenreich (89) 131 (1927).

Type: Chitral (W.Pakistan), A.Barrett(K!).

Perennial, caespitose; scapes 1-6 cm. long, aphyllous; rootstock flexuose, much branched, covered with withered leaf bases and leaves. Radical leaves lanceolate or elliptic, 5-8x1-2.5 mm., acute, entire, 3-veined, hairy especially at margins with ciliate, simple rarely forked hairs. Racemes 5-10-flowered, corymbose above, lax, increasing upto about 2.5 cm. in fruits. Flowers 5-7 mm. across, yellow; pedicels 3-6 mm., increasing upto 10 mm. in fruit, glabrous, filiform. Sepals 2.5-3x1.5-2 mm. Petals 4.5-5.8x2.7-3 mm., obovate-cuneate, apex subrounded often somewhat oblique. Stamens 6, about 2.5 : 2.8 mm.; anthers about 0.6 mm. long. Siliculae 4-6x3 mm., ovate, inflated, glabrous; valves obscurely veined; style 0.7-1(-1.7) mm. long with short, depressed stigma; seeds 4-5 in each loculus, about 1 mm. long, ovate-oblong; septum not veined.

W.Pakistan:

Chitral: Bromalu, 3900 m., Toppin no. 739(K!); Chitral, A.Barrett(K!).

N.W.F.P.: Hazara, Sarul, Kaghan, Inayat no. 21162(K!,BM!); Saifar maluk ka Kattha, 4320 m., Ina-yat no. 19167(K!).

Geog. Dist.: Endemic to W.Pakistan.

Toppin no. 739(K!) differs from the other specimens in having styles about 1.7 mm. long, but the other characters are exactly similar. It appears that the length of the style varies in this species.

9. D. radicans Royle, Illustr. i 71 (1839); H.f. et T\* in Journ. Linn. Soc. Bot. v 154 (1861); S.P. 186.

Syn: "D. alpina" H.f. et T. Anders. in Fl. Brit. Ind. i 142 (1872) -partim (non Linn.).

Type: N.W. Himalaya, Shalma and Manma, Royle (K!).

Perennial; stem lax, often procumbent, leafy, 15-40 cm. long. Lower leaves obovate or elliptic, upper ovate, 1-2.5x0.35-1.3 cm., acute or obtuse, entire or finely and distantly toothed, sessile; all leaves hairy with short simple or branched hairs. Racemes 15-30-flowered, lax, ebracteate, increasing upto 8 cm. in fruits. Flowers 6-10 mm. across, yellow; pedicels 5-20 mm. long, increasing upto 25 mm. in fruit, filiform. Sepals 3.2-3.8x1.7-2 mm. Petals 5.5-8x1.7-2.5 mm., oblong-obovate, cuneate, apex subemarginate. Stamens 6, about 3-4 : 4.5-5 mm.; anthers about 1 mm. long. Siliculae 8-10x2-3 mm., oblong-elliptic, subcontorted, acute, sparsely hairy to glabrous; valves 1-veined; style 1.5-2 mm. long with a depressed-capitate stigma; seeds 7-10 in each loculus, biseriate, about 1 mm. long, oblong-ovate; septum not veined.

N.W. Himalayas:

Kumaon, Palang Gadh, Byans, 3420 m., Duthie no. 5344 (K!, E!, BM!); Tihri-garhwal, Kedarkanta, 3300-3600 m., Gamble no. 24315 (K!, BM!); Duthie no. 1041 (K!); W. Gollan no. 1364 (K!); Drummond nos. 20264 (K!) and 20265 (K!, E!); (without locality), Royle (K!); Palang Gadh, Byans, J.R. Reid (E!).

Geog. Dist: Endemic to N.W. Himalayas.

\*H.f. and Thomson (1861) give the following note only, "Draba radicans Royle, appears hardly to belong to this genus; it is but slightly hairy, and has a very long style to the ovary; it is not in fruit." H.f. and T. Anders (1872) include it as a synonym of "D. alpina" (non Linn.).

10. \*D. amoena Schulz in Pflanzenreich (89) 188 (1927).

Type: N.W. Himalayas, Kumaon, Byans, J.F. Duthie no. 2730 (K!).

Perennial, 50-60 cm. tall, erect, sparsely branched above; caudex very short, covered with withered leaf bases; stem slender, leafy, hairy with short, simple or branched whitish hairs. Basal leaves rosulate,

oblanceolate, 4-7x0.8-1.7 cm., sessile, margin 4-6-subdentate above and entire below, apex obtuse or acute. Cauline leaves distant, becoming gradually smaller above, narrowly oblanceolate, acute, entire or obscurely toothed. Uppermost leaves ultimately forming bracts. All leaves hairy with branched or simple, short hairs. Racemes 25-40-flowered, corumbose above, bracteate below, increasing upto 10 cm. in fruits. Flowers 10-14 mm. across, lilac; pedicels 5-13 mm., increasing upto 20 mm. in fruit, filiform, subspreading or spreading. Sepals 4-4.5x2-2.6 mm. Petals 7.5-9x4-5 mm., obovate-cuneate, apex subemarginate. Stamens 6, about 4 : 5 mm.; anthers about 1 mm. long. Fruits 10-20x3-4 mm., oblong, contorted, flattened, sparsely hairy or glabrous; valves with a distinct mid-vein and reticulate venation; style about 1 mm. long with depressed-capitate stigma; seeds 10-15 in each loculus, biseriate, about 1.3x0.9 mm., ovate, compressed, brown; septum faintly veined with a distinct mid-vein.

N.W.Himalayas:

Kumaon, near Gartyang, 3600 m., Duthie no. 2730(K!); Palang Gadh, Byans, J.R.Reid(K!).

Geog. Dist: Himalayas.

II. \*D. altaica (C.A.M.) Bunge in Delect. Sem. Hort. Dorpat. 8 (1841); B.F.S. 326; S.P.216; S.E.P.510; K.F.U.423; P.Wenelbo in Nytt Mag. Bot. i 32 (1952).

Syn: D.rupestris R.Br. var. altaica C.A.M. in Ledeb., Fl. Alt. iii 71 (1831); "D.Wahlenbergii" H.f. et T. in Journ. Linn. Soc. Bot. v 151 (1861)- non Hartm., Handb. Skand. Fl. 249 (1820); "D.Fladnitzensis" H.f. et T. Anders. in FL: Brit. India i 143 (1872)- non Wulf. in Jacq., Miscel. Austr. i 147 (1778).

Type: Altai, alpine region, Ledebour (L- not seen).

Perennial, caespitose; shoots 1-3-leaved, 2-8(12) cm. long, erect or suberect; rootstock covered with withered leaf bases or leaves. Radical leaves rosulate, usually + lanceolate, very variable, 10-25x2-5 mm., acute, entire or 1-2-dentate above. Cauline leaves ovate-oblong or narrowly lanceolate, entire or 2-4-dentate. All leaves + hairy with simple or furcate hairs, rarely subglabrous. Racemes 8-15(-20)-flower-

-ed, corymbose, capitate or slightly increasing (rarely upto 5 cm.) in length in fruits, ebracteate rarely bracteate at the base. Flowers 2-3 mm., across, white; pedicels 0.3-1.5(-2) mm., increasing upto 6 mm. in fruits. Sepals 1-1.2x0.5-0.7 mm. Petals 1.8-2.2x 0.7-1 mm., obovate-cuneate, apex subemarginate. Stamens 6, about 1; 1.4 mm.; anthers about 0.25 mm. long. Siliculae 2.5-5x1.5-2 mm., ovate-oblong, subcompressed, acute, base rounded or obtuse, glabrous or subglabrous; style upto 0.5 mm. long with short, depressed, subretuse stigma; seeds 4-6 in each loculus, about 0.7-0.8 mm. long, oblong-ovate, subcompressed, brown; septum not veined.

A very variable species especially in leaf and fruit size and shape. Status of the infra specific races are very obscure.

W. Pakistan:

Chitral: ex P. Wendelbo (Herb. Oslo- not seen)

N.W.F.P.: Kaghan valley, Hazara, Inayat nos. 21156 and 21158 a and 21159 (Herb. Dehra Dun - not seen).

N.W. Himalayas:

Kumaon, near the Lebung glacier, 4500 m., Duthie no. 2718(K!); Lahul, Beyond the Baralacha pass, c.4500 m., S.R. Kashyap(K!); Kashmir: Above Kilan, Aitchison no. 13(K!); Matayan Dras, 3300 m., Gammie(K!); Ladak, J.L. Stewart no. 35(K!); Near Harnag, upper Lidder valley, c.3900 m., R. Stewart no. 12580(K!); Mt. Kolahoi, c.4200m., R. Stewart no. 9369 A(K!); Mt. Apharwat, 4200 m., R. Stewart no. 8860(K!); Zojibal pass, 3900 m., R. Stewart no. 18246(R-E!) and no. 18204(R-E!); Khyung Tso, Rupshu, 4950 m., Koelz no. 2263(K!); Kizil Lanjar, 4950 m., Clifford (K!); Baltistan, Barila, 4200-4500 m., Duthie no. 11976(BM!); Zojila, 3300-3600 m., Duthie no. 11651(E!,K!,BM!); Kampatri nalla, near Zojila, 3600 m., Duthie no. 13670(E!,K!,BM!); Ladak, Meshoo, nallah, 4800 m., Ludlow & Sherriff no. 8454(BM!); Gangabal, lakes 3900 m., R. Stewart no. 4546(R-E!); Karakorum: 4500 m., Clarke no. 10177(K!); Between Chokutenz and Gandar, 2700-3900 m., Conway no. 206(K!); Kero Lunga glacier, 4650 m., Russell no. 1243(BM!); Shokha glacier, 5250 m., Russell no. 164((BM!); Zangia Harar, Hunza valley, 4200 m., Russell no. 1004(BM!); Makerum, Hispar glacier, 3750-4050 m., Russell no. 1433(BM!); Hispar glacier, 4500 m., Russell no. 1583(BM!); Baspu glacier, 3900-4500 m., Russell no. 1136(BM!); Rocks above Nisik La, Russell no. 1383(BM!); Makerum, Hispar glacier, 4500 m., Russell no. 1466(BM!)(with Thlaspi cochlearioides H.f. et T.); W. Tibet : (without locality), Falconer, Herb. East India Co. no. 157(K!); Thomson (K!,BM!).

Geog. Dist:

Tibet, Central and North Asia.



12. D. glomerata Royle, Illustr. 171 (1839); S.P. 220.

Syn: D. tibetica var. Winterbottomii H.f.et T. in Journ. Linn. Soc. Bot. v 152(1861)- partim.

Type: N.W.Himalayas: Soongnum, Royle (Herb. Dehra Dun- not seen).

Perennial, caespitose; shoots 2-8 cm. long, 1-4-leaved, erect, densely covered with short, white, soft, branched hairs. Radical leaves densely rosulate, narrowly oblong, 5-15x1-2.5 mm., entire, tomentose, apex rounded or obtuse. Cauline leaves oblong-ovate, sessile, entire or 1-dentate. Racemes 10-15-flowered, corymbose, ebracteate rarely bracteate at the base, slightly or not increasing in length in fruits. Flowers 2.4-3 mm. across, white; pedicels 0.4-1 mm. long, increasing upto 4 mm. in fruit, tomentose. Sepals 1-1.3x0.5-0.6 mm. Petals 2-2.2x0.8-1 mm., obovate-cuneate, apex subemarginate. Stamens 6, about 1.2 : 1.5 mm.; anthers about 0.3 mm. long. Siliculae 3.5-5(-7)x1.3-1.8 mm., narrowly oblong-ovate, flattened, contorted, subglabrous or sparsely pubescent with minute furcate hairs; valves obscurely veined; style short, (0.3-0.5 mm) with minute, sub-retuse stigma; seeds 3-6 in each loculus, about 0.6 mm. long, ovate-oblong, brown; septum not veined.

W. Pakistan:

N.W.F.P.: Ghornaka, Kaghan valley, Hazara, Inayat no. 21156 b(Herb. Dehradun- not seen); Ganjanila, Kaghan valley, Inayat no. 21157(Herb. Dehradun- not seen).

N.W.Himalayas:

Chamba state, Pangi, 3450-4500 m., Harsukh(K!); Garhwal, mane, Longstaff (BM!); Lahul, N.L.Bor no. 15468(E!)and no. 13962 (E!); Kashmir: Sonmarg, 3900 m., R.Stewart no. 7380 I/2(K!); W.Tibet: Thomson(K!);

Geog. Dist:

Tibet: Baluch pass, 4950 m., Strachey & Winterbottom no.1731 (K!); Banks of Darma Yankte, 4650 m., Strachey & Winterbottom no. 1767(K!); Hill behind Gyangtse, c. 4500 m., F.C.Chapman no. 963(K!); Rongbuk valley, 5100 m., Hingston no. 361(K!).

13. \*\*Draba ludlowiana Jafri, sp. nov. (sect. Leucodraba DC.)

Affinis D. glomeratae Royle sed racemis laxis flexuosis remotifloris, floribus minutis, silicula breve ovato-orbiculata compressa haud contorta, calyce persistente, septo obscure uninervoso recedit.

Herba perennis, caespitosa, 10-18 cm. alta, tomentosa, pilis ramosis, albis, vestita; caudex 1-1.5 mm. crassus. Folia radicalia numerosa, dense rosulata, lineari-lanceolata, 8-16x1-2(-3) mm., integra, acuta, tomentosa. Folia caulina 2-4, elliptica vel oblongo-obovata, 2-8x1-3 mm., amplexicaulia, acuta, integra. Racemus 15-20-florus, laxis, remotiflorus, superne subcorymbosus, in fructu circa 9 cm. longus. Flores minuti, 2 mm. diam., albi, omnibus partibus persistentibus. Pedicelli in fructu 2.5-7 mm. longi. Sepala 1-1.5x0.6-0.8 mm., oblongo-elliptica, obtusa, ± diversa, pubescentia, persistentia, aequalia. Petala 2.5-3x1-1.7 mm., obovato-cuneata, ad apicem emarginata. Stamina circa 1 : 1.5 mm. longa; antherae circa 0.2 mm. longae, ovoideae, obtusae. Siliculae 3-4x2.5-3 mm., ovato-orbiculatae, compressae, glabrae, haud contortae; valvae membranaceae, obsolete nervosae; stigma minutum, subsessile vel sessile. Semina 8-10, biseriata, circa 0.8x0.7 mm., suborbiculata, compressa, brunea. Septum album, membranaceum, obsolete uninervosum.

Perennial, caespitose, 10-18 cm. tall, tomentose with short, branched, soft hairs; caudex 1-1.5 mm. thick. Radical leaves densely rosulate, linear-lanceolate, 8-16x1-2(-3) mm., entire, acute, tomentose. Cauline leaves 2-4, elliptic or oblong-obovate, 2-8x1-3 mm., amplexicaule, acute, entire. Racemes 15-20-flowered, lax, distantly flowered, subcorymbose above, increasing upto 9 cm. in fruits. Flowers minute, 2 mm. in diam., white, all parts persistent; pedicels 2.5-7 mm. long in fruits. Sepals 1-1.5x0.6-0.8 mm., oblong-elliptic, obtuse, spreading, pubescent, persistent, equal. Petals 2.5-3x1-1.7 mm., obovate-cuneate, apex emarginate. Stamens about 1 : 1.5 mm. long; anthers about 0.2 mm., long, ovoid, obtuse. Siliculae 3-4x2.5-3 mm., ovate-orbicular, compressed, glabrous, not contorted; valves membranous, obscurely veined; stigma minute subsessile or sessile. Seeds 8-10, biseriata, about 0.8x0.7 mm., suborbicular, compressed, brown. Septum white, membranous, obscurely 1-veined. (Plate no. XXIX).

N.W.Himalayas:

Kashmir: Ladak, 4800 m., stony hill slopes,, flowers white,  
dated- 12. 8. 1941, Ludlow & Sherriff no. 8555, Typus  
in Herb. Mus. Brit.

Geog. Dist: Endemic to Kashmir.

Distinguished from D. glomerata Royle by its lax,  
distantly flowered, flexuose raceme; minute flowers; short, ovate-orbicular  
siliculae, compressed, not contorted; persistent calyx and obscurely  
I-veined septum.

This species appears to be somewhat intermediate between  
D. glomerata Royle and D. altaica(C.A.M.)Bunge. The habit, leaf and indum-  
-entum resemble closely with the former, while the flower and fruit charac-  
-ter with the latter.

14. \*D. winterbottomii (H.f.et T.)Pohle in Fedde, Rep. xxxii 138 (1925);  
S.P. 266.

Syn: D. tibetica var. r. Winterbottomii H.f.et T. in Journ. Linn.  
Soc. Bot. v 152 (1861)- p.parte; "D. incompta"H.f.et T.Anders.  
in Fl. Brit. India i 142 (1872)[non D. incompta Stev. in  
Mem. Soc. Nat. Mosc. iii 268 (1812)].

Type: N.W.Himalayas: Balti, ascent to Deotso, 3900 m.,  
Winterbottom no. 623(K!).

Perennial, caespitose, sometimes lax; rootstock very  
branched, covered with withered leaves; scapes 2-6 cm. long, suberect,  
aphyllous rarely I-leaved, floccose-hairy with soft, short, white, branched  
or simple hairs. Basal leaves subrosulate, ovate-oblong or spatulate,  
3-8x1-2.2 mm., obtuse or acute, sessile, floccose-hairy. Racemes 6-10-  
flowered, lax, increasing upto 3 cm. in fruits. Flowers about 5 mm. across,  
white; pedicels 2-6 mm. long, increasing upto 10 mm. in fruit, filiform,  
spreading. Sepals 2.5x1 mm. Petals 4x2 mm., obovate-cuneate, apex sub-  
-emarginate, Stamens 6, about 2 : 2.5 mm.; anthers about 0.3 mm. long.  
Fruits 5-8x1.4-1.9 mm., lanceolate or oblong-elliptic, flattened, contort-  
-ed or subcontorted, acute, glabrous or sparsely hairy at the margins;  
valves obscurely veined; style 1-1.5 mm. long with minute, subretuse stigma;  
seeds 5-8 in each loculus, about 1 mm. long; septum not veined.

N.W.Himalayas:

Kashmir: Astor, 4200 m., Duthie no. 12169(E!,K!); Burzila, 4350 m., Clarke nos. 29847 A(K!) and 29847 C(BM!); Burzila, 4500-4800 m., R.Stewart no. 20132(K!); Baltistan, Ascent to Deotso, 3900 m., Winterbottom no. 623(K!).

Karakorum: Hispar glacier, 4500-4800 m., Russell no. 1479(BM!); Crystal peak, c.4500 m., Conway no. 262(K!); Rash pass, c. 4500 m., Conway no. 155(K!);

W.Tibet: Falconer, Herb. East Ind. Co. no. 155(K!).

Geog. Dist: Endemic to N.W.Himalayas.

15. D. lasiophylla Royle, Illustr. i 71 (1839); H.f. and T. in Journ. Linn. Soc. Bot. v 151 (1861) et H.f and T. Anderson in Fl. Brit. Ind. i 143 (1872)- p.parte(excl. syn. D. glomerata Royle); S.P.279. Syn: D. nubigena Schulz in Pflanzenreich (89) 291 (1927). Type: N.W.Himalayas: Bashahr state, Royle(K!).

Perennial, caespitose; shoots 5-20(-30) cm. tall, erect or suberect, leafy, flexuose, tomentose with short, branched and long simple and forked, white, mixed hairs. Basal leaves rosulate, lanceolate, 10-20x2-5 mm., acute, entire or 1-2-dentate, densely pubescent. Cauline leaves ovate-oblong, 4-12x2-6 mm., sessile, 1-4-dentate, acute, pubescent. Racemes 10-15-flowered, lax, corymbose above, sometimes bracteate below, increasing upto 10 cm. in fruits. Flowers 3-4 mm. across, white rarely yellowish; pedicels 1-5 mm. long, increasing upto 6 mm. in fruit, filiform, pubescent. Sepals 1.5-2x0.8-1 mm.; <sup>petals 2.4-3.8x1-1.5 mm.</sup> anthers about 0.25 mm. long. Siliculae 6-10x1.5-2 mm., oblong-ellipsoid, ± contorted, pubescent with short, furcate, white hairs, sometimes subglabrous rarely glabrous; style about 0.5 mm. long with minute, subretuse stigma; seeds 10-18 in each loculus, about 0.7 mm. long, ovate, brown; septum not veined.

N.W.Himalayas:

Lahul, J.L.Stewart(E!,K!); (without locality), Royle (K!); Above Gastote, 4800 m., Edgeworth no. 101(K!); Garhwal, 4800 m., Strachey & Winterbottom(K!); Tihri-garhwal, Rhudughera, 4200-4800 m., Duthie no. 899(E!,K!); Kumaon, Milum glacier, 3900 m., Strachey & Winterbottom (K!); Kunawar, Lippani, Drummond no. 5335(E!,K!); Kulu, Dibibokri Nal, 3840 m., Schelpe

nos. 3390(BM!) and 3414(BM!); Kumaon, Luthie no. 5336(K!)  
(with D. lanceolata Royle); Kunawar, Labrang, Drummond no.  
20252(K!); Byans, J.R.Reid(E!); Bashahr state, Lace no.569(E!).  
Kashmir: Sonmarg, 3900 m., R.Stewart no. 66II(K!); Sheshnag,  
Drummond no. I4203(K!); near Mt. Kolahoi, 4200 m., R.Stewart  
no. 9369 A(K!).

Geog. Dist:

Tibet: Khambajung, Younghusband no. 84(K!); Lonok, Younghusband  
no. 208(K!); Chumbi, King no. 327(K!); Rongshar valley,  
3600 m., Hingston no. 87(K!); Sikkim, Songla, 4800 m.,  
Ribu & Rhomo no. 5348(K!); Chambi, and Phari, Dungboo (K!);  
Sikkim, Hooker f.(K!); Seha, valley, 4650 m., Gammie(K!);  
Tarkarpo, 3600 m., Rhomo no. I30(K!).

16. D. lanceolata Royle, Illustr. i 72 (1839); S.P. 296; Fernald in Rhodora  
357 (1934); K.F.U. 433.

Syn: "D. incana" H.f. et T. in Journ. Linn. Soc. Bot. v 151<sup>(1851)</sup> et  
H.f. et T. Anders. in Fl. Brit. Ind. i 143<sup>(1852)</sup> (excl. syn. Klotz.)  
[non Linn., Sp. Pl. ii 643 (1753)];

Type: N.W. Himalayas: Royle(K!).

Perennial, caespitose; shoots 5-20 cm. tall, leafy, erect  
or suberect, flexuose; rootstock covered with withered leaf bases, branched.  
Radical leaves rosulate, oblanceolate, 10-20x2-4 mm., acute or obtuse,  
sparsely 2-6-dentate to entire, shortly stalked, tomentose(homotrichous)  
with short, branched hairs. Cauline leaves narrowly lanceolate, 5-10x2-4  
mm., sessile, 4-6-dentate, acute, tomentose. Racemes 10-15-flowered, lax,  
corymbose, increasing upto 8 cm. in fruits. Flowers 2.5-4 mm. across, white,  
the lower most often bracteate; pedicels 1-2.5mm. (rarely 4-6 mm.), increas-  
-ing upto 5 mm. (rarely upto 9 mm.) in fruit. Sepals 1.5-2.2x0.7-1 mm.,  
Petals 2.2-4.2x1-1.8 mm., obovate-cuneate, apex subemarginate. Stamens 6,  
about 1.6-2:2-3 mm.; anthers about 0.4 mm. long. Fruits 6-14x1.5-2 mm.,  
linear-oblong, flattened, + hairy with minute branched hairs, rarely glab-  
-rous or subglabrous; style 0.5-0.7 mm. long with short, obscurely retuse  
stigma; seeds 16-20 in each loculus, about 0.7 mm. long, oblong-ovate,  
brown; septum not veined.

W. Pakistan:

N.W.F.P.: Besar, Hazara, 3400 m., Inayat(Herb. Dehradun-notseen).

N.W. Himalayas:

(without locality), Royle(K!); Rotang, Kohsir, Drummond no.

20262(K!); Khardong Int., Drummond no. 20257(K!); Kunawar, Jacquemont(K!); Kumaon, Byans, 4200-4500 m., Duthie no. 5336(K!); (with D.altaica); Upper Chenab valley, R.Ellis no. 370 A(K!); near Purti, 2400 m., R.Ellis no. II66(K!);  
 Kashmir: Baltistan, 3150 m., Winterbottom(K!); Pahlgam, 3900 m., R.Stewart n. 5583(K!); Sonmarg, 3600 m., R.Stewart nos. 98II A (K!) and 4857(K!); Harnag, 3900 m., R.Stewart n. 9354(K!); Mitsa-hoi, 3450 m., R.Stewart no. IOOI7(K!); Shishnag, 3600 m., R.Stewart no. I2582(K!); Sonmarg, 3900 m., R.Stewart nos. 7334(K!), and 7269(K!); Saskatti, Drummond no. I4252(K!); Astanmarg, 3600-3900 m., Drummond no. I4294(E!,K!); Zojila, 3600-4000 m., Duthie no. II667(K!); (without locality), Thomson(K!); Zoji pass, 3300 m., R.Stewart no. 2I234(R-E!);  
 Karakorum : Zangia Harar, Hunza valley, 4200 m., Russell no. IOO7 (BM!); Barpu glacier, 3900-4500 m., Russell no. II34(BM!); Karakorum glacier, 3000-3300 m., Conway no. 34(K!); Karakorum, 4200 m., Clarke no. 3OI9I A(K!)(with D.stenocarpa H.f.et T.).

Geog. Dist:

Tibet, C. and N.Asia; also in N.America.

R.Stewart no. 9888(K!) from Kashmir(Nichanai pass, 3900 m.) was determined as a hybrid between D.lanceolata Royle and D.lasiophylla Royle by Schulz[Fedde, Rep. xxxi 33I (1933)]and was named D.nichanaica Schulz. It very closely resembles D.lanceolata in its habit and indumentum but the fruits are abortive and ill developed(suggestive of hybridity). The taxonomic status of this is not clear because there is no experimental work to prove it. I would, therefore, prefer to include it as an unusual form of D.lanceolata.

- 17. D. tibetica H.f.et T. in Journ. Linn. Soc. Bot. v I52 (186I)(excl. var. B.and r.); F.B.I. I44(excl. var. 2 ); S.P. 300; K.F.U.4I2; P.Wendelbo in Nytt Mag. Bot. i 33 (1952).

Syn: D. Turkestanica Regel et Schmalh. in Regel, Descrip. Pl. Nov. O.Fedtsch. 7 (1882); D. Transchellii Litw. in Trav. Mus. Bot. Ac. Sc. i I4 (1902); D. Thomsonii Pohle, Drab. Asiat. I4I (1925).

Type: W.Tibet: Zanskar, 3600-4200 m., Thomson(K!).

var.I. tibetica.

Perennial, caespitose ; shoots 6-20 cm. long, flexuose, 0-2-leaved, erect or suberect, simple, floccose-hairy with short, white, soft, branched hairs. Radical leaves rosulate, oblanceolate or oblong-elliptic, 7-20x2-5 mm., sessile, acute, entire clothed with similar hairs

as on stems. Racemes 5-10-flowered, corymbose above, increasing upto 10 cm. in fruits and becoming lax. Flowers about 5 mm. across, yellow; pedicels 3-5 mm., increasing upto 22 mm. in fruit, filiform, pubescent, ascending. Sepals 2.5-2.9x1.2-1.8 mm. Petals 4.5-5x2-2.2 mm., Obovate, shortly clawed, apex subemarginate. Stamens 6, about 2.5-2.8 : 3-3.5 mm.; anthers about 0.5 mm. long; filaments broad at the base. Fruits 6-18x1.5-1.8 mm., linear, compressed, rarely subcontorted, acute, pubescent with short, branched, hairs; style 0.5-1 mm. long with short, capitate stigma; seeds 8-12 in each loculus, biseriate, about 0.7 mm. long, brown, oblong-ovate, subcompressed; septum not veined.

W. Pakistan:

Chitral: Shajanali, 3000-3300 m., Toppin no. 255(K!); Below Zapotili, c. 3600 m., Wendelbo (Herb. Oslo- not seen).

N.W. Himalayas:

Above Kandong, Drummond no. 20258(K!); Kandong Int., Drummond no. 2026(K!).

Kashmir: Ladak, Khardong pass, R. Meinertzhagen no. 47(BM!).

Geog. List:

C. Asia.

Var. 2. chitralensis (Schulz) Jafri, comb. nov.

Syn: D. sikkimensis var. chitralensis Schulz in Pflanzenreich (89) 265 (1927); "D. armena" H.f. et T. in Journ. Linn. Soc. Bot. v 152 (1861).

Type: Chitral (W. Pakistan), 4150 m., S.A. Harriss (Herb. Dehra-Dun- not seen).

Perennial, caespitose. Pedicels 4-5 mm. long in fruits.

Valves densely pubescent to pubescent.

Distinguished from the type race by its short pedicels.

W. Pakistan:

Chitral: 4150 m., Harriss (Herb. Dehra-Dun- not seen).

Afghanistan:

Kohi Baba, 4200-4500 m., Griffith (K!).

D. sikkimensis (H.f. et T.) Pohle is confined to the East Himalaya (Sikkim) while D. tibetica H.f. et T. is common in the N.W. Himalayas.

Hooker f. and Thomson(1861) regarded the two as one species but under two different varieties. The characters given by Schulz(1927) for his var. chitralensis is intermediate between the two species. Griffith's plants from Afghanistan (regarded as "D.Armena" by H.f.et T.) are almost identical with this variety. A careful study shows that they resemble closely the specimens of D.tibetica, except that the pedicels are short. As D.tibetica is common in the present area and D.sikkimensis is endemic to E.Himalaya and does not occur in the present area, I have preferred to recognize the var. chitralensis under the former.

18. \*D. falconeri Schulz in Pflanzenreich (89) 300 (1927).

Type: Kashmir, Aliabad, 3150 m., C.B.Clarke no. 28697(B,K!).

Perennial, 20-50 cm. tall, + decumbent, flexuose, sparse-ly branched, distantly leaved with 6-12 cauline leaves, hairy with branched or simple hairs. Basal leaves rosulate, oblong-obovate, 8-15x2-5 mm., acute, entire or 1-dentate. Cauline leaves 10-35x4-10 mm., very variable in size and shape, usually oblong-obovate, acute, dentate to entire. All leaves hairy with branched and simple hairs. Racemes 15-40-flowered, corymbose above, increasing upto 30 cm. in fruits and becoming lax, ebracteate. Flowers 4-5.5 mm. across, white; pedicels 2.5-8 mm. long, increasing upto 25 cm. in fruit, filiform, ascending, hairy. Sepals 2-3x1-1.2 mm. Petals 4-6x1.5-2.2 mm., obovate, shortly clawed, apex subemarginate. Stamens 6; about 2.2 : 2.5 mm.; anthers about 0.5 mm. long. Fruits 10-20x2-3 mm., linear-oblong, + contorted, hairy with short, branched hairs; style 0.5-0.8 mm. long with depressed-capitate stigma; seeds 10-14 in each loculus, about 1 x 0.7 mm.; septum not veined.

W. Pakistan:

N.W.F.P.: Hazara, Sarul, Kaghan valley, Inayat no. 21155(K!);  
Hazara, Kaghan valley, 2500 m., Inayat no. 19189  
(Herb. Dehradun- not seen).

N.W.Himalayas:

Kashmir: Aliabad, 3150 m., Clarke no. 28697(K!); and no. 28955A (K!); Drummond no. 13922(K!); Sonmarg, 2550 m., Clarke nos. 30907(K!), 30911(K!) and 30911 B(BM!); Sonmarg,



3300 m., tall weak plants straggling in grass, R. Stewart no. 7268 (K!); Gulmarg, 3900 m., R. Stewart no. 8603 (K!); Pir Fanjal, Inayat no. 25503 (K!); W. Tibet, Falconer, Herb. E. Ind. Co. no. 153 (K!).

Geog. Dist:

Endemic.

Schulz (1927) when describing this species did not quote Falconer's specimen [Herb. East India Co. no. 153 (K!)] from W. Tibet on which C. B. Clarke has written in his own handwriting "D. incana var. Falconeri." Perhaps he did not have access to this specimen.

19. \*D. nemorosa L., Sp. Pl. ii 643 (1753); S.P. 309; K.F.U. 451.

Syn: D. nemoralis Ehrh., Beitr. vii 154 (1792); D. macroloba Turcz. in Bull. Soc. Nat. Mosc. xxvii (4) 341 (1854); "D. muralis" H.f. et T. Anders. in Fl. Brit. India i 144 (1872) [non Linn., Sp. Pl. ii 642 (1753)].

Type: Europe (not precisely designated) no. 5 (LS!).

Annual, sometimes biennial, 5-25(-40) cm. tall, erect, branched mostly from the base, leafy. Basal leaves rosulate, oblong-obovate, 8-35x3-15 mm., obtuse, remotely dentate to subentire, sessile. Cauline leaves distant, oblong-ovate, 5-28x2.5-12 mm., sessile, acute, 3-6-subdentate. All leaves, + hirsute with simple and branched hairs. Racemes 25-90-flowered, corymbose, ebracteate, increasing upto 25 cm. in fruits. Flowers minute, about 2 mm. across, light-yellow; pedicels 5-10 mm. long, increasing upto 26 mm. in fruit, filiform, spreading or ascending. Sepals 1-1.2x0.6-0.7 mm. Petals 1.6-1.8x0.5-0.7 mm., obovate-oblong, cuneate, apex subemarginate. Stamens 6, about 1.7-1.9 mm.; anthers about 0.25 mm. long. Siliculae 5-8x 1.5-2.5 mm., oblong-ellipsoid, inflated, + hairy with short, simple or furcate hairs; stigma minute, subretuse, subsessile; seeds 10-18 in each loculus, about 0.6 mm. long, ovoid, brown; septum not veined.

N.W. Himalayas:

Kashmir: Pahlgam, Lidder valley, Inayat no. 25504 (K!); Nabug nag valley, 1680 m., Winterbottom no. 212 (K!); (without locality), Thomson (K!).

Geog. Dist: C. and S.E. Europe, Mediterranean region, C. and N. Asia, China and Japan, and N. America.

Distinguished from D. muralis L. primarily by its long pedicels, subdentate leaves, and usually many, smaller seeds.

20. \*D. melanopus Komarov in Trav. Soc. Nat. Petersb. Bot. xxvi 102 (1896); S.P.317; K.F.U. 453.

Syn: "D. linearis" Pohle in Fedde, Rep. xxxii 20 (1925) [non Boiss. in Ann. Sc. Nat. ser. II xvii 167 (1842)].

Type: Turkestan, Serawschan, Komarov (L- not seen).

Perennial, very branched from the base, 5-8 cm. long, suberect; shoots filiform, aphyllous, rarely 1-leaved, + hairy below with simple or forked hairs, subglabrous or glabrous above. Basal leaves oblong-elliptic, rosulate, 5-14x1.5-3 mm., obtuse or acute, entire, hairy. Racemes 3-15-flowered, lax. Flowers about 2.5 mm. across, light-yellow; pedicels 1-4 mm., increasing upto 8 mm. in fruit, filiform, glabrous, spreading. Sepals about 1.5x0.8 mm. Petals 2.4-2.8x1 mm., obovate-cuneate, apex sub-emarginate. Stamens 6, about 1.7 : 2 mm.; anthers about 0.25 mm. long. Siliculae 5.5-7x1-1.5 mm., linear, subcompressed, acute, glabrous or sub-hairy with mostly simple, short hairs, sometimes sparsely and ciliate hairy at the margins; style 0.3-0.5 mm. long with short, depressed stigma; seeds 8-12 in each loculus, biseriate, about 0.7 mm. long, oblong-ovate, brown; septum not veined.

N.W. Himalayas:

Kashmir: Gilgit, Tin pass, 3600-4200 m., Giles(K!).

Geog. Dist: C. Asia.

21. \*D. tenerrima Schulz in Notizblatt xi 640 (1932)-cum var.

Type: Kashmir, W. Koelz no. 2451(B,K!).

Annual, 1.5 - 4.5 cm. tall, erect; stem simple, filiform, scapose. Basal leaves rosulate, few, obovate or elliptic-oblong, 2-8x1.5-3.5 mm., obtuse or acute, sessile or subsessile, entire or 1-dentate, subglabrous or sparsely hairy with simple or furcate hairs. Racemes 2-6-flowered, ebracteate, lax. Flowers about 1 mm. across, incomplete (without petals). Pedicels about 0.5 mm., increasing upto 4 mm. in fruit, filiform, glabrous. Sepals about 1 x 0.6 mm., oblong, subequal, persistent, glabrous. Petals

absent. Stamens 4, outer two suppressed, about 1 mm. long; anthers minute, about 0.2 mm. long. Siliculae obovate or broadly elliptic, 2.5-4x1.5-2.5 mm., compressed, apex rounded; valves membranous, obscurely veined, glabrous or sparsely hairy; stigma minute, sessile; seeds 2-3 in each loculus, about 0.7 mm. long, compressed, ovate, black; septum not veined.

N.W.Himalayas:

Kashmir: Ladak, Shushal, 4260 m., in shade among grasses, W.Koelz no. 2451(K!); Nunu, 4350 m., W.Koelz no. 2345(R-E!).

Geog. Dist: Endemic to Kashmir(N.W.Himalayas.).

22. D. stenocarpa H.f.et T. in Journ. Linn. Soc. Bot. v 153 (1861); S.P. 318; K.F.U. 450; P.Wendelbo in Nytt. Mag. Bot. i 32 (1952).  
 Syn: "D. linearis"H.f.et T.Anderson in Fl. Brit. India i 144 (1872)[non Boiss. in Ann. Sc. Nat. ser.II xvii 167(1842)];  
D. media Litw. in Trav. Mus. Bot. Ac. Sc. i 12 (1902).  
 Type: N.W.Himalayas: Balti, Das Kirin, Winterbottom no. 679(K!).

Annual, 12-40 cm. tall, erect, often branched from below, covered with simple or furcate hairs; stems leafy, flexuose. Basal leaves rosulate, oblong-obovate or oblong-elliptic, 1.6-4.5x0.2-1.8 cm., sessile, acute, subdentate to entire. Cauline leaves few, lanceolate, (1)3-6(-7) only, sessile, acute. All leaves entire or 1-3-dentate, hairy with simple and furcate hairs. Racemes 20-60-flowered, corymbose above, lax, increasing upto 20 cm. in fruits. Flowers 3.5-4 mm. across, yellow; pedicels 5-10 mm. long, increasing upto 25 mm. in fruit, filiform. Sepals 2-2.2x1 mm. Petals 3.5-4x1-1.2 mm., obovate-oblong, apex submarginate. Stamens 6, about 2 : 2.2 mm.; anthers about 0.25 mm. long. Fruits linear, 8-20x1.6-1.8 mm., + erect on spreading pedicels, subhairy with simple or furcate hairs; valves obscurely veined; stigma minute, obscurely retuse, subsessile; seeds 14-20 in each loculus, biseriate, about 0.7 mm. long, ovate, brown; septum not veined.

W.Pakistan:

Chitral: P.Wendelbo(Herb. Oslo- not seen).

N.W.Himalayas:

Lahul, Pukar, 3450 m., W.Koelz no. 8480(R-E!); Lahul, Schlagintweit no. 3702(BM!); Keylang, Drummond nos. 20259(K!) and 20263(K!); Sisul, Drummond no. 20256(K!); (without locality), J.L.Stewart no. 24(K!); Kohsir, Drummond no. 20255(K!); Kashmir: Mitsahoi, Ladak Rd., c.3300 m., R.Stewart no. 10018(K!); Baltistan, Dras valley, c.3600 m., Duthie no. II638(K!); Astor, above Doyan, 3600-3900 m., Duthie no. I2467(K!); Baltistan, Zojila, 3300-3600 m., Duthie (BM!,K!); Sonmarg, 3600 m., R.Stewart no. 7268(R-E!); Karakorum: Zangia Harar, Hunza valley, 3900 m., Russell no. I063 (BM!); Makerum, Hispar glacier, 3750 m., Russell no. I407 (BM!); Sat village, 2400 m., Conway no. 304(K!); W.Tibet: Balti, Das Kirin, Winterbottom no. 679(K!).

Geog. Dist: C.Asia.

23. \*\*Draba aubrietioides Jafri, sp. nov. (sect. Drabella DC.)

Affinis D.chölaensi W.W.Sm. sed pilis ramosis + vestita, pedunculis multifloris, siliqua glabra lineari-lanceolata, stylo breve, stigmatibus minuto depresso-capitato, seminibus majusculis angustissime alatis differt.

Radix perennis; rami annui numerosi, filiformes, circa 1 mm. crassi, prostrati, foliosi, flexuosi; planta habitu Aubrietiae valde similis; pilis ramosis minutis + vestita. Folia numerosa, alternata, elliptico-obovata, 1-2.3x0.3-0.7 cm., cuneata, subsessilia, acuta vel obtusa, integra vel rarius 1-3-subdentata, membranacea. Racemus 8-16-florus, ebracteatus, laxis, in fructu fere 15 cm. longus. Flores ignoti. Pedicelli 1-2.7 cm. longi, filiformes, suberecti. Siliquae lineari-lanceolatae, 1.2-2.5x0.23-0.27 cm., compressae, saepe diverse curvatae non contortae, glabrae; valvae membranaceae, obscure reticulatae, nervo medio tenue; stylus vix 1 mm. longus, tenuis; stigma minutum, depresso-capitatum; semina 10-20, sub-biseriata, circa 1.8 x 1 mm., oblonga, compressa, angustissime alata, brunea; septum membranaceum, album, nervo medio obscuro.

Radix perennialis; branches annual, numerous, filiform, about 1 mm. thick, prostrate, leafy, flexuose; plants habit very much like Aubrietia; clothed with minute, branched hairs. Leaves numerous, elliptico-obovate, 1-2.3x0.3-0.7 cm., cuneate, sessile, acute or obtuse, entire or rarely 1-3-subdentate, membranous. Racemes 8-16-flowered, ebracteate, lax,

increasing upto 15 cm. in fruits. Flowers not seen. Pedicels 1-2.7 cm. long, filiform, suberect. Siliquae linear-lanceolate, 1.2-2.5x0.23-0.27 cm., compressed, often variously curved, not contorted, glabrous; valves membranous, with a distinct mid-vein and obscure reticulate venation; style hardly 1 mm. long; stigma minute, depressed-capitate; seeds 10-20, sub-biseriate, about 1.8 x 1 mm., oblong, compressed, margin slightly winged, brown; septum membranous, white with an obscure mid-vein. (Plate no. XXX).

N.W.Himalayas:

Kashmir: Kishenganga valley, Sharda, 1800 m., damp cliffs, dated- 20. 7. 1939, R.Stewart no. 17760(K!,R-E!);  
Badwan, 2400 m., Shady cliffs, in mats, dated- 12. 7. 1946, R.Stewart no. 22594(K!).

This species is closely allied to D. cholaensis W.W.Sm. and D. sachalinensis F.Schmidt. It is distinguished from D. cholaensis by its somewhat dense minute branched hairs(not sparsely simple or forked), many flowered peduncle (not 3-5-flowered), glabrous siliquae (not sparsely hairy), very short style (not 1.5-2 mm. long), minute depressed-capitate stigma (not broader than the style and bilobed), <sup>or d</sup> large winged seeds( not 1-1.5x0.75 mm. and not winged). It is distinguished from D. sachalinensis by its long, prostrate, filiform branches, not densely pubescent, mostly entire leaves, few-flowered racemes (not 20-30-flowered) long pedicels, glabrous and not contorted siliquae. D. cholaensis is confined to E. Himalaya and D. sachalinensis to N.Asia. The present new species, D. aubrietoides, is only known from Kashmir.

24. \*D. gracillima H.f.et T. in Journ. Linn. Soc. Bot. v 153 (1861); F.B.I. 144; Schulz in Notizblatt ix 1076 (1927); S.P. 328.

Syn: "D.lanceolata" Klotz. et Gar., Bot Ergebn. Reise Waldem. 128 (1862)(non Royle).

Type: E. Himalaya, Sikkim, 2100-3900 m., J.D.Hooker(K!).

Perennial; branches many, annual, filiform, flexuose, + procumbent, 3-15(-25) cm. long, + hairy with simple or furcate hairs, rarely glabrous, leafy. Basal leaves rosulate, obovate-spathulate, 10-20

x4-5 mm., acute, distantly toothed to subentire, + hairy, margin often ciliate; cauline leaves ovate or elliptic, sessile, acute, distantly I-2-dentate, often sparsely hairy. Racemes 5-10-flowered, lax, increasing upto 15 cm. in fruits, ebracteate. Flowers 2.5-3 mm. across, yellow; pedicels 5-25 mm. long, increasing upto 30 mm. in fruit, filiform. Sepals 1.6-2x0.8-1 mm. Petals 2.4-2.8x0.8-1 mm., oblong-obovate, cuneate, apex subemarginate. Stamens 6, about 1.8 : 2 mm.; anthers about 0.3 mm. long. Fruits 6-14x1.5-2.2 mm., linear, compressed, subcontorted, glabrous; valves obscurely veined; style 0.3-0.4 mm. long with minute, depressed, stigma; seeds 6-10 in each loculus, biseriate, about 1 mm. long, ovate, brown; septum not veined.

N.W. Himalayas:

Kumaon, Ralam valley, 4000-4300 m., Duthie (Herb, Dehradun-not seen).

Geog. Dist:

Tibet: Karma valley, 4350 m., Wollaston no. 200(K!); Yatung, Hobson(K!); Samchung, 4800 m., Wollaston no. 163(K!).  
Sikkim: J.D. Hooker(K!); Dikchoo, 3300 m., Clarke no. 27808 (K!); Sundukphoo, 3600 m., Clarke no. 34986 A(K!); Zemu valley, 3240 m., Smith & Cave no. 1160(K!).

48. EROPHILA DC., Syst. Nat. ii 356 (1821) et Prodr. i 172(1824)- nomen conservandum; B.H.G.P. 75; B.F.O. 303; F.B.I. 144; S.P.343; S.E.P.518; K.F.U.454.

Syn: Gansblum Adans., Fam. ii 420 (1763).

Annual, rarely biennial, very variable in size; scapes + flexuose in fruits, aphyllous, erect or suberect. Radical leaves rosulate, oblong-obovate, cuneate, hairy or glabrous, sparsely dentate to subentire, acute or obtuse; hairs usually furcate. Racemes ebracteate, rarely one leaved, corymbose above, lax in fruits. Flowers minute, white rarely pale pink; pedicels filiform, flexuose in fruit, subspreading. Sepals almost equal, subspreading, not saccate. Petals about twice as long as the sepals, apex deeply bifid; lobes oblong or linear, almost equal. Stamens 6, not appendaged; anthers short, ovoid, obtuse. Lateral nectariferous glands in pairs, minute, conical; median absent. Ovary elliptic, 10-60-ovuled; style short, stigma depressed. Fruits oblong-elliptic or narrowly obovate,

bilocular, dehiscent; valves compressed or subcompressed, membranous, rarely subcontorted, somewhat reticulately veined; seeds biseriate, ovate, brown, tuberculated; septum membranous, not veined.

About 8 species in Europe, N.Africa and W.Asia.

Erophila verna (L.)Besser, Enum. Pl. Volhyn. 71 (1822); S.P.345; K.F.U. 456.

Syn: Draba verna L., Sp. Pl. 642 (1753); H.f.et T. in Journ. Linn. Soc. Bot. v 142 (1861); E. vulgaris DC., Syst. Nat. 356 (1821); B.F.O.304; F.B.I. 145.

Type: Europe(not precisely designated) no. 2(LS!).

Annual, 3-25 cm. tall, erect or suberect, + hairy below with furcate hairs, and glabrous above. Basal leaves rosulate, few to many, oblanceolate or oblong-obovate, very variable in size, entire to 1-2-dentate, acute, margin often ciliate hairy. Scapes aphyllous rarely 1-leaved. Racemes 10-20-flowered, corymbose above, flexuose in fruits. Flowers 2-2.5 mm. across, white rarely pinkish; pedicels 2-6 mm. long, increasing upto 25 cm. in fruit, filiform, subspreading or ascending, glabrous. Sepals 1.4-2x0.6-0.8 mm. Petals 2-3x1-1.6 mm., obovate-cuneate, deeply bifid at the apex. Stamens 1.4-1.6 : 1.6-1.9 mm.; anthers about 0.25 mm. long. Fruits elliptic or obovate-oblong, 6-9x2-4 mm.; valves membranous, glabrous, reticulately veined, sometimes subcontorted; seeds minute, 0.3-0.6 mm. long; septum not veined.

W.Pakistan:

Chitral: Dam gol, 1500 m., in stony ground, Toppin no. 20(K!).

Afghanistan:

(without locality), Griffith(K!); Kurrum valley, in old gravel, beds of streams, Aitchison nos. 140(K!)and 1154(K!).

N.W.Himalayas:

(without locality), Thomson(K!);

Kashmir: Pahlgam, Lidder valley, Inayat(K!); Falconer(K!).

Geog. Dist: Europe, N.Africa & Orient, N. and C. Asia. Introduced in N.America.

A very polymorphic species, primarily due to the existence of many "obligately self-pollinated pure lines" (Heslop-Harrison,

New Concepts in Flowering-plant Taxonomy, p.46 (1953)].

Inayat's specimens from Kashmir are somewhat distinct from the other specimens of the present area in being robust (20-25 cm. tall).

49. \*GRAELLSIA Boiss. in Ann. Sc. Nat. ser. II xvi 379 (1841) et xvii 172 (1842); B.H.G.P. 72; B.F.O. 306; S.E.P.524; K.F.U.201.

Perennial, subcaespitose, glabrous; shoots very sparsely leaved or aphyllous. Radical leaves long petioled with short, + reniform or rounded, broadly toothed rarely subentire lamina. Upper leaves if present, minute sessile or subsessile, linear, dentate. Racemes ebracteate short, subcorymbose, usually slightly increasing in length in fruits, rarely flexuose. Flowers small, white; pedicels filiform, flexuose, often spreading or deflexed, rarely short and strong. Sepals almost equal, sub-erect, not saccate. Petals about twice as long as the sepals, obovate-erbicular, shortly clawed, apex rounded. Stamens 6, not appendaged; anthers short, obtuse. Lateral nectariferous glands ring-shaped, open towards the outer side; median present, joining the laterals. Ovary elliptic, 4-ovuled, shortly stipitate; style short with depressed stigma. Fruits + elliptic, indehiscent or subdehiscent; valves membranous, plane or sub-contorted, glabrous; septum membranous, often incomplete (windowed); seeds 1-2 usually mature, ovate or suborbicular, not winged.

About three species in Persia, Afghanistan and W.Pakistan.

Key to the species:

- I.(a). Racemes slightly increasing in length in fruits; fruits 5-15x2-6 mm., indehiscent .....1. G. saxifragifolia.  
 I.(b). Racemes flexuose, increasing considerably in length in fruits; fruits 5-7x1.5-2 mm., subdehiscent .....2. G. chitralensis.

I. \*\*G. saxifragifolia (DC.) Boiss. in ANN.Sc. Nat. ser. II xvi 379 (1841) et Fl. Or. i 307 (1867); S.E.P.524; K.F.U.202.

Syn: Cochlearia saxifragifolia DC., Syst. 370 (1821);

Type: Persia, Mt. KhuDaena, Kotschy no. 767(G,K!).

Perennial, subcaespitose, erect, ~~sub~~ glabrous. Radical leaves rosulate, long stalked; lamina 0.8-2x1-2.5 cm., kidney-shaped or suborbicular, usually broadly 5-toothed; petiole 2.5-12 cm. long with



3-5 mm. broad sheathing base. Cauline leaves few, much smaller, 1-2x0.3-0.6 cm., shortly stalked or sessile, 1-3-toothed. Racemes 15-20-flowered, ebracteate, increasing upto 5(-8) cm. in fruits. Flowers about 5 mm. across, white; pedicels 4-8 mm. long, increasing upto 15 mm. in fruit, filiform, + spreading. Sepals 2-2.6x1-1.4 mm. Petals 3.5-5x2-3 mm., obovate-cuneate, apex rounded. Stamens 1.7-2.2 : 2.5-3 mm.; anthers about 0.6 mm. long. Fruits oblong-elliptic, 5-15x2-6 mm.; valves subinflated, plane, often subcontorted, glabrous; style about 0.4 mm. long with short, depressed stigma; seeds 1-2(-4), about 2-3x1.2-2 mm.; septum incomplete, often confined to the margins only.

Afghanistan:

Paghman, 2550 m., growing in crevices in rocks, W.R.Hay no. 139(K!); Tangi gharu, 1650 m., growing in crevices, white flowers fall off as soon as picked, W.R.Hay no. 51(K!).

Geog. Dist: Persia and Iraq.

2. \*G. chitralensis Schulz in Notizblatt ix 1085 (1927); S.E.P.524.

Type: Chitral (W. Pakistan), Tarashmir, 5650 m., Harriss (B-not seen)

Perennial with thickened root; stems about 20 cm. long in fruits, simple, aphyllous or very sparsely leaved. Basal leaves with 5-7 cm. long stalks, lamina 10-18 mm. in diam., reniform, about 5-toothed. Cauline leaves about 6x3 mm., elliptic. Racemes 12-25-flowered, ebracteate flexuose, increasing upto 15 cm. in fruits. Flowers not seen. Pedicels 5-15 mm. long in fruits, ascending, somewhat thickened. Fruits oblong or lanceolate, acute, 5-7x1.5-2 mm., often curved, subdehiscent or dehiscent.

Known from the type locality only. I have seen the photograph of Harriss's specimen from Chitral at Kew, which looks very distinct from the other species, G. saxifragifolia, especially in its long racemes, thickened pedicels and somewhat dehiscent fruits.



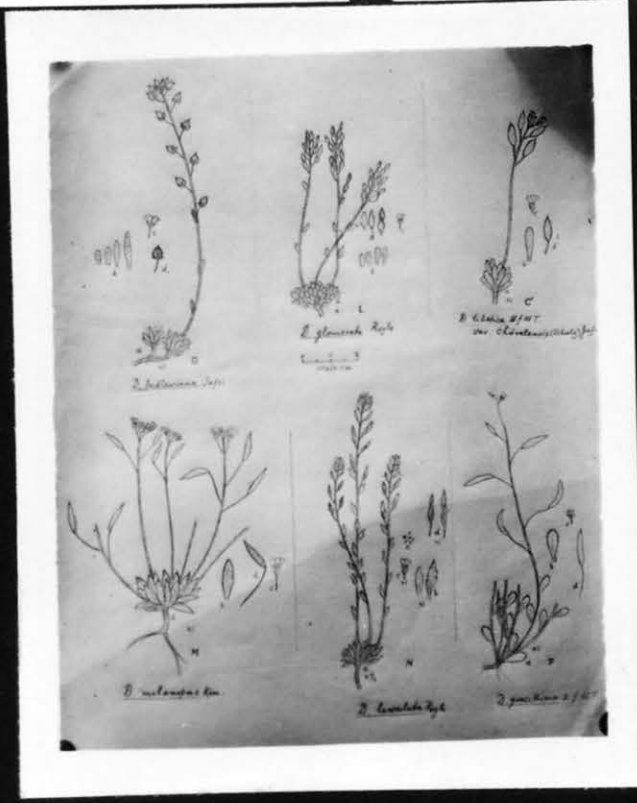
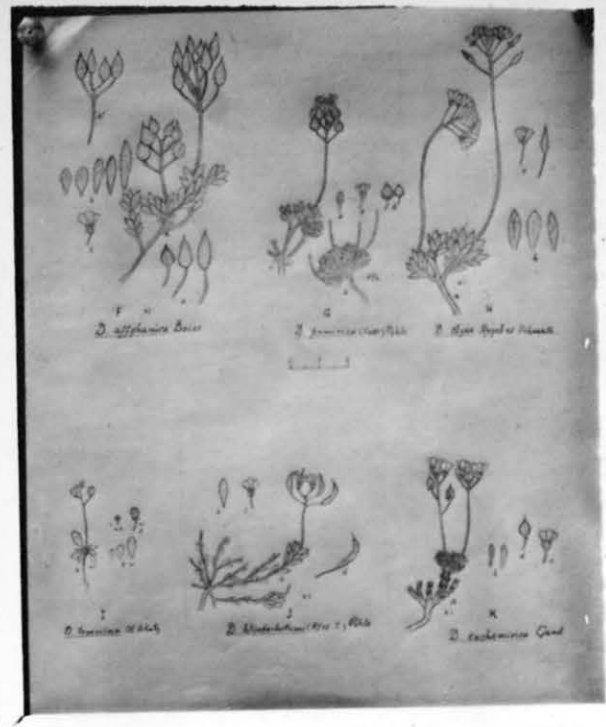
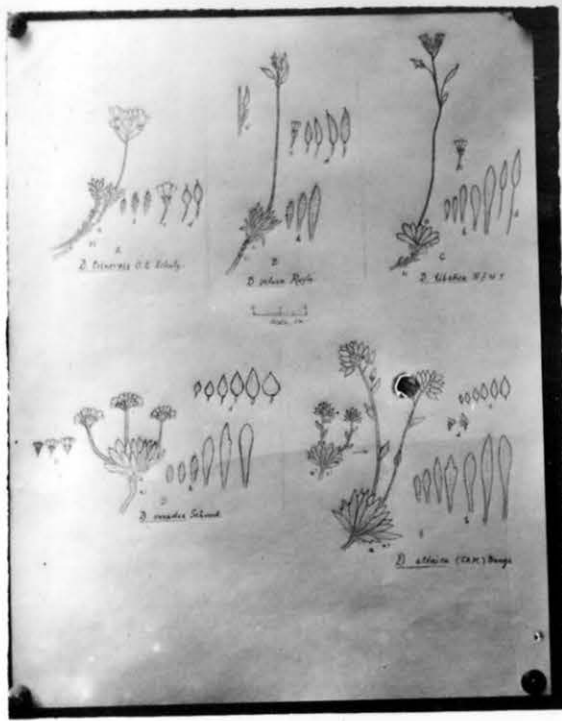


Fig. no. 17  
Draba spp.

A - Draba trinervia Schulz; B - D. setosa Royle; C - D. tibetica H.f. et T.;  
 var. tibetica; C' - D. tibetica var. chitralensis (Schulz) Jafri; D - D. oreades  
 Schrenk; E - D. altaica (C.A.M.) Bunge; F - D. affghanica Boiss.; G - D. pamirica  
 (Fedtsch.) Pohle; H - D. olgae Regel et Schmalh.; I - D. tenerrima Schulz;  
 J - D. winterbottomi (H.f. et T.) Pohle; K - D. cachemirica Gandoger; L -  
D. glomerata Royle; M - D. melanopus Kom.; N - D. lanceolata Royle; O -  
D. ludlowiana Jafri; P - D. gracillima H.f. et T.

[ a - habit; b - variation in leaf size and shape; c - flower; d -  
 variation in size and shape of fruits.]

TAXONOMIC STUDY ON CAPPARIDACEAE AND  
CRUCIFERAE OF W. PAKISTAN, AFGHANISTAN,  
AND N. W. HIMALAYA.

BY

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DEPARTMENT OF BOTANY

UNIVERSITY OF EDINBURGH

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—

THESIS FOR Ph.D.

OCTOBER, 1954.

—  
First Copy.



Tribe VII. Arabideae - according to O.E.Schulz in Pflanzenfam  
(17 b) 526 (1936).

Lateral <sup>c</sup>nectariferous glands various, often annular or semi-annular, simple or variously lobed; median present or absent. Hairs simple, branched or absent. Sepals subequal, suberect or somewhat spreading. Stamen filaments without appendages, rarely toothed. Ovary sessile or with short gynophore; stigma capitate, often subbilobed. Siliquae usually linear (rarely ellipsoid or subglobose), compressed or subcompressed rarely terete, bilocular, dehiscent; seeds uniseriate rarely biseriate, usually not winged; radicle accumbent.

Key to the eleven genera of the tribe Arabideae

- I. Siliquae compressed; valves flat, with or without a mid-rib:
  2. Valves opening suddenly and coiling spirally upwards;
    - ..... (Leaves pinnate).....50. Cardamine
  2. Valves not opening suddenly; <sup>and not coiling spirally upwards</sup> (leaves sinuate-toothed to entire, sometimes lyrate, very rarely pinnate):
    3. Plants robust; basal leaves soon withering; siliquae (long) sub-appressed; seeds usually biseriate .....57. Turritis
    3. Plants often small; basal leaves not withering; siliquae (short or long) + spreading, seeds usually uniseriate (biseriate in some species of Christolea):
      4. Flowers yellow; leaves often deeply sinuate-toothed.....  
.....53. Barbarea
      4. Flowers white, purple or lilac (rarely yellow); leaves mostly entire or subdentate (rarely toothed or lobulate):
        5. Plants densely villose (rarely subglabrous) with simple hairs; basal leaves short, spatulate (rarely oblong), + 3-5 (rarely -10)-lobulate or toothed above.....55. Christolea
        5. Plants + hairy but not villose; basal leaves often elongated, usually oblanceolate or oblong-obovate, sinuate-toothed to entire:
          6. Siliquae short, broadly linear, + contorted .....  
.....52. Phaeonychium
          6. Siliquae linear, strongly compressed:

7. Flowers small, yellow, subsessile; racemes few flowered, lax; stigma minute, subsessile or sessile...56. Drabopsis
7. Flowers mediocre or large, white, lilac or purple; pedicel-late; racemes corymbose; style + distinct with depressed stigma .....54. Arabis
- I. Siliquae subcompressed or subcylindrical, rarely ellipsoid; valves subconvex or convex with a distinct mid-vein:
8. Scapes 1-flowered .....51. Pegaeophyton
8. Racemes many flowered:
9. Flowers yellow .....59. Rorippa
9. Flowers white or lilac:
10. Plants glandular-hairy; leaves simple, toothed .....  
..... 60. Dontostemon
10. Plants glabrous or sparsely hairy with simple hairs; leaves pinnate .....58. Nasturtium.

50. CARDAMINE L., Sp. Pl. 653 (1753); B.H.G.P.70; B.F.O.160; F.B.I. 137; S.E.P.527; K.F.U.158; O.E.Schulz, 'Monogr. der Gattung Cardamine' in Bot. Jahrb. xxxii 280-623(1903); K.Biswas, 'Observations on Indian Cardamine' in Trans.and Proc. Bot. Soc. Edinburgh xxxiii (4) 416-430 (1943).

Syn: Dentaria L., l.c.; Pteroneurum DC., Syst. ii 269 (1821); Heterocarpus Philippi in Bot. Zeitung, xiv 641 (1856); Porphyrocodon H.f. in Gen. Pl. i 79 (1862); Ghinia Bubani, Fl. Lyren. iii 158 (1901); Dracanine Nieu. in Americ. Midl. Nat. iv 40 (1915).

Annual to perennial, glabrous or hairy with simple hairs. Leaves pinnate. Racemes corymbose above, ebracteate, often flexuose in fruits. Flowers small to large, white, lilac or purple; pedicels filiform, often flexuose, erect or curved. Sepals almost equal, inner pair often subsaccate at the base. Petals about twice as long as the sepals, rarely more, sometimes abortive, obovate, clawed, apex often subemarginate. Stamens 6, rarely 2(usually the outer ones) or more abortive; filaments not appendaged; anthers short, and blunt. Lateral nectariferous glands semiannualr or annu-iar; median absent rarely present. Ovary oblong or linear, 4-40-ovuled;

stigma short, capitate, often subbilobed on short or long style. Siliquae linear, compressed, bilocylar, dehiscent; valves smooth, usually opening suddenly and coiling spirally upwards, thus flinging the seeds to some distance; seeds uniseriate, oblong or suborbicular, flattened, brown.

About 150 species, cosmopolitan, chiefly in damp habitats. The tropical species are confined to high altitudes.

This big genus is represented by only 5 species in the present area. Schulz's monograph (1903) is a comprehensive work on this genus. K. Biswas (1943) recognized 13 species in India (now Indo-Pak subcontinent). Of these only four: C. macrophylla Willd., C. impatiens L., C. pratensis L., and C. hirsuta L. are actually recorded for the present area. He regards C. flexuosa With. conspecific with C. hirsuta L., but with the present day knowledge there can be no doubt that the two are distinct species — C. hirsuta L. with the somatic chromosomes  $2n=16$  and C. flexuosa With. with  $2n = 32$ . They are said to be not cross pollinated. He also regarded (1943) C. loxostemonoides Schulz and C. inayatii Schulz as conspecific with C. hirsuta L. ~~perhaps~~. He took these decisions very carelessly and hurriedly: this is evident from his studies made at Kew. He correctly included most of the specimens (seen at Kew - with his determinavit slips) cited under C. loxostemonoides by Schulz (1927) under C. pratensis L., but wrongly thought that C. loxostemonoides was conspecific with C. hirsuta L. There can be no doubt that C. pratensis L. is a very polymorphic species which is also evident from Heslop-Harrison's remarks in his new book, 'New concepts in Flowering Plants Taxonomy', page 87 (1953). ~~and therefore~~, C. loxostemonoides Schulz is conspecific with C. pratensis L. and not with C. hirsuta L. Similarly C. inayatii L. was regarded conspecific with C. hirsuta L. by him, it is actually conspecific with C. flexuosa With.

Biswas records "C. ovata" from Kashmir, which is purely a South American species. I have seen Prescott-Desie's specimen from Kashmir (at BM!) which Biswas thinks is 'C. ovata'. It is nothing but a state of C. macrophylla Willd.

The present five species are divided into the following two sections:

Sect. I. Macrophyllum Schulz, Monogr. 326 and 396 (1903); S.E.P. 529; K.F.U. 156. I. C. macrophylla Willd.

Sect. II. Eucardamine Schulz, Monogr. 327 and 418 (1903); S.E.P.530;  
K.F.U. 158.

2. C. impatiens L.      3. C. hirsuta L.      4. C. flexuosa With.  
5. C. pratensis L.

Key to the species

- I. Leaflets usually large, 3-8 cm. long (rarely about 1 cm. long), serrate, acute or acuminate ..... I. C. macrophylla
- I. Leaflets usually small, 0.5-1.5 cm. long (rarely upto 2.5 cm. long), slightly toothed or irregularly sublobulate:
2. Leaf base auricled ..... 2. C. impatiens
2. Leaf bases not auricled:
3. Flowers 5-15 mm. across, white, lilac or purple; perennial, occasionally bearing stolons ..... 5. C. pratensis
3. Flowers 3-5 mm. across, white; annual or biennial, sometimes perennating, never bearing stolons:
4. Annual; tap root slender; stem not very leafy, simple or sparsely branched mostly from the base, usually erect; basal leaves densely rosulate ..... 3. C. hirsuta
4. Biennial or perennating, usually with a short ascending root-stock; stems leafy, branched, flexuose, often ascending; basal leaves hardly or loosely rosulate .... 4. C. flexuosa

I. C. macrophylla Willd., Sp. Pl. iii 484 (1800); Schulz, Monogr. 399 (1903); S.E.P.530; K.F.U. 156.

Syn: C. dentariifolia Royle ex H.f. et T. in Journ. Linn. Soc. Bot. v 145 (1861); "C. ovata" Biswas in Trans. Bot. Soc. Edinburgh xxxiii 429 (1943)-non Benth.

Type: Siberia, Willdenow (B?- not seen).

Perennial, 30-100 cm. tall, erect, sparsely branched, glabrous or subhairy with simple hairs. Leaves pinnate with 2-10 pairs of leaflets and a terminal one, 5-15 cm. long with 1-5 cm. long petioles; leaflets (1)3-8x(0.5)1-3 cm., very variable, usually lanceolate, sessile or subsessile, +serrate, often sublobulate or sinuate-dentate, apex acute or acuminate. Racemes 25-50-flowered, corymbose above, increasing upto 20 cm. in fruits. Flowers 8-15 mm. across, white, lilac or purple; pedicels 5-10



mm. long, increasing upto 20 mm. in fruit. Sepals 3-5x1-2 mm. Petals 8-15 x 2.5-5 mm., obovate-cuneate, apex subemarginate. Stamens six, 3.5-4.5 : 5-6.5 mm.; anthers 1-1.5 mm. long. Siliquae linear, 2.5-5x0.12-0.2 c.m., straight, glabrous; valves rigid, with a faint mid-vein; style 1-4 mm. long, with accipitate, subbilobed stigma; seeds 1.5-2x1-1.2 mm., oblong, brown; septum not veined.

W. Pakistan:

N.W.F.P.: Kaghan, Chokran, 3300 m., Inayat no. 21135(K!);

Hazara, Inayat(K!); Kaghan, Z.Hasan(R-E!);

Punjab: Lahore, near Phalga, Drummond no. 20248(E!,K!); Lahapur, Drummond nos. 20249(E!,K!); and 20250(K!); Raiengarh, 2400 m., Gamble no. 26804(K!); Bararkanda, Drummond no. 20243(E!,K!);

N.W.Himalayas:

Kulu dist. , Pabati valley, 3300 m., E.Schelpe no. 3286(BM!); Ravi valley, Swatch, 2250 m., Watt no. 695(E!); Kumaon, Wallich catl. no. 4779(E!); Lahul, Jespa, 3750 m., N.L.Bor no. 16416(E!); Manali, 3540 m., N.L.Bor nos. 14091(E!), and 12607(E!); Ganbir, 3000 m., N.L.Bor no. 14943(E!); Pangi, 2850 m., Watt (E!); Matiana, Markanda, 2550 m., Lace no.54(E!); Chamba, Chatri forest, 2700 m., Lace no.1561(E!); Basha hr st., Watt(E!); (without locality), J.L.Stewart(E!); Royle (K!); Simla, Sungri, 2700 m., H. Collett no. 923(K!); Byas valley, J.L.Stewart(K!); Kumaon, Strachey & Winterbottom(K!); Namik, 2400 m., Strachey & Winterbottom(K!); Garhwal, Kulhara, 3000m., Strachey & Winterbottom(K!); Kidarkanta, 3000 m., Duthie no. 1029(K!); Chenab valley, Furti, 2250 m., R.Ellis no. 1154(K!); Jaunsar, Gamble no. 23646(K!); Harbidun, 3300 m., Gamble no. 24262(K!); Dabmir, 2400 m., Gamble no. 24319(K!); Upper chenab valley, R.Ellis no. 466(K!);

Jashmir: Pir Panjal, Jacquemont(K!); Baba Pir Rishi, Winterbottom no. 325(K!);ishtwar, 3000 m., Ludlow & Sherriff no. 9225 (BM!); Gaunan, 1950 m., Ludlow & Sherriff no. 7813(BM!); Jashmir, Falconer no. 2280(K!); Jashmir, Bringhi valley, 2850 m., Ludlow no. 50(BM!); Donga La, 3300 m., Ludlow & Sherriff no. 533 (BM!); Gulmarg, 2700 m., P.Himins no. 123(BM!); and no. 104 (BM!); Mirpur, 2400 m., Clarke no.28703(BM!); Gulmarg, 2100 m., damp places in woods, Prescott-Decie(BM!); Below Nel, 1950 m., R.Stewart no. 17814(R-I!).

Geog. Dist: Himalaya and Central Asia.

A very variable species especially in size and shape of leaf-lets. Biswas(1943) recognizes two varieties dissolving 2 var. out of four previously recognized by Hooker f.(1872). East Himalayan specimens have mostly larger leaves, but smaller plants with smaller leaves exactly resembling the W., Himalayan and C.Asian specimens are not lacking. Similarly

plants with larger leaves are not lacking in N.W.Himalayas. This variation in the size of leaves seems to be the affect of the environment; and perhaps due to more damp condition in the E. Himalaya the plants are usually large. Komarov's Fl. URSS. does not recognize any variety and the same treatment is followed here.

Biswas (1943) records 'C. ovata' from Kashmir. This species is purely S.American. I have seen Mrs. Prescott-Decie's specimen at the Brit. Museum which Biswas thinks is C. ovata. It is nothing but a state of C. macrophylla Willd. which is a very polymorphic species.

2. C. impatiens L., Sp. Pl. 655 (1753); F.B.I.138(excl. syn.); S.E.P.530; K.F.U.158.

**Type:** Europe(not precisely designated), no. 8(LS!).

Annual to perennial herbs, 10-60 cm. tall, erect or sub-erect, glabrous or sparsely hairy. Leaves very variable in size; lower ones usally with subrounded leaflets and the upper ones with oblong-ovate leaflets; petioles short with broad auricled bases; leaflets 5-19, very variable in size and shape, 4-25x3-10 mm, 2 - 5 - sublobed to entire, + stalked, apex acute to rounded. Racemes 20-30-flowered, corymbose above, ebracteate, increasing upto 15 cm. in fruits. Flowers 2.5-5 mm. across, white; pedicels 4-8 mm. long, increasing upto 10 mm. in fruit, ascending. Sepals 1.5-3x0.5-0.8 mm. Petals 3.5-5x1 mm., oblong-cuneate, apex rounded. Stamens six, 1.5-2.5 : 2.8-3.5 mm.; anthers about 0.7 mm. long. Siliquae linear, 2.5-3x0.1 cm., straight; valves glabrous, faintly veined; style very short with minute stigma; seeds uniseriate, about 1 x 0.6 mm., oblong-ovate, reddish brown; septum not veined.

W.Pakistan:

. Chitral: Drosh, 1350 m., Toppin no. 51(K!); Jambatai, Harriss no. 15904(BM!).

N.W.F.P.: (without locality), H.Deane (K!); Kaghan, Nila, Inayat (K!); Kankoli, Inayat(K!); Mirgan, Inayat no. 17038(K!).

Funjab: Murree hills, 1950 m., R.Stewart no. 1659(K!); Lahore, Pulga, Drummond no. 20247(K!); Rotang, Drummond no. 20241(K!); Kulu, E.Nasir no. 322(R-E!).

Afghanistan:

(without locality), Griffith no. 1475(K!); Kurrum valley, very common near water from Kurrum to Shalizan, Aitchison no. 279(K!).

N.W.Himalayas:

Simla, Ushan valley, 1200 m., Watt no. 9923(E!); Burma, 1350 m., Watt(E!); Simla, Watt(E!); Teesa, 1500 m., Watt no. 662 (E!); Lahul, Manali, H.L.Bor no. 12608(E!); Tissu, 3090 m., H.L.Bor nos. 14605(E!) and 14623(E!); Chamba, 900 m., Lace no. 1908(E!); Jaunsar, Watt no. 2936(E!); East of Lakwanā, Reid (E!); On the way to Kilar, Watt no. 2546(E!); Kulu dist. Parbat-i valley, 2700 m., E.Schelpe no. 3275(BM!); Alwar, 2400 m., R.Stewart no. 2432(K!); Dehradun, 1500 m., Gamble no. 25321(K!); Simla, Elysium hills, Gamble no. 4138 A(K!); Simla, Bourne no. 3633(K!); Simla, Drummond nos. 20244(E!,K!) and 20245(K!); Kasanli hills, Drummond no. 20356(E!,K!); Simla, Edgeworth nos. 94(K!); and 92(K!); Chamba, Chauri, 1890 m., Parker(K!); Almora, 1650 m., Strachey & Winterbottom(K!); Shenkhet, Thomson(K!); Simla, H.Collett(K!); Morali, 3150 m., Collett no. 979(K!); Simla, H.Reich no. 113(K!); (without locality), J.L.Stewart (E!,K!); Nila valley, 3000-3300 m., Duthie no. 91616(BM!) (with C. flexuosa With. ); Kumaon, Devali, Strachey & Winterbottom(BM!); (without locality), 1800-3000 m., Thomson(BM!); Kashmir: Gulmarg, 2400-2700 m., P.Timins no. 122(BM!); Donga galli, A.P.Young(BM!); Pahlgam, Pinfold no. 74(BM!); Traqbol, 2700 m., Clarke no. 29297(K!,BM!); Barungalli, 1800 m., Clarke no. 28329 (E!,K!); Mt. Makadeo, R.Stewart no. 7152 I/2(K!); Nabugnag pass, Winterbottom no. 209(K!); Hirpar, 2400 m., Clarke no. 2865(K!).

Geog. Dist: Europe, temperate Asia and Himalaya.

3. C. hirsuta L., Sp. Pl. 655 (1753); K.F.U. 159.

Type: Europe(not precisely designated) no. 10(LS!).

Annual, (5)10-30 (-40) cm. tall, erect; tap root slender; simple or branched mostly from the base. Basal leaves often densely rosulate, pinnate, stalked, 2-7-jugate, (2)4-8(-10)x(0.8)1.5-2.5 cm., glabrous or hairy with simple hairs; leaflets obovate-orbicular except the apical one which is slightly larger and usually subreniform, shortly stalked or sessile, very variable in size, subentire or irregularly few lobulate and toothed; upper most pair together increasing the width of the terminal lobe. Racemes 10-30-flowered, corymbose, ebracteate, increasing upto 10 cm. in fruits. Flowers 3-5 mm. across, white; pedicels 2.5-5 mm. long, increasing upto 10 mm. in fruit. Sepals 1.8-2.5x0.6-0.8 mm. Petals 3-5x1-1.8 mm., oblong-obovate, cuneate, apex rounded; sometimes suppressed. Stamens 6, sometimes 4(the outer 2 abortive or absent)or less due to abortion, 2-3 mm. long; anthers about 0.75 mm. long. Siliquae linear, 1.5-2.5x0.1 cm., straight,

glabrous; valves smooth with a faint mid-vein; style very short with a capitate stigma; seeds about 1x0.7 mm., oblong-obovate, brown; septum not veined. "2n=16".

W. Pakistan:

Punjab: Karnal, Griffith no. 20355(K!); Mulu, L. Basir no. 324 (R-L!); (without locality), J.L. Stewart(E!).

N.W. Himalayas:

Kumaon, Thomson(K!); Almora, 1650 m., Strachey & Winterbottom (K!); Chenab valley, Shor, 2250 m., R. Ellis no. 1021(K!); Chamba state, Wazirat church, 2190 m., Parker(K!); Kilar, 2400-2700 m., Watt no. 2954(L!); (without locality), Clarke no. 12585(L!); Teesa, Watt(E!);  
Rashmir: Gilgit, Giles(E!,K!).

Geog. Dist: Throughout most of the Northern Hemisphere.

4. C. flexuosa With., Bot. Arr. Brit. Fl. 3 ed. 578 t.3 (1796); K.F.U.159.

Syn: C. sylvatica Link. in Hoffm., Phyt. Blactt. i 50 (1803);

C. umbrosa Andrz. in DC., Syst. 260 (1824); C. Inayatii Schulz in Notizblatt ix 1069(1927); "C. hirsuta" Biswas in Trans. Bot. Soc. Edin. xxxiii 424- partim(non L.).

Type: Europe(not precisely designated).

Perennial, sometimes biennial or annual, 10-60 cm. tall, often with a short ascending rootstock and suberect or erect branches, leafy flexuose stem. Basal leaves few, hardly or loosely rosulate, stalked; cauline leaves sessile or sessile; all leaves pinnate with about 5 pairs of similar leaflets; all leaflets abovate, suborbicular or subovate; very variable in size and shape, sessile; almost glabrous, often sublobulate or subentire, apex acute, obtuse or rounded. Racemes 15-40-flowered, lax, ebracteate, increasing upto 30 cm. in fruits. Flowers and fruits as in C. hirsuta L. except stamens which are always six and seeds often very narrowly winged.  
 "2n = 32".

W. Pakistan:

N.W.F.P.: Peshawer, H. Deane(K!).

N.W. Himalayas:

Kumaon, Almora, 1650 m., Strachey & Winterbottom(K!,BM!); Tihri-Garhwal, Nila valley, Duthie no. 916(BM!)(with C. impatiens L.); Jaunsar, 1800 m., Gamble no. 22836(K!); Simla, Chadwick falls, H? Collett(K!); Nagkunda, 2700 m., H. Collett nos. 789(K!)and

788(K!); Pukga, Drummond no. 20246(K!); Sankaran, Drummond no. (K!);

Kashmir: Barungalli, 1950 m., Clarke no. 28413(BM!);

Geog. Dist: Europe, W. and C. Asia, India, China and Japan. Probably introduced in N. America.

Distinguished from C. hirsuta l. primarily by its lax habit, leafy stems, flowers always with six stamens and very narrowly winged seeds, in addition to the double number of the somatic chromosomes ( $2n = 32$ ).

5. C. pratensis L., Sp. Pl. 656 (1753); F.B.I. 138; K.F.U. 166.

Syn: C. loxostemonoides Schulz in Notizblatt ix 1069(1927);

"C. hirsuta" Biswas in Trans. Bot. Soc. Edinburgh xxxiii 424(1943)-partim (non L.).

Type: Europe(not precisely designated)no. II(LS!).

Perennial, with or without a short prostrate rootstock, occasionally bearing stolons; stems erect or suberect, 20-60 cm. tall, glabrous. Leaves pinnate, stalked, 2-8-jugate; leaflets orbicular, ovate, oblong-ovate or reniform, very variable in size and shape, often (2)4-15 mm. in diam. (terminal lobe comparatively slightly large), shortly stalked or subsessile, often + 3-lobulate, apex gland-tipped, slightly mucronate. Radical leaves + rosulate. Racemes (5)10-15(20)-flowered, lax, ebracteate, corymbose above, increasing upto 15 cm. in fruits. Flowers 5-15 mm. across, white, lilac or pale purple; pedicels 8-15 mm. long, increasing upto 25 mm. in fruit. Sepals 3.5-5x1-2 mm. Petals 10-15x5-10 mm., obovate-oblong, cuneate, apex subemarginate. Stamens six, 3.5-5 : 5-8 mm.; anthers about 1 mm. long. Siliquae oblong-linear, 2.5-4x0.1-0.15 cm., straight; valves glabrous with a faint mid-vein; style about 1 mm. long with a capitate stigma; seeds uniseriate, about 1.5x1 mm., oblong-ovate, brown; septum not veined.

N.W. Himalayas:

Kumaon, Ralam valley, Inayat no. 24239(K!); Juling Kang, 5700 m., Inayat no. 24240(K!); Barge kang pass, 3900 m., Strachey & Winterbottom(K!); Nipchang valley, Darma, 3900-4200 m., Duthie no. 2724(K!); Kumaon, Lebung pass, 4500 m., Duthie no. 5330(BM!); Tihrigarhwal, Duthie no. 911(BM!).

Kashmir: Hasora, Winterbottom no. 773(K!); Gilgit, 3000-3600 m., Giles no. 577(K!); Gilgit, Giles(E!).

Geog. Dist: Europe, Temperate Asia and N. America.

forma I. luxurians (Schulz) Jafri, comb. et stat. nov.

syn: C. loxostemonoides Schulz, var. luxurians Schulz  
in Notizblatt ix 1070 (1927).

Type: Tihrigarhwal, Hila valley, under rocks, 4200-4500  
m., Luthie no. 912(B,K!).

Plants very lax, flexuose, spreading; petioles of the leaves  
upto 35 cm. long; leaflets upto 30x25 mm., + trilobulate as in the type race  
with gland-tipped apices.

Known from the type locality only.

51. \*PEGAEOPHYTON Hayek et Handel-Mazzetti in Akad. Anzeiger Wien, n.26-27  
p.2 (1922); S.E.P. 533.

Perennial; rootstock thick, fleshy, covered with dense radical  
leaves. Leaves oblanceolate or narrowly spatulate, glabrous or sparsely  
hairy with simple hairs, stalked. scapes 1-flowered, usually as long as  
as the leaves. Flowers mediocre or large, lilac or white, often with  
blue or pinkish veins. Sepals almost equal, spreading, not saccate.  
Petals broad, suborbicular-cuneate, about twice as long as the sepals,  
apex rounded or subemarginate. Stamens 6, not appendaged; anthers short,  
blunt. Lateral nectariferous glands semiannular, open towards the inner  
side; median present, joining the laterals. Ovary ellipsoid, 10-12-ovuled;  
style very short with a capitate stigma. Siliquae ovoid or ellipsoid,  
glabrous, often subcontorted, unilocular, indehiscent; seeds biseriate,  
ellipsoid, brown, not winged.

2 species in Himalaya and C.Asia.

\*Pegaeophyton scapiflorum (H.f. et T.) Marq. et Shaw in Journ. Linn. Soc.  
Bot. xlviii 229 (1929); S.E.P. 534.

Syn: Cochlearia scapiflora H.f. et T. in Journ. Linn. Soc. Bot.  
v 154 (1861); F.B.I. 145; Schulz in Notizblatt ix 1074  
(1927).

Type: E.Himalaya, Sikkim, 5100 m., J.D.Hooker (K!).

Perennial short herb, subcaespitose with about 1-cm.  
thick rootstock covered below with withered leaf bases. Radical leaves  
rosulate, oblong-spathulate, or oblanceolate, (1.5)2-4x0.2-0.5 cm., sessile,  
with sheathing bases, entire or obscurely toothed, apex rounded, obtuse or

acute, glabrous or sparsely hairy with simple hairs. Scapes 1-flowered, 1.5-3.5 cm. long, many. Flowers (4)5-7 mm. across, white with lilac veins. Sepals 2.5-4x1-1.5 mm. Petals 4-6.5x2.5-3 mm., obovate-cuneate, apex subemarginate. Stamens 2.5-3 : 3.5-4 mm.; anthers about 0.5-0.7 mm. long. Siliquae 6-8x2.5-4,5 mm., oblong-elliptic, glabrous, unilocular; seeds biseriate, small.

N.W.Himalayas:

Lahul, Keylang, 3000 m., Watt no. 3120(E!);

Kashmir: Ladak, Khardong La, 4500 m., Ludlow & Sherriff no.

8430(B<sub>m</sub>!)(with Aphragmus oxycarpus (H.f.et T.)Jafri].

Geog. Dist: Himalaya (Tibet).

52.\*PHAEONYCHIUM Schulz in Notizblatt ix 1092 (1927); S.E.P. 535.

Perennial, covered with minute, branched, soft, white hairs. Caudex thickened, densely covered with withered leaf bases. Scapes 10-30 cm. long, erect. Radical leaves densely rosulate, linear, entire, bases broad, somewhat sheathing. Racemes lax, ebracteate, increasing in length in fruits, rarely developing 1-2 short bracts. Flowers mediocre, long pedicelled, white, sometimes pinkish. Sepals suberect, oblong-elliptic, persistent, equal, not saccate. Petals obovate, clawed, apex subretuse. Stamens 6, not appendaged. Lateral nectariferous glands horse-shoe shaped, median absent. Ovary oblong, 3-6-ovuled, tomentose; style short, slightly thickened with bilobed, depressed-capitate stigma. Siliquae linear, small, flattened subcontorted, pubescent with minute, soft, white, branched hairs; valves with a distinct mid-vein; seeds irregularly uniseriate, few, sub-orbicular, compressed; septum membranous, not veined.

One species in Himalaya.

Distinguished from Cheiranthus L. by its scapese flowering shoots, minute branched, soft hairs, persistent calyx, short, contorted siliquae with few ovules. Also distinguished from ~~Fraxia~~ Christolea Camb. by its linear-oblongate, elongated, entire leaves, absence of median nectariferous glands and bilobed stigmas with lobes + spreading.

Phaeonychium parryoides (Kurz)Schulz in Notizblatt ix 1092(1927);

S.E.P.535.

Syn: Cheiranthus parryoides Kurz ex Hooker f., Fl. Brit.

Ind, i 132 (1872).

Type: W. Tibet, Zanskar, 3600-4200 m., Stoliczka(K!);

Perennial, scapes 10-30 cm. long, erect, densely pubescent with minute, soft, branched, white hairs. Caudex thickened, covered with withered leaf bases. Radical leaves rosulate, narrowly oblong or oblanceolate, 4-9x0.4-0.7 cm., stalked, entire, bases broad, somewhat sheathing, entire. Racemes 15-20-flowered, ebracteate (rarely 1-2-bracteate), lax, increasing upto 20 cm. in fruits. Flowers 6-7 mm. across, white or pinkish; pedicels 0.5-1.5 cm. long, increasing upto 2.5 cm. in fruit, erect. Sepals 3-4x1-1.8 mm. Petals 7-8x3-3.5 mm., obovate, clawed, apex subretuse. Stamens 3-4 : 4-5 mm.; anthers about 1 mm. long. Siliquae (immature) about 1.8x0.2 cm., linear, flattened, contorted, clothed with minute, branched, soft, white hairs; valves with a distinct mid-vein; style short, about 1 mm. long with depressed-capitate, bilobed stigma with lobes + spreading; seeds (immature) few, suborbicular, compressed; septum membranous, not veined.

N.W. Himalayas:

Kishtawar, Schlagintweit no. 5210(BM!);

Kashmir: Saru valley, 4200 m., dry hillside, flowers white,  
Osmaston no. 196(K!)

W. Tibet: Zanskar, N.W. of Pensila, 3600-4200 m., Stoliczka(K!);  
Zanskar, Schlagintweit no. 7483(K!); Pensila in Spiti,  
Stoliczka(K!).

Geog. Dist: Tibet.

53. BARBARALA Beckmann, Lexic. Bot. 33 (1801); B.H.G.F.68; B.F.C.183;  
F.B.I.134; S.M.P.537; K.F.U.130.

Syn: Campe Dulac, Fl. Hautes-Pyren. 199 (1867).

Biennial, sometimes perennial, erect, branched, glabrous or sparsely hairy with simple hairs. Basal leaves rosulate, lyrate-pinnatifid or deeply pinnatifid, stalked; terminal segment comparatively large. Upper leaves sessile, often amplexicaule, irregularly sinuate-toothed. Racemes corymbose above, becoming lax in fruits, ebracteate rarely bracteate, Flowers mediocre, yellow; pedicels spreading or curved in fruit, slightly or not thickened. Sepals erect, often yellowish, almost equal. Petals usually about twice as long as the sepals, obovate-cuneate or spatulate, apex subrounded. Stamens 6, not appendaged; anthers short, blunt.



Lateral nectariferous glands semiannular, open towards the outer side, + 3-lobulate towards the inner side; median present, not joining the laterals. Ovary oblong, 24-32-ovuled; style short with a subretuse stigma. Siliquae bluntly four angled, or subcompressed-terete, straight or curved, often subtorulose, bilocular, dehiscent; valves with a distinct mid-rib, often rigid and strong; seeds uniseriate, ovate or elliptic, smoke brown, not winged; septum membranous, not veined.

About 15 species, chiefly in Europe, Mediterranean region, C. and N. Asia; also in N.America.

Key to the species

- I. Upper stem leaves pinnately divided or cut .....3. B. intermedia  
 I. Upper stem leaves simple, toothed or shallowly lobed:  
 2. Terminal lobe of the basal leaf broadest at the base, + cordate; siliquae 1.5-3 cm. long .....1. B. vulgaris  
 2. Terminal lobe of the basal leaf cuneate at the base, broadest somewhere in the middle; siliquae 3-4.5 cm. long...2. B. plantaginea

I. B. vulgaris r.Br. in Ait. Hort. Kew. 2 ed. iv 109 (1812); B.F.O.183; K.F.U.132.

Syn: Erysimum Barbaraea L., Sp. Pl. 660(1753).

Type: Europe(not precisely designated)no. 2 (LS!).

Var. I. vulgaris

Biennial, rarely perennating, 30-90 cm. tall, erect, branched, glabrous. Basal leaves rosulate, lyrate-pinnatifid, 3-9-jugate, stalked 5-15x1.5-4 cm.; terminal lobe suborbicular or ovate-oblong, many times larger than the lateral lobes, broadest at the base; lateral lobes narrowly oblong. Uppermost leaves simple, ovate or ovate-oblong with broad bases, sinuate-toothed, sessile, 1-4x0.5-2.5 cm. Racemes 20-40-flowered, corymbose above, ebracteate, increasing upto 20 cm. in fruits. Flowers 5-7 mm. across, yellow; pedicels 2-4 mm. long, increasing upto 5 mm. in fruit, subspreading, slightly thickened. Sepals 2.6-3x1 mm. Petals 4.8-6x1.7-2 mm., oblong-obovate, apex rounded. Stamens 2.5 : 3 mm.; anthers about 0.8 mm. long. Siliquae 1.5-3x0.15-0.2 cm., erect, straight or sub-curved; valves glabrous, rigid, with a + distinct mid-vein; style 1.5-2.5 mm. long; seeds uniseriate, ovate, 1.2-1.5x1 mm.

W. Pakistan:

Chitral: Pattisum, 2700 m., Toppin no. 174(K!); Guger, 2400-2700 m., Harriss no. 15893(BM!).

Afghanistan:

Kurram valley, Habib kulla, common, Aitchison no. 154(K!);  
(without locality), Aitchison no. 35(BM!).

N.W. Himalayas:

Tihrigerhwal, Jamara in Damar valley, 3300 m., Duthie no. 906 (BM!).

Kashmir: Dras ladak, 3150 m., Ludlow & Sherriff no. 8329(BM!); ~~Gulm~~  
Gulmarg, 2700 m., P. Timins no. 134(BM!); Gilgit, Sulbur, 3000 m., Giles no. 307(K!); (without locality), Thomson(K!); Zoji pass, R. Stewart(K!); Pan Dras, Ladak Rd., R. Stewart (K!);  
Fir Panjal, Jacquemont (K!); Shankargarh, R. Stewart no. 21760 (R-E!).

Geog. Dist: C. Asia and westward to Europe.

Var. 2. arcuata (Opiz.) Fries, Nov. 2 ed. 205 (1832-1842)

Syn: Erysimum arcuatum Opiz. in Presl. Fl. Cech. 138(1819);  
Barbaraea arcuata Rechb. in Bot. Ztg. (1820) et Flora v 296 (1822); "B. vulgaris var. taurica" H.f. et T. And. in Fl. Brit. Ind. i 134 (1872)-partim (non DC., Syst. 207 (1821)).

Type: not precisely designated.

Distinguished from the type race by its arcuate young siliquae. Mature siliquae 2-3.5 cm. long. Pedicels 4-12 mm. long, spreading.

Afghanistan:

Hajuk, Griffith no. 1458(K!).

Geog. Dist: C. Asia, Westward to Europe.

2. \*B. plantaginea DC., Syst. 208 (1821); B.F.O. 183; K.F.U. 134.

Syn: Sisymbrium Barbaraea L., Sp. Fl. <sup>2 ed.</sup> /921 (1753).

Type: Orient, Tournefort (G?- not seen).

Biennial, 30-70 cm. tall, erect, branched, glabrous, subglaucous. Lower leaves sublyrate or sinuate-toothed, 3-4-jugate, stalked; terminal lobe broadly elliptic, cuneate at the base, broadest somewhere in the middle, irregularly tooth-ed especially above or subentire.

lateral lobes minute, entire or subentire. Upper leaves oblong-obovate, sinuate-toothed above, auricled at the base, amplexicaule. Racemes 30-70-flowered, corymbose, ebracteate, increasing upto 25 cm. in fruits. Flowers 3.5-5 mm. across, yellowish; pedicels 1-3 mm. long, increasing upto 7 mm. in fruit, somewhat thickened. Sepals 3-3.5x1 mm. Petals 5-6x1.2-1.6 mm., oblong-obovate, apex rounded. Stamens 3-3.4 : 3.5-3.8 mm.; anthers about 1 mm. long. Siliquae linear, tetragonate-compressed, 3-4.5x0.15 cm., sub-arcuate; valves glabrous with a distinct mid-vein; style about 1 mm. long; seeds uniseriate, 20-30 in each loculus, about 1 x 0.8 mm., suborbicular, brownish; septum not veined.

W. Pakistan:

Baluchistan: Rakhshan river bed at Janjgur, c.930 m., Hotson no.160 [Herb. St. Xavier's College Bombay -not seen]  
Geog. Dist:

Persia: Koh-Baena, Kotschy no. 610(K!); Tabriz, Gillist-Smith no. K 806(K!); Dilman, 1440 m., Cowan & Darlington no. 2153(K!).

Iraq: Finjwin, Rawi no. 8549 H(K!); Arl Gird Dagh, Guest no. 2808(K!).

Turkey: Anatolia, near Angora, Lindsay no. 9(K!); Siwas, Bornmu-ller no. 3240(K!).

Caucasus: Georgia, R.L.Hohenacker(K!); Armenia turcica, Egin, P.Sintenis no. 2629(K!).

3. \*B. intermedia Boreau, Fl. Cent. France ii 40 (1840); S.E.F.537.

Syn: B. vulgaris var. sicula H.f.et T.Anders. in Fl. Brit. Ind. i 134 (1872).

Type: France, ? (P- not seen).

Biennial, 15-60 cm. tall, erect, branched, glabrous or sparsely hairy with simple hairs. Rosette leaves lyrate-pinnatipartite, 3-5-jugate, 2.5-12x0.8-3 cm., stalked; terminal lobe large, ovate, subcordate, usually entire, apex subretuse or rounded; lateral lobes narrowly oblong, many times smaller than the terminal lobe, obscurely toothed to entire; the uppermost lateral lobes pair together equal or exceeding the ~~wid~~ width of the terminal lobe. Uppermost leaves usually deeply pinnatifid, 2-3-jugate, with narrow oblong lobes. Racemes 15-25-flowered, ebracteate, corymbose above, increasing upto 20 cm. in fruits. Flowers 4-6 mm. across, bright yellow; pedicels 1-4 mm. long, increasing upto 5 mm. in fruit, ~~not~~ thickened, ascending. Sepals 3-3.5x1-1.4 mm. Petals 4-6x1-1.5 mm., oblong-

obovate, cuneate, apex rounded. Stamens about 3 : 4.5 mm.; anthers about 0.8 mm. long. Siliques terete-compressed, or bluntly 4-angled, oblong; 1-3x0.15-0.2 cm., straight, apex acute; valves glabrous with a distinct mid-rib; seeds uniseriate, about 1-1.5x0.8-1 mm., ovate; septum not veined.

W. Pakistan:

N.W.F.P.: Kaghan valley, Kathyali, Inayat(K!); Hazara, Sirsa, valley, Inayat no. 19177(K!).

N.W. Himalayas:

Kila Gujral nullah, Watt no. 2211(E!); near Bilrundi, 3300 m., Watt no. 2907(E!); Keyalang, Watt no. 2106(E!); Chenab valley, 2550 m., R. Ellis nos. 1274(K!) and 139(K!); Leosai, Head of Kishenganga valley, 3900 m., R. Stewart no. 22153(K!); Chamba, Alwas, R. Stewart no. 2487(K!); Lahul, Jaeschke no. 19(K!); (without locality), Royle(K!); J.L. Stewart (E!); Thomson(K!); Kumaon, Nalam, 3600 m., Strachey & Winterbottom (K!); Garhwal, Rogila, 3300 m., Strachey & Winterbottom(K!); (without locality) Thomson(BM!).

Kashmir: Flail, 3750 m., Clarke no. 30656 B(BM!); Marbul pass, 3150 m., Clarke no. 31294 A(BM!); Gulmarg, 2400-2700 m., Timins no. 133(BM!); Pir Panjal, 3000 m., Lucdow & Sherriff no. 7750 (BM!); Sorus above Bahlgam, 3600 m., R. Stewart no. 9213(K!); Sonmarg, 3600 m., R. Stewart no. 9807(K!); above Gulmarg, 3000 m., R. Stewart no. 8753(K!); (without locality), Falconer's collector nos. 2505(K!), 2450(K!), and 2707(K!); Pir Panjal, Falconer's collector no. 2996(K!); Sheshnag, 3900 m., Drummond no. 14182(K!); Rasparin pass, Winterbottom no. 226(K!); Sonmarg, H. Rich no. 1104(K!); Baltistan, 2700-3000 m., Thomson (K!); W. Tibet, Falconer's collector no. 3463(K!); Sonmarg, 3000-3300 m., R. Stewart no. 3532(R-E!).

54. ARABIS L., Sp. Pl. 664(1753); S.E.P. 542.

Syn: Abazicarpus Andr. ex DC., Syst. ii 213 (1821); Turrita Wallr., Sched. crit. 351 (1822); Arabisa Reichb., Handb. 260 (1837); Arabidium Spach., Hist. Nat. vi 436 (1838); Shortia Raf., Aut. Bot. 16 (1840); Lomaspora DC. ex Steud., Nom. 2ed. ii 65 (1841); Dollineria Sauter in Flora xxxv 353 (1852); Caulopsis Fourn. in Ann. Soc. Linn. Lyon Nouv. xvi 332(1868).

Perennial, sometimes annual or biennial, usually hairy with simple or branched hairs, sometimes glabrous above. Rosette leaves usually stalked and comparatively hairy. Cauline leaves few to many, sometimes wanting, sessile or stalked, often + dentate and amplexicaule. Racemes usually corymbose, becoming lax in fruits, usually ebracteate. Flowers mediocre or

large, rarely small, white, sometimes lilac or purple; pedicels filiform, rarely thickened in fruit. Sepals suberect or erect, subequal or equal, lateral pair often somewhat broad and subsaccate at the base, apex acute or obtuse. Petals obovate-oblong, entire, shortly clawed, apex rounded or subtruncate. Stamens 6, not appendaged; anthers oblong-linear. Lateral nectariferous glands annular or subannular, incomplete, irregular; median often minute, conical or various, not joining the laterals. Ovary linear, usually 20-60-ovuled. Siliquae linear-oblong, strongly compressed; valves I-veined with reticulate venation, glabrous rarely hairy; style short with minute, entire, depressed stigma; seeds uniseriate rarely subbiseriate, ovate, compressed, sometimes narrowly winged; septum membranous, not veined.

About 100 species, mostly throughout the North Temperate zone.

It is represented by only 12 species in the present area. Of these two are new to science.

Hooker f. and Thomson in Journ. Linn. Soc. Bot. v(1861) record 8 species of Arabis from the present area, but of these 4 must be eliminated; as follows:

1. Arabis glabra Crantz. = Turritis glabra L.
2. A. nuda Bel. = Drabopsis nuda (Bel.) Stapf.
3. A. glandulosa Kar. et Kir. = Dontostemon glandulosus (Kar. et Kir.)
4. A. Thomsonii H.f. et T. = Arabis tibetica H.f. et T. Schulz.

Their "A. alpina" should be called Arabis pterosperma Edgew. In Fl. Brit. India (1872) Hooker f. and T. Anderson also record 8 species, but rightly include A. Thomsonii as a synonym of A. tibetica, while the rest are just the same as given in the above mentioned journal except for the addition of one new species, A. taraxacifolia T. Anders. Thus, actually, there are only five species of Arabis in Fl. Brit. India. Boissier in Fl. Or. (1867) record only one species, which should be now called Arabis auriculata Lam., from Afghanistan. This clearly shows how little this genus was known from the present area at the time the above-mentioned two Floras were written.

During successive years several new species were described. G. Watt (1881) described two new species, A. bijuga and A. pangiensis from N.W. Himalayas. Schulz (1927) described five 'new' species: A. alticola, A. Clarkei, A. quinqueloba, A. scaposa, and A. tenuirostris. I have examined all these thoroughly and find that Schulz's four new species are

valueless and should be sunk in the following manner:

1. A. alticola Schulz = A. amplexicaulis Edgeworth.
2. A. Clarkei Schulz = A. tenuirostris Schulz
3. A. quinqueloba Schulz = A. tibetica H.f. et T.
4. A. scaposa Schulz = A. saxicola Edgeworth.

These conclusions have been drawn after examining large number of specimens.

The Index Kewensis/<sup>records</sup>A. taraxacifolia T. Anders. as a synonym of Arabis arvensis Edgew. I have examined Edgeworth's type specimen of the latter at Kew, and find it to be nothing but Malcolmia africana (L.) R.Br! The same is also evident from Edgeworth's description given in Trans. Linn. Soc. xx 32 (1851). Arabis taraxacifolia T. Anders. is a distinct species.

No mention of Arabis saxicola Edgew. is made in Fl. Brit. India, although this species was published in 1851. I have seen the type specimen of this species at Kew on which T. Anderson(?) has made the remark "indeterminable". But seeing Edgeworth's good description of this species and the specimen, there can be no doubt of its being a distinct species. Schulz, apparently not realizing its existence, described a 'new' species, A. scaposa (1927), which is nothing but A. saxicola Edgew.

Thus by 1927, the number of species of Arabis increased to nine in the present area.

During the present studies at Kew a remarkably good specimen of Arabis fruticlosa C.A.M. from Chitral was found lying among the unidentified crucifers (Plate no. xxxvi). This species was formerly known from Central and North Asia only, but now its geographical distribution should be extended upto Chitral (W. Pakistan). Another remarkable, minute, new species Arabis brevicaulis Jafri, has been added from Karakorum (N.W. Himalayas). The second new species, Arabis griffithiana Jafri, was found among some unidentified crucifers from Afghanistan collected by Griffith.

Thus there are now 12 species of Arabis in the present area.

There could be no doubt that A. pterosperma Edgew. is a distinct species from A. alpina L. which is purely European and N. Asian (Schulz, 1927). In addition to the other distinguishing characters they have very distinct leaf shapes: A. alpina L. - coarsely toothed with short, triangular, obtuse or acute apex; A. pterosperma Edgew. - not very coarsely toothed with the apical part elongated, entire with a rounded apex.

Arabis is divided into sixteen sections in Pflanzenfam. (1936), and the 12 species of the present area fall in the following three sections:

Key to the 3 sections:

I. Stems leafy:

2. Siliquae and plants covered with short, stellate hairs .....  
 ..... sect. II. Dendrarabis  
 2. Siliquae glabrous; plants hairy with simple or branched hairs....  
 ..... sect. I. Alomatium

I. Stems aphyllous (rarely 1-2-leaved) ..... sect. III. Drabopsis

Sect. I. Alomatium DC., Syst. ii 214 (1821); S.E.F. 543.

- |                                       |                                   |
|---------------------------------------|-----------------------------------|
| 1. <u>Arabis brevicaulis</u> Jafri    | 2. <u>A. tibetica</u> H.f. et T.  |
| 3. <u>A. taraxacifolia</u> T. Anders. | 4. <u>A. tenuirostris</u> Schulz  |
| 5. <u>A. auriculata</u> Lam.          | 6. <u>A. bijuga</u> Watt          |
| 7. <u>A. pangiensis</u> Watt          | 8. <u>A. amplexicaulis</u> Edgew. |
| 9. <u>A. pterosperma</u> Edgew.       |                                   |

Sect. II. Dendrarabis C.A.M. in Ledeb., Fl. Alt. iii 19 (1831); S.E.P. 545.

10. A. fruticulosa C.A.M.

Sect. III. Drabopsis Griseb., Fl. Rumel et Bithyn. i 247 (1843); B.F.O. 166;  
 S.E.P. 546.

- |                               |                                  |
|-------------------------------|----------------------------------|
| II. <u>A. saxicola</u> Edgew. | 12. <u>A. griffithiana</u> Jafri |
|-------------------------------|----------------------------------|

Key to the species:

I. Cauline leaves absent (rarely 1 or 2):

2. Plants 10-15 cm. tall in fruits; radical leaves sparsely hairy/<sup>with</sup> simple or furcate hairs; siliquae straight, + erect, on the same radius as 5-6 mm. pedicels ..... II. A. saxicola  
 2. Plants about 5 cm. tall in fruits; radical leaves tomentose with soft, white, branched hairs; siliquae recurved, + erect on spreading 10-15 mm. pedicels ..... 12. A. griffithiana

I. Cauline leaves present, usually many:

3. Siliquae pubescent ..... 10. A. fruticulosa

3. Siliquae glabrous:.....

4. Plants minute, 1.5-3 cm. tall in fruit ..... I. A. brevicaulis  
 Plants 10-70 cm. tall in fruits:

5. Cauline leaves cuneate at the base, sessile:
6. Perennial, often short, much branched from the base; subspreading; fruits + erect .....2. A. tibetica
6. Biennial, or annual, often tall, not much branched from the base, erect; fruits + recurved:
7. flowers minute, about 2 mm. across; fruits 0.8-1 mm. broad; racemes 20-50-flowered .....3. A. taraxacifolia
7. Flowers mediocre, 3-3.5 mm. across; fruits 1.2-1.6 mm. broad; racemes 8-20-flowered .....4. A. tenuirostris
5. Cauline leaves sessile, bases + broad, semiamplexicaule or amplexicaule:
8. Annual; pedicels 2-4 mm. long in fruit, thickened .....5. A. auriculata
8. Perennial; pedicels 10-25 mm. long in fruit, not thickened:
9. Plants subglabrous, glaucous; petals in pairs, + diverging... .....6. A. bijuga
9. Plants + hairy, often hispid; petals neither in pairs nor diverging:
10. Cauline leaves very few, narrowly oblong, not auricled at the base, semiamplexicaule; hairs stellately branched .....7. A. pangiensis
10. Cauline leaves many, + broad at the base, amplexicaule; hairs simple or forked:
- II. Siliquae + spreading; rosette leaves large, 5-15x 1-3 cm. ....8. A. amplexicaulis
- II. Siliquae suberect or erect; rosette leaves small, 2-4x0.5-1.5 cm. ....9. A. pterosperma.

I\*A. brevicaulis Jafri, sp. nov. (sect. Alomatium DC.)

Affinis A. saxicolae Edgew. sed habitu tenuissimo, caulibus foliatis, <sup>brevibus</sup> indumento densiore e pilis ramosis composito, foliis radicalibus multo brevioribus differt.

Herba perennis, caespitosa, tenuissima, 1.5-2.5 cm. alta; caulis simplex erectus foliatus; caudex 1-2 mm. crassus. Folia radicalia rosulata, 4-9x1.5-3 mm., elliptica vel oblanceolata, cuneata, sessilia, integra



subobtusa; pilis ramosis brevibus dense pubescentia. Folia caulina 2-4, alterna, oblongo-ovata, 1.5-4.5x1-2 mm., sessilia, semiamplexicaulia, acuta vel obtusa, dense pubescentia. Racemus 5-10-florus, ebracteatus, corymbosus, in fructu circa 1 cm. longus. Flores 3-3.5 mm. diam., albi; pedicelli 1 mm. longi, in fructu circa 4 mm. longi ascendentes pubescentes. Sepala oblonga, 1.2-1.5x0.8-1 mm., obtusa, subaequalia, pubescentia. Petala circa 3 x 1 mm., obovato, unguiculata, ad apicem subrotundata. Stamina 1 : 1.5 mm.; antherae circa 0.3 mm., ovoideae, obtusae. Siliquae immaturae 17x0.9 mm., lineares, acutae compressae, glabrae; valvae uninervosae, submembranaceae; stylus 0.5-0.6 mm. longus; stigma minutum, depresso-capitatum, integrum. Semina 20 - 30 uniseriata.

Perennial, very small herb, 1.5-2.5 cm. tall, caespitose, erect, densely pubescent with soft, branched, short, white hairs. Caudex 1-2 mm. thick. Radical leaves rosulate, elliptic or oblanceolate, 4-9x1.5-3 mm., cuneate, sessile, entire, subobtuse, densely pubescent with short, branched hairs. Cauline leaves 2-4, alternate, oblong-ovate, 1.5-4.5x1-2 mm., sessile, semiamplexicaule, acute or obtuse, densely pubescent. Racemes 5-10-flowered, ebracteate, corymbose, increasing upto about 1 cm. in fruit. Flowers 3-3.5 mm. across, white; pedicels about 1 mm. long, increasing upto about 4 mm. in fruit, ascending, pubescent. Sepals 1.2-1.5x0.8-1 mm., oblong, obtuse, subequal, pubescent. Petals 3 x 1 mm., obovate, clawed, apex subrounded. Stamens 1 : 1.5 mm.; anthers about 0.3 mm. long, ovoid, obtuse. Immature siliquae about 17 x 1 mm., linear, compressed, acute, glabrous; valves 1-veined, submembranous; style 0.5-0.6 mm. long with minute depressed-capitate entire stigma; seeds 20-30, uniseriate. (Plate no. xxxi).

N.W. Himalayas:

Karakorum: Zangia Harar, Hunza valley, 3600 m., dated: 5. 7. 1939, R.S. Russell no. 1066(BM!).

Distinguished from A. saxicola Edgew. by the very short ~~habit~~ size of the plants, presence of cauline leaves, very small and densely pubescent radical leaves and short branched, white, soft hairs.

P. S. R. 1066

S. M. H. JAFRI. (1954)



FLORA OF KARAKORAM

Locality: Zangia Nurur, Hunza Valley. 12,000ft.

Date: 5.7.1939

A. Scott Russell

No. 1066

*Arabis brevicaulis* Jafri, sp. nov.

Determinavit

S. M. H. Jafri  
16.3.54

Plate no. XXXI. Arabis brevicaulis Jafri

2. A. tibetica H.f. et T. in Journ. Linn. Soc. Bot. v 143 (1861); F.B.I. 136; P. Wendelbo in Nytt Lag. Bpt. i 32 (1952).

Syn: A. Thomsonii Hooker f. l. c. ; A. quinqueloba Schulz in Notizblatt ix 1065 (1927); Arabidopsis multicaulis Pamp., Agg. Fl. Caracorum in Sped. Ital. Filip. ser. II xi 160 (1933)

Type: W. Tibet, Zanskar, 3600-4200 m., Thomson(K!).

Perennial, 8-20 cm. tall, very branched from the base, subspreading or suberect, often densely hairy with simple or furcate hairs, rarely subglabrous. Rosette leaves 1-4x0.3-1 cm., spatulate, sinuate-toothed to subentire, shortly stalked to sessile, apex obtuse or rounded. Cauline leaves oblong-obovate to linear, 0.8-2.5x0.15-0.4 cm., distantly toothed or lobulate, sometimes entire, stalked or sessile, apex obtuse or rounded. Racemes 15-20-flowered, ebracteate, lax, subcorymbose above, increasing upto 12 cm. in fruits. Flowers 3-7 mm. across, white rarely pinkish; pedicels 3-4 mm. long, increasing upto 9 mm. in fruit, ascending, not thickened. Sepals 2.5-4.2x0.7-1.4 mm. Petals 3-7x1-2.5 mm., oblong-obovate, apex rounded. Stamens 2.5-5 : 3-5.5 mm.; anthers about 1 mm. long. Siliquae linear-oblong, 4-6.5x0.12-0.18 cm., acute, + erect, strongly compressed, glabrous; valves with a distinct mid-vein; style 1-1.7 mm. long, stigma minute, entire; seeds 15-20 in each loculus, uniseriate, 1-1.2x0.7-0.8 mm., ellipsoid, brown, not winged or slightly winged; septum not veined.

W. Pakistan:

Chitral: Harmano shal, c. 3700 m., scattered in gravel, P. Wendelbo (Herb. oslo- not seen); Shokar shal, c. 3500 m., P. Wendelbo (Herb. Oslo- not seen).

Afghanistan:

Kurram valley, Alikhel, 2100 m., Aitchison no. 120(K!).

N.W. Himalayas:

Lahul, Keylang, Drummond no. 20274(K!); 4500 m., N.L. Bor no. 15188(E!); Yotse glacier, Drummond no. 20270(K!); Bhaga valley, 3000 m., Jaeschke nos. 16(K!); and no. 26(K!); (without locality) Royle (K!); Chamba, Nurpur, 1200-1650 m., Schlagintweit-no. 30169 (BM!);

Jashmir: Thana mandi, Drummond no. 13878(K!); Rangdum, 3900 m., growing on sandy stony slope, Osmaston no. 192(K!); Sirsu, Gondla Drummond no. 20227(E!, K!); Baltistan, Iras valley, 3000-3300 m.,

Luthie no. II749(K!); Kargu nullah, above Dras, 3600-4200 m.,  
Luthie no. II776(L!,K!,BM!); and no. 3727(K!); Deosai, 3900 m.,  
Clarke no. 29814 A(K!); Deosai pass, 3900 m., R.Stewart no. 22170  
C (K!); Burzil pass, 4200 m., R.Stewart no. 22064(K!); Upper  
Lidder valley, Harnag, 3600 m., R.Stewart no. 9344 A(K!); Kolshoi  
glacier, 3600 m., R.Stewart no. 8271(K!); Ladak, J.L.Stewart(K!);  
Kamri pass, Naigund, Inayat no. 25512(K!); Sonmarg, 4200 m.,  
R.Stewart no. 9823(K!); Boji pass to Matyana, 3000 m., R.Stewart  
no. 7559(K!); Zoji valley, 3000 m., H.Rich(K!); Sirsu, Gondla,  
Drummond no. 20227(E!,K!); Pass to Gurais, Winterbottom no.53(K!);  
above Burzil in Gurais, Astor, Winterbottom no.59(K!); Burzil,  
3150 m., Clarke no. 29624 A(K!); Karpo La, Dras, 4500 m., R.Stewart  
no. 22292(K!); Ladak, 3600-4800 m., Thomson (E!,K!); Kargai, nala,  
Dras, Inayat (K!); Pangtaran, to Amarnatto, A.F.Young(BM!); Ladak,  
saser Brangsa, 4560 m., Ludlow (BM!); Ladak, Khardon La, 4650 m.,  
Ludlow & Sherriff no. 8405(BM!); Kutki pass, 3000 m., Watt no.3190  
(E!); Masjid valley, above Aro, 3900 m., Luthie no. 13298(E!).  
Karakorum: Makerum, Hispar glacier, 4350 m., Russell no. 1459(BM!);  
3900 m., Clarke no. 3169(BM!);  
W.Tibet: Zanskar, 3600-4200 m., Thomson(K!); Deotsoo, Falconer's  
collector nos. 3637(K!); and 3727(K!).

Geog. Dist:

C.Asia: Sabak, 3000 m., V.L.Komarov(K!); Djidik, 2160 m., Komarov  
(K!).

Arabis quinqueloba Schulz, distinguished by Schulz by its larger  
flowers, does not hold good when a large number of specimens is seen. There-  
fore it is conspecific with A. tibetica H.f.et T.

3. A. taraxacifolia T.Anders. in Fl. Brit. India i 136(1872); Schulz in  
Notizblatt ix 1062 (1927).

Type: near Peshawer(W.Pakistan), J.L.Stewart(K!P!).

Biennial, or annual, 20-50 cm. tall, hairy with short branched  
hairs; stems often weak, sparsely leaved or leafless above, branched, sub-  
erect, filiform. Basal leaves rosulate, lyrate-pinnatifid, 4-6-jugate,  
3-7x0.8-2 cm., somewhat rough with short, stellate hairs; terminal lobe  
+ ovate, often lobulate, apex rounded or obtuse. Cauline leaves very few,  
oblong-linear or lanceolate, 1-4x0.1-0.8 cm., subentire or entire. Racemes  
20-50-flowered, lax, increasing upto 30 cm. in fruits. Flowers minute,  
about 2 mm. across, white or pinkish; pedicels 5-10 mm. long, increasing upto  
18 mm. in fruit, filiform, + spreading. Sepals 1.9-2x0.6-0.8 mm. Petals  
2.8-3x0.7-0.8 mm., narrowly spatulate. Stamens 2.5 : 3 mm.; anthers about  
0.5 mm. long. Siliquae 4-8.5x0.08-0.1 cm., linear, often recurved, acute;

valves glabrous, 1-veined; seeds many, small, about 0.9x0.5 mm., ellipsoid, brown; septum not veined; style 1-1.8 mm. long with minute, depressed stigma. (Plate no. XXXII).

W. Pakistan:

N.W.F.P.: Hazara, Kaghan valley, Inayat nos. 1913(K!); and 1914 (K!); near Peshawar, J.L. Stewart(E!,K!); Silla Khana, H. Deane no. 6(K!); (without locality), H. Deane(K!).

Punjab: Hasan Abdal, Aitchison no. 319(K!); Rawalpindi, H. Stewart (K!).

Afghanistan:

Safed koh, 2700 m., H. Collett no. 88(K!); From the Herwar to the base of Mt. Sika-ram, 2400-2700 m., Aitchison nos. 74(K!) and 385(K!); (without locality), Griffith(K!); Rhyber pass, 1110 m., H. Johnston no. 104(E!,K!).

Geog. Dist: Endemic.

4.\*A. tenuirostris Schulz in Botizblatt ix 1066 (1927).

Syn: A. Clarkei Schulz l.c.1063.

Type: Kashmir: Kunzlwani, 2250 m., Clarke no. 29400 A(K!).

Biennial, 10-40 cm. tall, often very branched; branches erect or suberect, + hairy, especially at the base, sometimes subglabrous or glabrous above; hairs simple or forked, somewhat rigid. Basal leaves obovate-spathulate, 1-4x0.3-0.8 cm., obtuse, often 2-4-dentate or lobulate, stalked, sparsely hairy. Cauline leaves narrow, linear or oblong, 5-15x1-5 mm., obtuse, often 2-3-dentate, sessile or subsessile, sparsely hairy or glabrous. Racemes 8-20-flowered, ebracteate, lax, increasing upto 20 cm. in fruits. Flowers mediocre, 3-3.5 mm. across, white; pedicels 3-6 mm. long, filiform, glabrous, increasing upto 12 mm. in fruit, + spreading. Sepals 2-2.5x0.8 mm. Petals 3.5-4.5x1.5 mm., obovate-oblong. Stamens 3-3.5 : 3.5-4 mm; anthers 0.7-0.8 mm. long. Siliquae 3-8x0.12-0.16 cm., linear, often curved, strongly compressed, acute; valves glabrous, 1-veined; style 0.6-1.8 mm. long with minute, depressed, entire stigma; seeds 20-36 in each loculus, uniseriate, 1-1.5x0.6-0.7 mm., oblong-ovate, compressed, brown, obscurely winged; septum not veined.

N.W. Himalayas:

Sach pass (Punjab), 2400 m., R. Stewart no. 2587(K!); Chamba, Langi, Hanan nullah, 2850 m., R. Stewart no. 2779(K!).

Kashmir: Kunzlan, 2250 m., Clarke no. 29400 A(K!); Bang La, 2400 m., Clarke no. 29537(K!); Sonmarg, 2700 m., 3000 m., R. Stewart nos. 6738(K!), 6861(K!), 9803(K!), 7325(K!), 3531(K!) and 7224(K!); Sach pass, 2400 m., R. Stewart no. 2621(K!); Kishenganga valley, Chorwan, 2700 m., R. Stewart no. 22623(K!); Drass pass, 2700-3000 m., Thomson(K!); Rajohiangan pass, c. 2700 m., R. Stewart no. 22542(K!); Baltistan, Lanchan nala, above Dras, 3500-3600 m., Luthic no. 13766(K!); Kamri pass, north slope, 3000 m., R. Stewart no. 22772(K!); Sonmarg, 3600 m., R. Stewart nos. 7344(K!) and 9240 A(K!); Zoji pass, to Katayana, 3000 m., R. Stewart no. 7562(K!); Kunzlan, c. 2250 m., Clarke nos. 29430B(BM!); and 29400 B(BM!);

Karakorum: 3150 m., Clarke no. 30473 D(BM!).

Geog. Dist: Endemic.

This species is very closely allied to A. tibetica H.f. et T., but is distinguished by its larger hairs, biennial habit and longer styles.

A. Clarkei Schulz is nothing but a state of this species. Schulz distinguished it by its robust habit and other minor characters which do not hold good when a large number of specimens is examined.

5. A. auriculata Lam., Dict. i 219 (1783); F.B.I. 135.

Syn: A. Montbretiana Boiss. in Ann. Sc. Nat. 53 (1842); B.F.O.

169; A. sinaica Boiss., Diagn. ser. I(8) 21(1849); A. cadmea Boiss., Diagn. ser. I(8) 21(1849).

Type: France, Dauphine, M. Liotard(P- not seen).

Annual, 8-35 cm. tall, pubescent with short, stellate hairs; stem erect, simple with 4-10 distant cauline leaves. Basal leaves few, sub-rosulate, spatulate or oblong-obovate, 0.5-3x0.2-2 cm., subentire or bluntly toothed, stalked, obtuse, pubescent. Cauline leaves ovate or ovate-oblong, 0.5-2x0.2-1.5 cm., toothed or entire, + auricled at the base, auricles obtuse, apex obtuse or acute, amplexicaule or semiamplexicaule. Racemes 5-10-flowered, lax, increasing upto 10 cm. in fruits. Flowers 2-4 mm. across, white; pedicels 1.5-4 mm. long, increasing slightly or not in fruit, thickened (about as thick as the fruit). Sepals 1.5-2x0.5-1 mm. Petals 3.5-4x0.8-1 mm., narrowly spatulate, apex rounded. Stamens about 2 : 2.2 mm.; anthers about 0.3 mm. long. Siliquae 2.5-3x0.08-0.1 cm., linear-oblong, often straight, compressed, glabrous or sub-hairy, acute; valves + I-veined; style about 0.5 mm. long with minute, depressed stigma; seeds

10-15 in each loculus, uniseriate, about 1 x 0.6 mm., oblong-ovate, compressed, brown; septum not veined.

W. Pakistan:

Chitral: Jambatai, 1650 m., Harriss no. 15911(K!); Drosch, 1350-1500 m., Toppin no. 41(K!); Ayun, 1500 m., Toppin no. 42 (K!).

N.W.F.P.: Kaghan, Malkandi, Inayat no. 21141(K!); Abbottabad, 1500 m., R. Stewart(K!) and no. 14633(R-E!).

Afghanistan:

Khyber pass, Forsapper, 1590 m., H. Johnston no. 63(E!); Alipore, in wet sandy places, Griffith no. 1478(K!).

N.W. Himalayas:

Chenab valley, R. Ellis no. 1004(K!); (without locality), Thomson (K!, BM!).

Kashmir: Bren nala, 1800 m., Coventry no. 1457(K!).

Geog. Dist:

Europe, N. Africa and Orient, C. and N. Asia.

A. Montbretiana Boiss, originally distinguished from A. auriculata Lam. by its smaller pedicels, does not hold good. Hooker f. and Thomson's treatment in sinking the former in the latter species is justified, though Komarov's Fl. U.R.S.S. (1939) still recognizes the two as distinct species. The other two species, A. sinaica Boiss. and A. cadmea Boiss., reduced to varieties of A. auriculata Lam. in Fl. Orientalis (1867) and Suppl. Fl. Or. (1888), are in my opinion not good varieties due to the presence of intermediate forms breaking down all the distinguishing characters. They are all one and the same taxon with a wide range of infraspecific variation.

6. \*A. bijuga Watt in Journ. Linn. Soc. Bot. xviii 376 (1881).

Syn: "A. bengiensis" Schulz in Notizblatt ix 1063 (1927)-partim (non Watt).

Type: N.W. Himalayas, Fangi, 2550 m., G. Watt no. 899(E!).

Perennial, 15-40 cm. tall, subglabrous, glaucous, erect, sparsely branched; caudex 1-3 mm. thick; stems slender, thin. Radical leaves rosulate, spatulate or oblong-obovate, 3-9x0.5-1.5 cm., distantly toothed to subentire, + glabrous, margin somewhat ciliate hairy with simple or forked hairs, apex obtuse or rounded. Cauline leaves distant, oblong-elliptic or oblong, 1-5x0.2-1.2 cm., entire or subentire, sessile, + amplexicaule, apex obtuse. Racemes 8-18-flowered, ebracteate, lax, increasing upto 15 cm. in fruits, ~~subspreading~~, Flowers 7-10 mm. across, white; pedicels long, filiform, increasing upto 2.5 cm. in fruit, + spreading. Sepals 3-5x1-1.5

mm. Petals 8-14x2-4 mm., oblong-obovate, + diverging in pairs. Stamens 6-7 : 7-8 mm.; anthers about 0.9 mm. long. Siliquae 3-4.5x0.08-0.1 cm., linear-oblong, compressed, glabrous; valves 1-veined; style about 1 mm. long with minute depressed stigma; seeds 20-28 in each loculus, uniseriate, about 1 x 0.5 mm., ellipsoid, compressed, brown; septum not veined. (Plate no. XXXIII).

N. Pakistan:

Chitral: Lam Gol, 1500 m., common in rocks Toppin no. 96(R!).

N.W.F.P.: Raghan, Malkandi, Inayat no. 21145(B- only photograph seen at Kew); Hamalban, 2700 m., Inayat no. 1140(B- only photograph seen at Kew); Abbottabad, R. Nath no.

Punjab: Murree hills, Changla galli, 2400-2700 m., R. Stewart 114(R-E!) (R-E!).

N.W. Himalayas:

Chamba, R. Ellis no. 133(R!); Upper Chenab valley, Killar, 2550 m., Baden-Powell no. 59(R!); Purti, 2250 m., R. Ellis no. 1002 (R!); Pangi, 2400 m., R. Ellis no. 962(R!); Pangi, 2850 m., on rocks, Larker(R!); (without locality), Jacquemont(R!); Thomson (R!); Pangi, 2510 m., Watt no. 899(E!,K!) and no. 837(E!).

Rashmir: Sindh valley, Wosah, 1800 m., Ludlow & Sherrii no. 7573(BR!).

Geog. List: Endemic.

Schulz(1927) confused this species with A. pangiensis Watt; the photographs of the two specimens [Inayat nos. 21145(R!) and 1140(R!)] from Chitral seen at Kew, are not <sup>of</sup> A. pangiensis Watt (as identified by Schulz) but are A. bijuga Watt.

7. \*A. pangiensis Watt in Journ. Linn. Soc. Bot. xviii 373 (1881); Schulz in Notizblatt ix 1063 (1927),-partim; P. Wendelbo in Nytt Mag. Bot. i 32 (1952).

Type: N.W. Himalayas, Pangi, 3000 m., G. Watt no. 2400(L!).

Perennial, caespitose, densely hispid below with short, branched, often brownish hairs; stems usually simple, 12-20 cm. tall, radical leaves densely rosulate, spatulate-oblong, 3-6x0.4-1 cm., often 1-4-dentate towards the apex, entire below, very variable in size, sessile or subsessile, obtuse or acute, densely pubescent. Cauline leaves few, oblong-linear, 1.5-3x0.2-0.4 cm., sessile, semiamplexicaule, entire or subdentate towards the apex, pubescent. Racemes 10-20-flowered, ebracteate, increasing upto



15 cm. in fruits. Sepals 3-3.5x0.7-0.9 mm. Petals 5-5.5x1-1.5 mm., narrowly spatulate, apex rounded. Stamens 3.5-4 : 4-5 mm.; anthers about 0.7 mm. long. Siliquae linear-oblong, 3.5-5x0.1-0.15 cm., strongly compressed, subspreading; valves glabrous, with a distinct mid-vein and reticulate venation; style about 0.8 mm. long with minute, depressed, entire stigma; seeds many, uniseriate, small, oblong, brown; septum not veined. (Plate no. XXXIV).

W. Pakistan:

Chitral: Zapotili, c. 3500 m., (Herb. Oslo- ex P. Wendelbo).

N.W.F.P.: Swat, Herb. Gordon College, Pakistan nos. 256(R-E!), and 110(R-E!);

N.W. Himalayas:

Chenab, Sach, Pangi, Brandis no. 37791(K!); Upper Chenab valley, R. Ellis no. 194(K!); Pangi, 3000 m., Watt no. 2400 (E!); 2400 m., Watt no. 881(E!); Pangi, R. Stewart no. 2842 (R-E!); Kashmir, Titwal, to Surkhala, 1080 m., R. Stewart no. 17465(R-E!).

Geog. Dist: Endemic.

8. A. amplexicaulis Edgeworth in Trans. Linn. Soc. xx 31 (1851); Hooker f. et Thomson in Journ. Linn. Soc. Bot. v 142 (1861); F.B.I. 136. Syn: A. alticola Schulz in Notizblatt ix 1062 (1927).

Type: N.W. Himalayas, Garhwal, Chur, Shioli, Edgeworth(K!).

Perennial, 20-70 cm. tall, erect, branched mostly from the base, + hairy, often hispid below and glabrous above; hairs simple or forked. Basal leaves rosulate, often large, 5-15x1-3 cm., oblanceolate or oblong-obovate, stalked, often dentate with short and obtuse teeth, rarely sinuate-toothed, apex rounded or obtuse. Cauline leaves distant, sessile, (1) 1.5-6x0.5-3 cm., ovate-oblong, amplexicaule, apex obtuse or rounded, entire or subentire. Racemes 12-35-flowered, ebracteate, corymbose above, increasing upto 25 cm. in fruits. Flowers 5-10 mm. across, (rarely about 4 mm. across), white; pedicels 3-6 mm. long, increasing upto 15 mm. in fruit, filiform, glabrous, + spreading or ascending. Sepals 3-6x1.5-2.8 mm., petals 5-10(-14)x2-3.5(-5) mm., oblong-obovate. Stamens 3-4 : 5-6 mm.; anthers 1-1.6 mm. long. Siliquae 3-6x0.1-0.12 cm., linear-oblong, spreading or horizontal, rarely somewhat drooping, acute; valves glabrous, with a distinct mid-vein; style about 1 mm. long with minute, depressed stigma; seeds many, uniseriate, about 1 x 0.8 mm., ovate, compressed, brown; septum not veined.

W. Pakistan:

Chitral: Jambatal, Harriss no. 15981(BM!).

N.W.F.P.: Abbottabad, 1200-1500 m., R. Stewart no. 16375(K-E!);  
Mughan, 1500 m., Inayat no. 19172(K!).

Punjab: Murree hills, Shikargali, R. Stewart no. 23575(K!); Changla g  
gali, R. Stewart no. 2919(K!); (without locality), R. Stewart  
 no. 6130(K!).

Afghanistan:

Kurram valley, Shendtoi, Aitchison no. 377(K!).

N.W. Himalayas:

Simla, Hatu forest, 2850 m., Gamble no. 6101 A(K!); (without  
 locality), Jacquemont(K!); Nagkunda, Collett nos. 41(K!), 19  
 (K!), and 12(K!); Chamba, Kaletra forest, Bhandal range, 2400  
 m., Parker (K!); Koral, Drummond no. 20230(K!); (without local-  
 -ity), Royle(K!); J.L. Stewart(K!); Thomson(K!); Strachey &  
Winterbottom(K!); Dalhousie, R. Stewart no. 2144(K!); Chur, 2400-  
 2700 m., Edgeworth(K!); Madhuri pass, 2400 m., Strachey & Wint-  
-erbottom(K!); Tihri Garhwal, Balchoo, 2700 m., Gamble no. 26696  
 (K!); Kumaon, valley of Rangongi, 2400 m., Strachey & Winter-  
bottom (K!); Ascent from Dawali, 2650 m., Strachey & Winter-  
bottom (K!); Garhwal, Berali to Rechapu, Falconer's collector  
 no. a/32(K!); Sungri to Bhagi, 2700-3000 m., Inayat no. 7252(K!)  
Lahul, Keylang, Drummond no. 20238(K!), and no. 20338(E!);  
Dalhousie, Drummond nos. 20231(K!), 20232(K!), 20233(K!) and  
 20234(K!); Chur, Drummond no. 20235(K!); (without locality),  
Drummond no. 20239(K!); Jaunsar, 2100 m., Gamble no. 2328(K!);  
 near Theog, 2400 m., Gamble no. 6036 A(K!); Chota Simla, H. Rich  
 no. 531(K!); Jaunsar, Bhujkati, 2100 m., Keshavnand, no. 277(E!);  
Mandali, 2100-2400 m., Duthie(E!); Nagkunda, muttujana hill,  
 2700 m., Watt no. 13520(E!); Chamba, Baliani forest, 2100 m.,  
Lace no. 1942(E!); Ushan valley, 1200 m., Watt no. 8876(E!);  
Hoya khud, 1500 m., Watt no. 10036(E!); Chamba, Bhandal, 2400  
 m., Lace no. 1358(E!); Mhulel chamba, 1500 m., Watt no. 616  
 (E!); Nagkunda, hills, 2650 m., Watt no. 9674(E!); Bashahr, Duni,  
 2790 m., Lace no. 270(E!); Last of Takwani, 600 m., Reid(E!);  
Kawa, 3300 m., Reid(E!);

Kashmir: Near Gurais, 2400-2700 m., Luthie(BM!); Srinagar, 1500-  
 1800 m., Luthie no. 10814(E!); Mari, A.F. Young (BM!); Near  
Gulmarg, 2400-2700 m., Luthie(BM!); Srinagar, 1500 m., Timins  
 no. 148(BM!); Sind valley, Finford no. 144(BM!).

Geog. Dist: Endemic.

A very polymorphic species, especially in size of leaves and  
 flowers. A. alticola Schulz, said to be distinguished from it by its small  
 narrow leaves, is nothing but a state of it.

9. A. pterosperma Edgew. in Trans. Linn. Soc. xx 33 (1851); Schulz in Notizblatt ix 1063 (1927).

Syn: "A. alpina" H.f. et T. in Journ. Linn. Soc. Bot. v 141 (1861)  
et H.f. et T. Anders in F.B.I. 135 (non Linn.).

Type: Himalaya, Badrinath, 2700-3000 m., Edgeworth (K!).

Perennial, 18-45 cm. tall, erect, branched mostly from the base, hairy especially below with simple or furcate hairs. Radical leaves spatulate or obovate-oblong, 2-4x0.5-1.5 cm., stalked, toothed, apex obtuse or rounded, often densely hairy. Cauline leaves oblong, sessile, 1-2.5x0.25-0.8 cm., toothed below with apex usually somewhat elongated and entire, rounded or obtuse, subauricled at the base, + amplexicaule, usually sparsely hairy. Racemes 20-30-flowered, lax, ebracteate, increasing upto 12 cm. in fruits. Flowers 4-5 mm. across, white or pale pinkish; pedicels 3-4 mm. long, increasing upto 12 mm. in fruit, filiform, glabrous, suberect. Sepals 3-4x 0.8-1 mm. Petals 5-7.5x1.4-1.8 mm., oblong-obovate, apex subtruncate. Stamens about 2.5 : 3.5 mm.; anthers about 0.6 mm. long. Siliquae oblong-linear, 3.5-6x0.1-0.15 cm., strongly compressed, erect or suberect, glabrous; valves distinctly 1-veined; style about 0.7 mm. long with a minute, depressed stigma; seeds 25-35 in each loculus, uniseriate, about 0.9x0.6 mm., ovate, compressed, brown; septum not veined.

W. Pakistan:

N.W.F.P.: Kaghan, Inayat no. 21144(K!); Chapran, Inayat(K!).

Punjab: Murree, J.L. Stewart(K!).

N.W. Himalayas:

Bashahr state, Theog to Matiana, Lace no. 692(E!); Nagkunda, 2700 m., Watt no. 8353(E!); Chenab valley, Pangi, 2400 m., Watt nos. 787(E!) and 2525(E!); Below Dunsy, Watt-no. 2994(E!); Kilar, Watt nos. 2916(E!) and 319(E!); (without locality), Thomson(K!); Royle (K!); Sirsu, Drummond no. 20226(K!); Kumaon, Shapuligadh, 3300-3600 m., Duthie no. 2716(B- only photograph seen at Kew); Chamba, Kutki pass, 4200 m., W. Koelz no. 8607(R-E!).

Kashmir: Sind valley near Baltal, 3000-3300 m., Duthie no. 11595(E!) Pir Panjal, 2100 m., Drummond no. 13928(E!,K!); Astan marg, 3300 m., Drummond no. 14236(K!); Sheshnag, 3750 m., Drummond no. 14215 (K!); Astanmarg, 3600-3900 m., Drummond no. 14292(K!); Nishatbagh, Falconer's collector no. 2114(K!); above Burzil in Gurais, Winterbottom no. 59(K!); Sonmarg, 3300 m., R. Stewart nos. 6421(K!), 6663 (K!), 7266(K!) and 9785(K!); Baramula, pass, 1350 m., Winterbottom (K!); (without locality), Jacquemont(K!); Rattanpir, Clarke no.

28315 A(K!); and no. 28315 B(BM!); Pahlgam, 2700 m., R. Stewart no. 7962(K!, R-E!); Barungalli, Clarke no. 28404 A(K!); Lidder valley, Laripara, Inayat (B- only photograph seen at Kew); Baltal, Sind valley, 2850 m., Ludlow & Sherriff no. 3304(BM!); Masjid valley, above Aro, 3900 m., Duthie no. 13298(BM!); Bringhi valley, 2700 m., Ludlow no. 17(BM!); Tragbol, 3000 m., R. Stewart no. 4232(R-E!).

Geog. Dist:

Tibet: Niti, 3450 m., Strachey & Winterbottom (K!); Yatung, to Lachung La, 3600 m., Gould no. 2027(K!).

10. \*\*A. fruticulosa C.A.M. in Ledeb., Fl. Alt. iii 19 (1831); et Fl. Ross. i 119 (1842); B.F.S. 446; S.E.F. 545.

Type: Altai, Ledebour (L, K!);

Perennial, 10-25 cm. tall, pubescent with minute stellate, soft, white hairs; rootstock elongated, branched above, 2-4 mm. thick, covered with leaf bases. Radical leaves rosulate, often congested, very variable in size, 1-6x0.2-0.7 cm., oblong-obovate or oblong-elliptic, apex + rounded, entire, stalked, pubescent. Cauline leaves few, small, oblong-ovate, distant, 0.5-1.5x0.2-0.5 cm., semiamplexicaule, rarely subcordate, acute or obtuse, entire, pubescent. Racemes 6-12-flowered, ebracteate, corymbose, increasing upto 7 cm. in fruits. Flowers 6-8 mm. across, pale rose coloured; pedicels 2-6 mm. long, increasing upto 8 mm. in fruit, not thickened, ascending. Sepals 4-5.5x1.5-2 mm. Petals 9-12x3-5 mm., obovate-oblong, shortly clawed, apex subtruncate or subemarginate. Stamens 3.8-4.5 : 4.5-5 mm.; anthers about 1 mm. long. Siliquae linear-oblong, 2.5-5.3x0.12-0.15 cm., strongly compressed, erect or suboblique, subtorulose; valves pubescent with minute, stellate hairs, distinctly mid-veined; stigma capitate, broad, subsessile or sessile; seeds 12-24 in each loculus, 1.5-1.7x0.7-0.8 mm., oblong-ellipsoid, compressed, brown, very narrowly winged; septum not veined. (Plate no. XXXVI).

W. Pakistan:

Chitral: Shajanali, 3000-3300 m., Toppin no. 373(K!); (Without locality), Toppin no. 464(K!).

Geog. Dist:

C. Asia: Altai, Ledebour (K!); Soongaria, Ajagus, Kar. et Kir. no. 1194(K!);

N. Asia: Siberia, Grisebach (K!).

This is an entirely new record for the present area, a fact which favours the view that many more records of Central Asian crucifers will come to light with an increased knowledge of the Flora of Chitral.

II. A. saxicola Edgeworth in Trans. Linn. Soc. xx 32 (1851).

Syn: A. scaposa Schulz in Notizblatt ix 1065 (1927); P. Wendelbo in Nytt Mag. Bot. i 32 (1952).

Type: N.W. Himalaya, Garhwal, Dhawli, 2700-3300 m., Edgeworth(K!).

Var. I. saxicola Perennial, 10-15 cm. tall, sparsely hairy below with short, furcate hairs; stem simple; rootstock 1.5-3 mm. thick, branched above but not densely covered with withered leaf bases. Radical leaves oblanceolate, 1.5-5x0.2-0.6 cm., stalked, entire or slightly 1-dentate above, apex obtuse or acute, sparsely hairy. Cauline leaves absent or rarely 1-2, linear, cuneate, entire. Racemes 5-10-flowered, lax, increasing upto 8 cm. in fruit. Flowers 3.5-5 mm. across, white; pedicels 2.5-5 mm. long, increasing upto 6 (8) mm. in fruit, filiform, suberect or subascending. Sepals 2.5-3.8x0.6-1 mm. Petals 5-7x1-1.6 mm., linear-cuneate, apex rounded. Stamens 2.5-3 : 3-3.8 mm.; anthers about 0.5 mm. long. Siliquae linear, strongly compressed, 2-2.5 (-5)x0.1-0.12 cm., acute, straight, + erect, glabrous; valves 1-veined; style 0.5-0.8 mm. long with minute, depressed, entire stigma; seeds 12-16 in each loculus, uniseriate, about 0.8x0.4 mm., ovate, compressed, brown, non mucous when wet; septum not veined.

Afghanistan:

Kurram valley, Seratgah, 3900 m., Aitchison no. 822(K!);

N.W. Himalayas:

Lahul, Kardong, Jaeschke no. 224(K!); Garhwal, Dhawli, 2700-3300 m., Edgeworth(K!);

W. Tibet: Zanzkar, 3600-4200 m., Thomson(K!).

Geog. Dist: Endemic.

Var. II. elatior (Schulz) Jafri, comb. nov.

Syn: A. scaposa Schulz var. elatior Schulz in Notizblatt ix 1066 (1927); P. Wendelbo l.c. 32.

Type: Kashmir, Gilgit, 3000-3300 m., Duthie no. 12430(B,K!).

Plants robust, 20-30 cm. tall; radical leaves 2-5x0.6-1.4 cm., oblong-obovate, sparsely hairy; siliquae large, 4-6x0.12-0.2 cm., linear-

oblong, subspreading or spreading on about 1 cm. long pedicels; seeds large, 1-1.5x0.8-1 mm., suborbicular.

W. Pakistan:

Chitral: Zapotili, c. 3500 m., P. Wendelbo (Herb. Oslo - not seen);  
Jamishi Ghochar, c. 3900 m., P. Wendelbo (Herb. Oslo - not seen).

N.W. Himalayas:

Chamba, Kilar, Fangi, 2700 m., R. Stewart no. 2842(K!);  
Rashmir: Kamri valley, on rocks near Kalafiani, 3000-3300 m.,  
Duthie(K!); Gilgit, Nittar valley, on rocks, 3000-3300 m.,  
Duthie no. 12430(K!).

Geog. Dist: Endemic.

This variety is remarkably distinct from the type race by its robust habit, large siliquae and bigger seeds. I have seen only one somewhat intermediate form between the type race and the variety. Cytological or experimental research might lead to its separation as a distinct species.

12. \*\*Arabis griffithiana Jafri, sp. nov. (sect. Drabopsis Griseb.)

Affinis A. saxicolae Edgew. sed statura breve, foliis radicalibus tomentosis, inferioribus emarcidis basibus persistentibus fibrosis, caudicibus dense obsitis, indumento densiore e pilis ramosis composito, pedicellis longioribus divaricatis, siliquis erectis ad apicem recurvatis differt.

Herba perennis, caespitosa, in fructu circa 5 cm. alta. Folia radicalia congesta, rosulata, lanceolata, 1-3x0.2-0.4 cm., tomentosa, integra vel 1-3-subdentata, acuta, petiolata, inferiora emarcida basi persistentia fibrosa, caudicibus dense vestitis. Caules aphylli. Flores ignoti. Pedunculi + erecti, 5-10-fructiferi, circa 5 cm. longi, glabri. Pedicelli 10-15 mm. longi, filiformes, glabri, flexuosi, patentes. Siliquae 20-24x1 mm., lineares, compressae, glabrae, erectae, ad apicem recurvatae acutae; valvae membranaceae, uninervatae; stylus circa 1 mm. longus; stigma minutum, depresso-capitatum, integrum. Semina 20-30, uniseriata, circa 1 x 0.4 mm., oblonga-ellipsoidea, brunea, humida haud mucilaginosa; septum membranaceum, enervatum.

Small, perennial, caespitose herb, about 5 cm. tall in fruit.

Radical leaves congested, rosulate, lanceolate, 1-3x0.2-0.4 cm., tomentose, entire or 1-3-subdentate, acute, petiolate; lower withered with their persist-



Plate no. XXXVI. *Arabis fruticulosa* C.A.M.

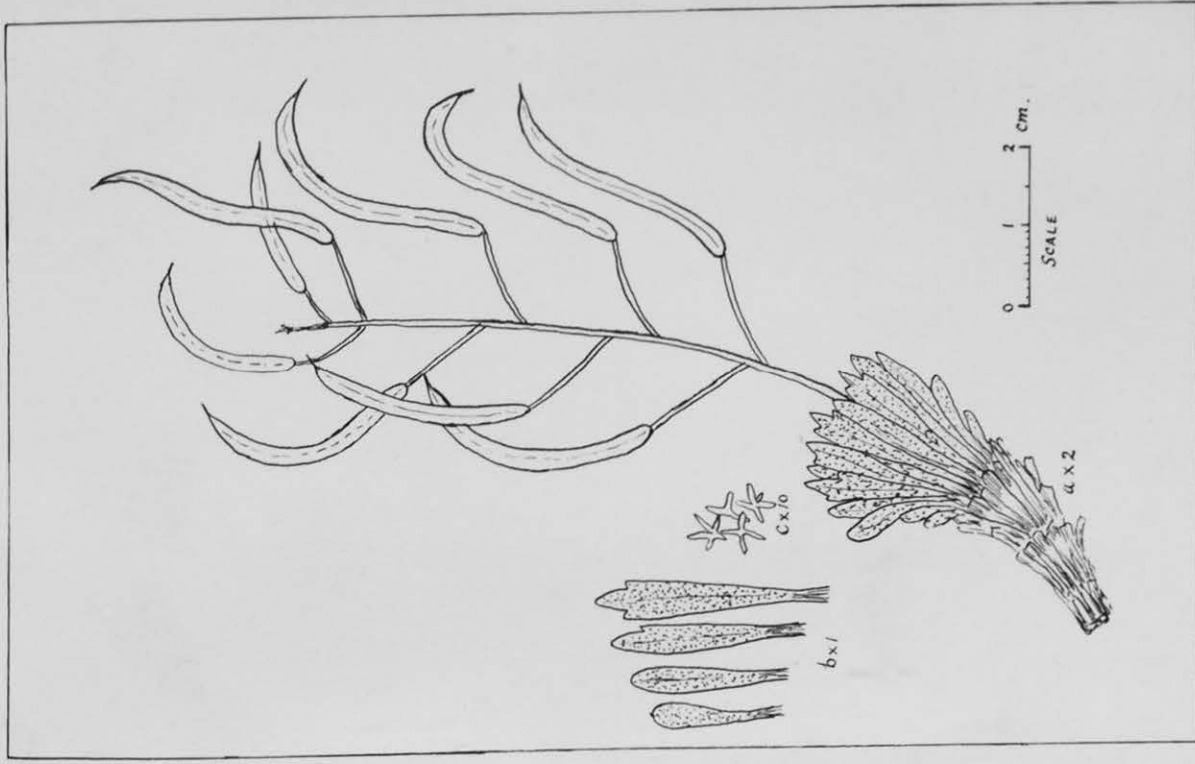


Fig. no. 18  
*Arabis griffithiana* Jafri  
 [a - habit; b - leaves; c - hairs]



Plate no. XXXII.

*Arabis taraxacifolia* T. Anders.



Plate no. XXXIII.

*Arabis bijuga* Watt



Plate no. XXXIV.

*Arabis pangiensis* Watt



Plate no. XXXV.

*Arabis pterosperma* Edgeworth



-ent, strong, fibrous bases densely covering the basal part of the plant. Stems aphyllous. Flowers not seen. Peduncles + erect, 5-10-fruited, about 5 cm. long, glabrous. Pedicels 10-15 mm. long, filiform, glabrous, flexuose, spreading. Siliquae 20-24x1 mm., linear, compressed, glabrous, erect with recurved apex, acute; valves membranous, 1-veined; style about 1 mm. long with minute, depressed-capitate, entire stigma. Seeds 20-30, uniseriate, about 1 x 0.4 mm., oblong-ellipsoid, brown, not mucilaginous when wet; septum membranous, not veined. (Fig. no. 18).

Afghanistan:

Siah sung, limestone rocks, Griffith, Typus in Herb. Kew.

Geog. Dist: Endemic.

Distinguished from A. saxicola Kew. by its small size; densely caespitose habit with basal part of the plant densely covered with persistent withered leaf bases; tomentose radical leaves with short, branched, soft, white hairs; ~~and~~ erect siliquae with recurved apices; and long,  $\frac{1}{2}$  spreading pedicels.

55. \*CHRISTOLEA Cambess. in Jacquemont, Voy. Bot. 17 t 17 (1844); B.H.G.F. 80; S.E.P. 464; K.F.U. 328.

Syn: Ermania Cham. in Linnaea vi 533 (1831) - not validly published; Melanidion Greene in Ottawa Nat. xxv 146 (1912); Desideria Pamp. in Bull. Soc. Bot. Ital. 107 (1926); Arcroschizocarpus Gomb. in Bot. Nozl. xxxvii (1940); Hoelzia Reehinger f. in Phytion iii 59 (1951).

Perennial, often tufted and somewhat dark coloured herbs, pilose with simple or furcate, white hairs, very rarely glabrous. Branches often procumbent or suberect, mostly developing from the base, sparsely leafy or aphyllous. Leaves spatulate or obovate-oblong, 1-5(-10)-toothed or lobulate usually above, + entire below, sometimes entire or obscurely toothed, often pilose, very rarely glabrous, 1-5-veined; Basal leaves rosulate, somewhat larger than the upper leaves. Racemes few to many flowered, subcorymbose, bracteate or obraceate. Flowers small or mediocre, usually lilac, rarely white or yellowish with + lilac bases; pedicels short or long, often pilose and unilateral. Sepals suberect, equal or subequal, oblong, obtuse, inner

pair not or hardly separate at the base, sometimes persistent even in fruits. Petals spatulate or obovate-oblong, Stamens six, filaments not appendaged; anthers oblong, obtuse or subapiculate. Lateral nectariferous glands annular, median joining the laterals. Ovary narrowly to broadly linear, rarely ovate-oblong, often pilose, few to many ovuled; stigma depressed-capitate, sessile or subsessile, rarely on short style. Siliquae narrowly to broadly linear, lanceolate or oblanceolate, short or long, bilocular, dehiscent; valves--plane-compressed to subinflated, pilose to glabrous, usually with a distinct mid-vein and reticulate venation; sseds 1-2-seriate; septum membranous, complete rarely incomplete, thinnest in the middle.

13 species, chiefly in Himalaya and C.Asia.

Recent investigations have revealed that Christolea Cambess. (1844) and Ermania Chamisso (1831) are congeneric (Plate nos. XXXVII, XXXVIII and XL). Although Ermania is earlier it is not a validly published name. It was published originally as an alternative name for Draba? parryoides Cham. [Linnaea vi 533 (1831)]. Chamisso wrote, "Draba? parryoides n.sp. vel potius novum genus e solo fructu, deficiente flore, haud rite definiendum. Draba dolichocarpis subjungimus pro tempore plantum aliquanduo fors jure meritoque nomine inventoris ERMANIAM parryoidem salutandum ....."

Ledebour [Fl. Ross. i 132 (1842)] regarded Draba? parryoides Cham. as a species of Parrya and named it as Parrya Ermanii.

N. Busch in Fl. Sib. (1931) retained P. Ermanii Ledeb. but later on in Komarov's Fl. U.R.S.S. viii 328 (1939) he correctly recognized it as a species of Christolea, making a new combination Christolea parryoides (Cham.) N. Busch. Therefore, it was Busch who first found that Ermania was congeneric with Christolea Cambess., and the former being not a validly published he took the valid generic name Christolea. At the same time he transferred two more species to Christolea bringing the number of species to five in the Russian territory. But out of these five, only three remain as distinct species, because the other two are nothing but states of Christolea crassifolia Cambess.; this was revealed <sup>during</sup> the present studies in the British herbaria after examining large number of specimens. Plate nos. XXXVII and XXXVIII show the extreme ends of range of variations in C. crassifolia Cambess.

The original description of Christolea given by Cambessedes and

based only on Jacquemont's collection from Himalaya is incomplete. Apparently the flowers look yellowish in Jacquemont's specimens, but a careful examination shows that the lilac tinge is present at the bases of most of the flowers. Probably, due to this yellowish colour of the flowers, it was included under the tribe Sisymbrieae by most of the previous authors. But now there is a large collection of specimens present at Kew and the other British herbaria, ~~xxx~~ a study into Christolea crassifolia Cambess. shows a very wide range of variation: densely pilose to glabrous habit; flowers yellowish to lilac. Therefore, the original generic description does not hold good. The same is true when we see the other species, which also have the same kind of variations. This has compelled me to give an adequate description of the genus.

O.E.Schulz in Pflanzenfam. (1936) not only recognizes Ermania Cham. and Christolea Cambess. as two distinct genera, but he also keeps them under two different tribes: the former under Arabideae and the latter under Sisymbrieae. He includes about 10 species under Ermania and quotes Desideria Pamp. (1926) as its synonym (which is based on an abnormal specimen of the so called Ermania himalayensis) and 3 species under Christolea. He described a new species of Draba, calling it D. laujarica [Fedde, Rep. xxxiii 109 (1935)] without apparently realizing that the type specimen cited for this was already the type of the so called Ermania lanuginosa (H.f. et T.) Schulz (1933) [syn: Farrya lanuginosa H.f. et T. (1861)]. Thus, in this case Schulz obscured the generic concept of the so-called Ermania and Draba by inadvertently placing the same specimen in both the genera. This specimen, Strachey & Winterbottom no. 7 (H!) from Laujar, W. Tibet, has a superficial resemblance in its fruit to some species of Draba: being large, ovate-oblong or broadly linear. But the habit and every other character of this specimen leaves no doubt that it is a species of Christolea (Ermania). Such fruit shapes are even present on the type species of Christolea, C. crassifolia Cambess. The septum is incomplete in the type specimen of Farrya lanuginosa H.f. et T., but other records show various degrees: from slightly to very incomplete septum. It is probably due to the septum being thinnest in the middle, a character present in most of the species of Christolea included here.

Recently Eric Hulten in his flora of Alaska and Yukon (1945)

recognized two species of Ermania, E. parryoides Cham. and E. borealis (Greene) Hulten from his region. His E. borealis also shows incomplete to complete septum character. He quotes Melanidion Greene (1912) and Arcroschizocarpus Gombocz (1940) as synonyms of Ermania Cham. Hulten's interesting discussion leaves no doubt that they must go as synonyms of Christolea Camb., as Ermania is not a valid name.

Very recently Rechinger fil. [Phyton iii 55 (1951)] described a 'new' genus, Koelzia from Afghanistan. He doubtfully included it under the tribe Arabideae. It is interesting to note that his 'new' genus and 'new' species, Koelzia afghanica (Plate no. XXXIX) is nothing but Christolea crassifolia Cambes. placed under the tribe Sisymbrieae by Schulz and most of the other previous authors. Rechinger was perfectly right in placing his Koelzia under the tribe Arabideae. Christolea Cambess., with that sort of flower and fruit character, occupies a very odd place under the tribe Sisymbrieae.

Christolea Cambess. is a remarkably distinct genus, especially in its habit, leaf, indumentum, flower and fruit characters: radical leaves short, + spathulate, often tufted, usually 3-10-toothed or lobulate above and entire below, pilose with simple and furcate hairs; flowers usually lilac; siliquae linear, lanceolate to ovate-oblong, compressed to subinflated, often + pilose; lateral nectariferous glands semiannular or annular, median joining the laterals. These characters leave no doubt to me that its proper place is under the tribe Arabideae as given for Ermania and not under Sisymbrieae as given for Christolea by Schulz (Pflanzenfam, 1936). [Christolea Camb., including Ermania Cham. as synonym, has been given a place between Octoceras and Forssetia in Komarov's Fl. U.R.S.S. viii 528 (1939)].

It will be evident from the synonyms given here under Christolea Cambess. that it includes four validly published and one not validly published genera as its synonyms.

The genus is primarily Himalayan and C. Asian. I find 13 species in the world of Christolea Cambess., but so far my knowledge goes only four have been published and included under it. Therefore 9 new combinations have been made (a separate paper on this genus is in press).

Of the thirteen species only seven occur in the present area. Of the seven species one, Christolea scaposa Jafri, is new to science, and



Plate no. XXXVII. *Christolea crassifolia* Cambess.



Plate no. XXXVIII. *Christolea crassifolia* Cambess.





15723 *Christolea crassifolia* Cambess.  
Afghanistan, Mass. 2939  
Koeber

UNITED STATES NATIONAL MUSEUM



PLANTS OF AFGHANISTAN  
*Christolea crassifolia* Cambess.

Sinjan Pass  
Elev. 12,000 ft. July 20, 1907  
Climate: air. cream

WALTER KOEHL No. 12723  
1907

Plate no. XXXIX. Christolea crassifolia Cambess.

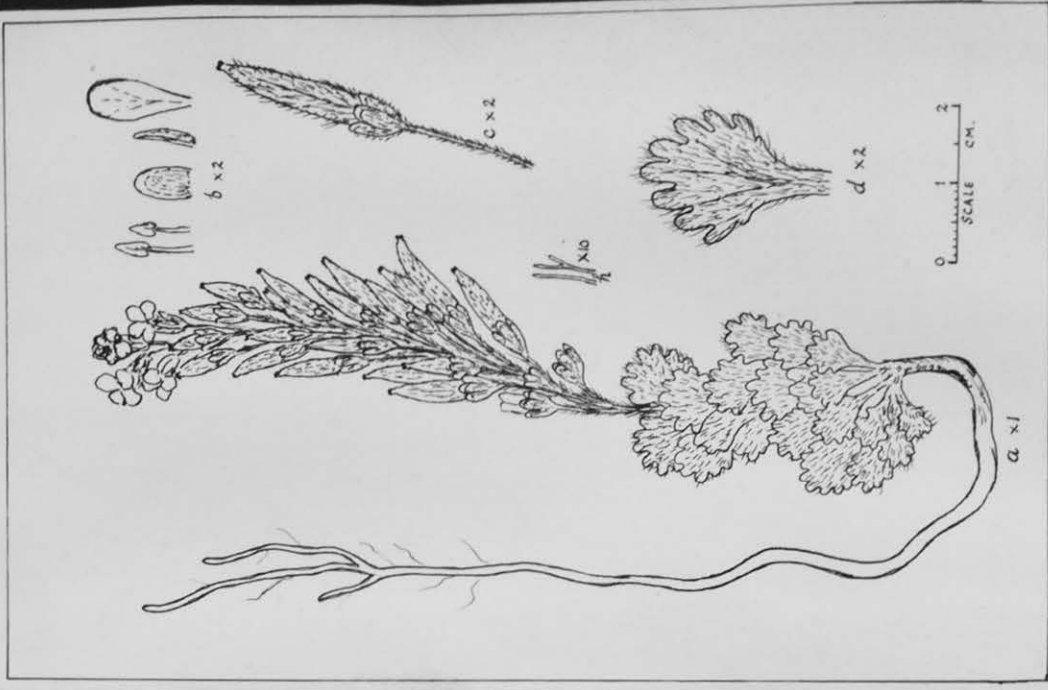
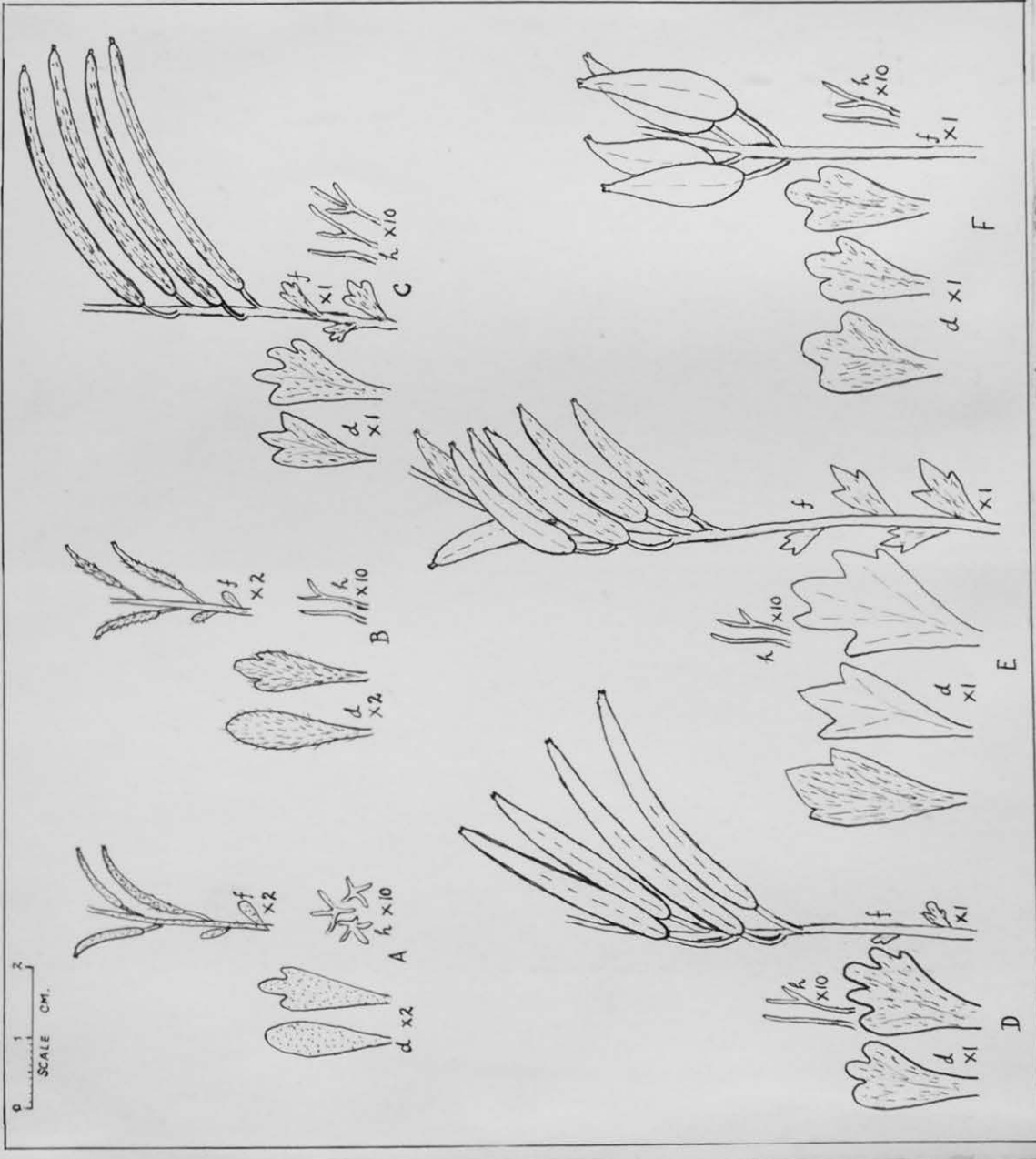


Fig. no. 19

- Christolea spp.  
 A - *Christolea albiflora* (T. And.) Jafri; B - *C. parkeri* (Schulz) Jafri; C - *C. himalayensis* (Cambess.) Jafri; D - *C. stewartii* (T. And.) Jafri; E - *C. crassifolia* Cambess.; F - *C. lanuginosa* (H. f. et T.) Jafri; G - *C. scapoza* Jafri (a - habit; b - floral parts; c - silique).  
 [f - part of the fruiting axis; d - radical leaves; h - hairs].



five have been transferred to Christolea from other genera.

Key to the species

I. Racemes bracteate, at least below:

2. Siliquae glabrous .....6. C. stewartii

2. Siliquae pilose:

3. Plants clothed with short stellate hairs; flowers white .....3. C. albiflora

3. Plants pilose with simple rarely furcate hairs; flowers lilac:

4. Leaves narrow, ± entire; flowers white with lilac bases; hairs short .....4. C. parkeri

4. Leaves spatulate, 1-3-toothed above; flowers lilac; hairs long .....7. C. himalayensis

I. Racemes ebracteate:

5. Fruits ovate-oblong or broadly linear with a length/breadth ratio of 2-2.5; septum incomplete; seeds biseriate....2. C. lanuginosa

5. Fruits linear or lanceolate with a length/breadth ratio of 4-8; septum complete; seeds uniseriate(rarely sub-biseriate):

6. Cauline leaves absent; radical leaves with ± orbicular lamina having (5)8-10 regular short lobes .....5. C. scaposa

6. Cauline leaves present; radical leaves with spatulate or obovate lamina having 3(-5) irregular, ± triangular teeth .. .  
..... I. C. crassifolia .

I. C. crassifolia Cambess. in Jacquemont, Voy. Bot. 17 t 17 (1844); F.B.I. 154.

Syn: C. pumirica Korsh. in Mem. Acad. Petersb. ser. VIII iv 89 (1896); C. crassifolia var. pumirica (Korsh.) Korsh., Fragm. 11. Turk. 415 (1898); C. inciza Schulz in Notizblatt ix 1073 (1927); Hoelzia afghanica Rechinger f. in Phytion iii 59 (1951).

Type: W. Tibet, Jacquemont (P, R!).

Perennial, 15-40 cm. tall, branched, decumbent or suberect, densely pubescent to glabrous; hairs simple rarely forked; branches sparsely leaved. Leaves very variable in size and shape, obovate-oblong or spatulate, 1-5x0.3-2.5 cm., usually ± 3-toothed above, sometimes sinuate-toothed or subentire, usually somewhat fleshy, often 3-veined; teeth ± triangular,

irregular. Racemes 10-25-flowered, ebracteate, corymbose above, increasing upto 8 cm. in fruits. Flowers 4-7 mm. across, yellowish often with lilac bases; pedicels 2-6 mm., increasing upto 10 mm. in fruit, filiform, often subapressed and curved above. Sepals 2.8-3x1-1.8 mm. Petals 4.8-6.2x1.5-3 mm., spatulate, apex rounded. Stamens 3-3.5 : 3.5-4 mm.; anthers about 1 mm. long. Siliquae broadly linear, 1.2-3.2x0.3-0.4 cm., compressed, rarely subcontorted, glabrous or hairy; valves with a distinct mid-vein and reticulate venation; stigma subbilobed, depressed-capitate, sessile or on very short style; seeds 5-10 in each loculus, uniseriate, about 2 x 1 mm.; septum complete. (Plate nos. XXXVII, XXXVIII, and XXXIX: Fig. 19 e.).

Afghanistan:

Badakhshan, 3000-3600 m., Giles nos. 238(K!) and 245(K!); Minjan pass, 3600 m., W.Koelz no. 12723(V,U-E!).

N.W.Himalayas:

Kunawar, Thomson(K!); Spiti, 3600 m., Gill no. 2000(K!); Ascent to Kiber, Piti, 3900-4200 m., Thomson(K!); (without locality) J.L.Stewart(E!); Kashmir: Baltistan, Falconer(K!); 2700 m., Ludlow no. 370(BM!); Ladak, 3900-4200 m., Thomson (K!); Gya, 4050 m., Ludlow & Sherriff no. 8486(BM!); Lamayuru, 3300 m., Ludlow & Sherriff no. 8379(BM!); Gogna, 4650 m., Ludlow no. 825(BM!); Kharchor, 3090 m., Ludlow no. 510(BM!); N.Khardong valley, 4200m., rocky banks of streams, Clifford no. 12(K!); Lamayuru, 3450 m., Osmaston no. 35(K!); Puga, Rupshu, 4650 m., on dry sandy plains, W.Koelz no. 2160(K!); Ladak, 3300 m., Kohli no. 5(K!); Khardong garge, 3300-3900 m., Clifford no. 23(K!); Baltistan, Thalle La, 3000 m., R.Stewart no. 20588 (R-E!); W.Tibet: (without locality), Jacquemont(K!); Thomson(K!); Sutlej river banks, 4050 m., Strachey & Winterbottom (K!); Nubra, Munro (K!); Thomson(K!); Schlagintweit no. 2364(E!); Zanskar, 3600-4500 m., Thomson(K!); (Without locality), Thomson(E!); Pangkong, Schlag-intweit no. 2562(BM!); Karakash, watershed, Cayley(K!).

Geog. Dist:

C.Asia:

Tibet: Thorold(K!); Henderson (K!); Heyde(K!); 4500 m., A.Pike no. 380(K!).  
Famir: 3900-4200 m., Alcock no. 17678(K!,BM!); Fedtschenko(K!); Kashgar, W.Bellew (K!).

A very variable species, especially in shape and size of leaves and degree of pubescence. Size of siliquae also shows a wide range of variation. Any separation of taxa on these characters would be valueless. The above measurements show a continuous range of variation.

2.\*C. lanuginosa (H.f.et T.) Jafri, comb. nov.

Syn: Parrya lanuginosa H.f.et T. in Journ. Linn. Soc. Bot. v 136 (1861); Ermania lanuginosa(H.f.et T.)Schulz in Fedde, Rep. xxxiii 185 (1933); E. Koelzii in Fedde Rep. xxxi 332 (1933) et xxxiii 109(1935).

Type: W.Tibet, Laujar, 5250 m., Strachey & Winterbottom no. 7 (K!).

Perennial, 1-5 cm. tall, erect, pilose with simple and branched white hairs; flowering branches aphyllous. Radical leaves rosulate, spatulate, 7-13x2-6 mm., entire or with 1-3-blunt teeth above. Racemes 6-15-flowered(rarely about 3-flowered), ebracteate, subcorymbose, increasing upto 2 cm. in fruits. Flowers 3-4 mm. across, mauve; pedicels 2-4 mm., increasing upto 6 mm. in fruit, + spreading. Sepals 2.5-3(-5)x1-1.5 mm., somewhat persistent. Petals 5-6(-9)x2-2.5 mm., spatulate, apex subemarginate. Stamens 3-4 : 4-6 mm.; anthers about 1 mm. long. Siliquae(almost mature) broadly linear or oblong-ovate, about 2 x 0.8 cm., acute, flattened, often subcontorted, + glabrous; valves with a distinct mid-vein; style short(about 0.5 mm.)with short, subretuse stigma; seeds 4-6 in each loculus, biseriate, 1.5-2 x 0.8-1.2 mm., elliptic, smoke brown; septum incomplete, often confined to the margins. (Fig. no. 19 f.)

N.W.Himalayas:

Kashmir: Rupshu kyensa La , 5700 m., W.Koelz no.223I(B- not seen).

W.Tibet: Laujar, 5250 m., Strachey & Winterbottom no. 7(K!).

Geog. Dist:

Tibet: 5280 m., in water logged stony soil, Thorold no. 34 (K!); East of Horpa tso, 5100 m., A.Pike no. 832(K!).

3.\*C. albiflora (T.Anders.) Jafri, comb. nov.

Syn: Cheiranthus albiflorus T.Anderson in Fl. Brit. India i 133 (1872); Ermania albiflora(T.Anders.)Schulz in Bot. Jahrb. lxvi 98 (1933).

Type: ~~Kashmir~~ West Tibet, Zanskar, 3600-4800 m., Thomson(K!).

Perennial, 3-10 cm. tall, clothed with short, stellate hairs; stems erect, leafy. Radical leaves narrowly spatulate or oblong-obovate,

1-2x0.15-0.4 cm., entire or shortly 1-3-lobulate, apex rounded; upper leaves oblanceolate or linear; uppermost usually acting as bracts. Racemes 10-15-flowered, corymbose above, bracteate below. Flowers 5-6 mm. across, white; pedicels 1.5-3 mm. long, increasing about twice their length in fruit. Sepals 2.7-3x1-1.5 mm. Petals 7-8x3-3.5 mm., obovate, apex subtruncate. Stamens about 3 : 3.5 mm.; anthers about 0.7 mm. long. Siliquae(young) about 5x0.8 mm., linear, densely hairy; style about 0.7 mm. long, glabrous with short, depressed, subretuse stigma. (Fig.no.19 a).

Known from the type locality only.

4. \*C. parkeri (Schulz) Jafri, comb. nov.

Syn: Ermania Parkeri Schulz in Fedde, Rep. xxxi 33 (1933).

Type: Kashmir, Sonmarg, 3900 m., R.Stewart no. 9874 A

(B- not seen).

Perennial, 2.5-10 cm. tall, erect, leafy, hairy with simple rarely forked hairs. Radical leaves narrowly spatulate, 1-1.5x0.3-0.5 cm., entire or slightly 1-3-toothed, apex rounded; upper leaves short, oblanceolate to linear. Racemes 10-15-flowered, bracteate, corymbose above. Flowers about 5 mm. across, white with lilac bases; pedicels 1-2(-4) mm., increasing more than twice their length in fruit. Sepals 2.8-3x1-1.2 mm. Petals 4.5-8x2.5 mm., spatulate, apex subemarginate. Stamens 2.5-3 : 3.2-3.5 mm.; anthers 0.5-0.7 mm. long. Siliquae(young) about 1x0.1 cm., linear, pilose, about 8-ovuled in each loculus; stigma depressed capitate, shortly bilobed, subsessile or sessile. (Fig. no. 19 b).

N.W.Himalayas:

Kashmir: Ladak, Hanupatta, 4350 m., stony sandy slopes, Osmaston no. 55(K!).

Karakorum: Sat village, 2400 m., Conway (K!){with C.himalayensis}.

Geog. Dist: Endemic.

I have not seen the type specimen of this species, but its habit like C. albiflora(T.Anderson)Jafri<sup>though</sup> with simple hairs is so characteristic that it cannot be confused with any other species. The other two records from Kashmir and Karakorum seen at Kew differ slightly in the size

of flowering shoot and flowers: being slightly larger than the Schulz's original description of the species. In my opinion this is only an infra-specific variation as Schulz's description is based only on one specimen.

This species was described originally on a specimen collected by R.R. Stewart from Kashmir. As the name C. stewartii (T. Anders.) Jafri [syn: Ermania stewartii (T. Anders.) Schulz - Cheiranthus stewartii T. Anders. (1872)] was already occupied Schulz named it after R.H. Parker.

5. Christolea scaposa Jafri, sp. nov.

Affinis C. prolifero (Maxim.) Jafri sed caulibus nudis, racemis flexuosis multifloris, floribus brevibus viridi-lilacinis, sepalis persistentibus, pedicellis in fructu multolongioribus, siliquis angustioribus dense pilosis differt.

Herba perennis, dense pilosa, circa 10 cm. alta, violacea; pilis simplicibus rarius furcatis albis obsita. Radix elongatus circa 2 mm. crassus. Caulibus aphyllous, flexuosus. Folia radicalia dense rosulata, spatulata, 5-14x2.5-8 mm., lamina petiolum aequans, ± orbiculata, saepe 8-10-lobulata, carnosula, pilosa. Racemus circa 30-florus, ebracteatus laxissimus, superne subcorymbosus, in fructu circa 10 cm. longus. Flores breves, circa 5 mm. diam., viridi-lilacini. Pedicelli 4-6 mm. longi, filiformes, suberecti, in fructu circa 10 mm. longi, pilosi. Sepala 3-4x1.2-1.7 mm., oblonga, ad apicem rotundata, persistentia. Petala 5-6x2 mm., spatulata, ad apicem subtruncata. Stamina 3-5 : 5-6 mm. longa; antherae circa 1 mm. longae, oblongae, obtusae. Siliquae (immaturae) usque 12 x 2 mm., late lineari-oblongae, compressae, dense pilosae; valvae uninervosae; stigma bilobatum subsessile vel sessile; semina immatura uniseriata; septe completo.

Perennial, densely pilose herb, about 10 cm. tall, violet coloured; hairs simple rarely furcate, white; radix about 2 mm. thick, elongated. Flowering shoot aphyllous. Radical leaves densely rosulate, spatulate, 5-14x2.5-8 mm., stalked, stalk about as long as the lamina; lamina ± orbicular, usually 8-10-lobulate, fleshy, pilose. Racemes about 30-flowered, ebracteate, subcorymbose above, lax and increasing upto 10 cm. in fruit. Flowers small, about 5 mm. across, green-lilac; pedicels 4-6 mm. long, increasing upto 10 mm. in fruit, filiform, suberect, pilose.

Sepals 3-4x1.2-1.7 mm., oblong, apex rounded, persistent. Petals 5-6.5x2 mm., spatulate, apex subtruncate. Stamens 3-5 : 4.5-6 mm. long; anthers about 1 mm. long, oblong, obtuse. Siliquae (immature) about 12 x 2 mm., broadly linear-oblong, compressed, pilose; valves with a distinct mid-vein; stigma bilobed, subsessile or sessile; seeds immature, uniseriate; septum complete. (Plate no. XLI and fig. no. 19 g).

N.W. Himalayas:

Kashmir: Shaksgam valley, 4950 m., dated- 3.7.1926, R.C.

Clifford no. 7, Typus in Herb. Kew!

Geog. Dist: Endemic to Kashmir.

Distinguished from C. prolifera (Maxim.) Jafri by its aphyllous flowering shoot; flexuose many flowered raceme; small, green-lilac flowers; persistent sepals; elongated pedicels and narrow, pilose siliquae.

R.C. Clifford gives the following field note: "Green-flowered plant found growing on a gravel and shale slope about 500 ft. above stream level at 16500 ft.; July 3rd. 1926; the only specimen seen after prolonged and careful search."

6. \*C. stewartii (T. Anders.) Jafri, comb. nov.

Syn: Cheiranthus Stewartii T. Anderson in Fl. Brit. India i 135 (1872); Ermania stewartii (T. Anders.) Schulz in Bot. Jahrb. lxvi 98 (1933).

Type: Kashmir, Ladak, J.L. Stewart (K!).

Perennial, 3-5 (+8) cm. tall, spreading or suberect, pilose except the siliquae. Radical leaves rosulate, spatulate, 1.2-3x0.5-1 cm., bluntly 3-5-toothed; cauline leaves short, narrowly spatulate to linear, 1-3-toothed or entire; all leaves fleshy and pilose with simple and branched hairs. Racemes 6-15-flowered, bracteate, increasing upto 6 cm. in fruits. Flowers 4-5 mm. across, lilac; pedicels 1-1.5 mm., increasing upto 8 mm. in fruit. Sepals 2.5-2.8x1 mm. Petals 4.5-5.5x1.6-2 mm., spatulate, apex submarginate. Stamens about 2 : 2.5 mm.; anthers about 0.5 mm. Siliquae 2.5-4x0.25-0.35 cm., linear, compressed; valves glabrous, with a distinct mid-vein and reticulate venation; stigma depressed, retuse, sessile; seeds many, uniseriate, about 1.5x1 mm., ovate-orbicular, brown; septum complete. (Fig. no. 19 d).

N.W. Himalayas:

Kashmir: Ladak, J.L. Stewart (K!); Harnag, upper Lidder valley, 4500 m., R. Stewart no. 9349 (K!, R-E!); Sonmarg, c. 3900 m., Clarke no. 30814 (K!); (without locality), J.L. Stewart (E!).

Geog. Dist: Endemic to Kashmir.

7. \*C. himalayensis (Cambess.) Jafri, comb. nov.

Syn: Cheiranthus himalayensis Cambess. in Jacquemont, Voy. Bot. 14 (1844); Cheiranthus himalaicus H.f. et T. in Journ. Linn. Soc. Bot. v 137 (1861); Desideria mirabilis Pamp. in Bull. Soc. Bot. Ital. 116 (1926); Ermania himalayensis (Cambess.) Schulz in Notizblatt ix 1080 (1927); Christolea linearis Busch in Komarov, Fl. U.R.S.S. viii 636 t. 15 (1939).

Type: N.W. Himalayas, Kunawar, Jacquemont (P, K!).

Perennial, 5-15 cm. tall; spreading or suberect, pilose, leafy; hairs simple or furcate, white. Radical leaves rosulate, spathulate, 1-3.5 x 0.5-1 cm., bluntly + 3-toothed; cauline leaves spathulate to linear, small; uppermost usually acting as bracts; all leaves + fleshy, pilose. Racemes 15-25-flowered, bracteate, corymbose above, increasing upto 10 cm. in fruits. Flowers 4-6 mm. across, lilac; pedicels 1-4 mm. long, increasing upto 8 mm. in fruit, filiform, rigid, pilose. Sepals 2-3.8 x 0.8-1.5 mm. Petals 4-6.5 x 1.5-2 mm., spathulate, apex subemarginate. Stamens 2-2.7 : 3-4 mm.; anthers about 0.5 mm. long. Siliquae linear-oblong, 1.8-3.6 x 0.15-0.3 cm., compressed; valves + pilose, with a distinct mid-vein and reticulate venation; stigma depressed-capitate, sub-bilobed, sessile; seeds many, uniseiate rarely sub-biseriate, about 1.2 x 0.7 mm., ovate, brown; septum complete. (Fig. no. 19 c).

W. Pakistan:

Chitral: Barun gol, above Jamishi ghochar, c. 4500 m., P. Wendelbo no. 36713 (BM!).

N.W. Himalayas:

Kunawar, Jacquemont (K!); (without locality), J.L. Stewart (E!); Kashmir: Gilgit, 4650 m., Tanner no. 283 (K!); Tin pass, c. 3900 m. Giles (K!); Baltistan, ascent to Deotso, Winterbottom no. 875 (K!); Manpo La, 4650 m., R. Stewart no. 2227C (K!, R-E!); Burji La,

3600 m., Clarke nos. 2989I B(K!) and 2989I A(BM!); Shiksgum valley, 5100-5400 m., Clifford no. I(K!); and no. 59(K!); Mizil Lanjar, 4950 m., Clifford no. 54(K!); Ladak, Karakorum pass, 5250 m., Ludlow no. 47I(BM!);

W. Tibet: (without locality), Thomson(K!).

Karakorum: Shoka glacier, 4050 m., Russell no. 1657(BM!); Crevasse glacier, 4500 m., Spender(BM!); karakorum, Clarke nos. 30462(K!); 30250 A(K!) and 30250 B(BM!); ~~xxx~~ near Daranshi camp, 4620 m., Conway(K!); found upto about 4950 m., Conway no. 139(K!).

Geog. Dist: C.Asia, and Himalaya.

56.\* DRABOPSIS C.Koch in Linnaea xv 253 (1841); S.E.P. 548.

Annual with only rosette leaves, small, simple, rarely branched from the base; hairs branched. Rosette leaves oblong-obovate or elliptic, subsessile, entire or slightly toothed. Scapes aphyllous, often one or few arising from the base, filiform, erect or suberect. Racemes few flowered lax. Flowers small yellow; pedicels short, about as thick as the peduncle, ebracteate. Sepals almost equal, spreading, not saccate. Petals less than twice as long as the sepals, spatulate. Stamens 6, not appendaged; anthers short, blunt. Ovary oblong, 14-24-ovuled; stigma minute, sessile or subsessile. Siliquae oblong, compressed, apex obtuse, bilocular, dehiscent; valves with a distinct mid-vein, glabrous; seeds uniseriate, oblong, brown, not mucilaginous when wet; septum membranous, not veined.

One species from Himalaya and Central Asia to Asia minor.

Drabopsis nuda(Belang.)Stapf in Denkschr. Akad. Wien. 298 (1886);

S.E.P. 548.

Syn: Arabis nuda Belang., Voy. Ind. Or. i (1840); F.B.I. 137;

Drabopsis verna C.Koch in Linnaea xv 253 (1841); Arabis

scapigera Boiss. in Ann. Sc. Nat. ser. II xvii 54 (1842);

Sisymbrium nudum(Belang.)Boiss., Fl. Cr. i 214(1867);

Arabidopsis verna(C.Koch.)Busch in Fl. Camc. crit. iii

457(1909); K.F.U. 80; Stenophragma nudum B.Fedtsch.,

Restit. Turkest. 457(1915).

Type: Not precisely designated.

Annual, 5-15 cm. tall, erect or suberect, + hairy below and glabrous above, simple rarely branched from the base. Rosette leaves oblong-obovate or broadly elliptic, 5-15x2-6 mm., sessile, entire or subdentate,



hairy with short, branched hairs. Scapes 5-10(-15)-flowered, lax, ebracteate. Flowers 2.5-3.5 mm. across, yellow; pedicels 1-2.5 mm. long, increasing upto 3(-6) mm. in fruit, about as thick as the peduncle. Sepals 1.5-2x0.6-0.8 mm. Petals 2.5-3x0.6-0.8 mm., spatulate, apex rounded. Stamens about 2 : 2.5 mm.; anthers about 0.5 mm. long. Siliquae oblong-linear, 1.5-4x0.08-0.12 cm., erect or slightly curved, glabrous, apex obtuse or subobtuse; valves with a distinct mid-vein; seeds uniseriate, about 1 x 0.5 mm., oblong brown; septum not veined.

W. Pakistan:

Chitral: Dam gol, Toppin no. 23(K!);

Baluchistan: Quetta, 1650 m., Lace no. 3542(E!); Urak, 2100 m.,

Lace(E!); Khojak pass, Duthie no. 8585(K!).

Afghanistan:

Koshuk pass, Griffith no. 1467(K!); Kabul, W.R. Hay no. 25(K!);

Kurram valley, Alikhel, Aitchison nos. 97(K!) and 97 a(K!);

Khyber pass, Forspar, 1590 m., H. Johnston no. 59(E!); Khyber pass, 1110 m., H. Johnston(E!, K!).

N.W. Himalayas:

Kilar, 2700 m., Watt no. 2918(E!); Chenab valley, Shor, 2250 m.,

Gamble nos. 1005(K!) and 1019(K!);

Kashmir: Thomson(K!); Falconer's collector nos. 2281(K!) and 2080

(K!); Shapayum, Winterbottom no. 132(K!); Lidder valley, Palgam,

Inayat no. 25492(K!); (without locality), 1560 m., Kohli no. 6

(K!); Tangmerg, M. Nath no. 246(R-E!).

Geog. Dist: C. Asia and westward to Asia minor.

57.\* TURRITIS L., Sp. Pl. 666 (1753); S.E.P. 548; K.F.U. 171.

Syn: Arabis L. sect. Turritis Bentham et Hooker, Gen. Pl. i

69 (1862); Psilarabis Fourr. in Ann. Soc. Linn. Lyon Nouv.

xvi 332 (1868).

Biennial, often tall and glabrous, glaucous, sometimes hairy below with forked, somewhat stiff hairs; stem simple or sparsely branched. Basal leaves rosulate, often drying early, oblong-obovate or elliptic, shortly stalked or sessile, entire or sparsely toothed, + hairy with rigid, forked hairs. Cauline leaves lanceolate or oblong-ovate, sagittate-amplexicaule, glabrous. Racemes corymbose above, ebracteate, flexuose in fruits. Flowers mediocre, white or yellow; pedicels filiform, rigid, erect, sub-pressed. Sepals erect, subequal, inner pair saccate at the base. Petals

less than twice as long as the sepals, oblanceolate. Stamens 6, not appendaged; anthers oblong, obtuse. Lateral nectariferous glands annular, slightly opened towards the outer side; median present, joining the laterals. Ovary linear, many(130-200)-ovuled; stigma capitate, subbilobed, subsessile. Siliquae long, slender, erect, compressed, subterete, bilocular, dehiscent; valves with a distinct midrib, glabrous; seeds usually 2-seriate, ovate, brown; septum membranous, not veined, often with deep depressions caused by seeds.

3 species in Europe, Asia Africa and N.America.

Turritis glabra L., Sp. Pl. 666(1753); S.E.P.549; K.F.U. 171.

Syn: Arabis glabra(L.)Bernh., Syst. Verz. 195 (1834); F.B.I. 135.

Type: Europe(not precisely designated) no. I(LS!).

Biennial, 30-120 cm. tall, simple rarely branched, hairy below and glabrous above. Rosette leaves withering early, obovate-oblong, 5-15x1.5-3.5 cm., entire or toothed, stalked or subsessile, obtuse or acute, + hairy; cauline leaves lanceolate or oblong-ovate, sessile, sagittate-amplexicaule, 2-8x0.6-3 cm., entire, acute, subapressed, + glabrous. Racemes many flowered, corymbose above, increasing upto 30 cm. in fruits. Flowers 4-7 mm. across, yellowish-white; pedicels 4-5 mm. long, increasing upto 10 mm. in fruit, filiform, subapressed or erect. Sepals 3-4x0.8-1.3 mm. Petals 4-5x1-1.5 mm., oblanceolate, apex rounded. Stamens about 3 : 4 mm.; anthers about 1 mm. long. Siliquae linear, 3-10x0.12-0.15 cm., erect, straight; valves glabrous with a distinct midrib; seeds many, + biseriate, ovate-orbicular, about 0.6 mm. long.

W.Pakistan:

N.W.F.P.: Kaghan, Imayat no. 19170(K!).

N.W.Himalayas:

Paternala, 2550 m., Parkinson no. 7397(E!); Bashahr state, 2790 m., Lace 271(E!); Pangi, 2700 m., Watt nos. 10(E!); and 998(E!); Near Purti, 2400 m., Watt no. 2295(E!); Kilar, 2700 m., Watt no. 2962(E!); Pangi, 2400 m., Watt no. 797(E!); Balli, 1800 m., Watt no. 4893(E!); Ranung, Watt no. 3209(E!); Bagi, 2700 m., Watt no. 13547(E!); (without locality), Watt nos. 9937(E!) and 3209(E!); Ghaswal, Drummond no. 20221(E!,K!); Kidar kantha, 4200 m., Drummond no. 20222(E!,K!); J.L.Stewart(E!); Simla, Drummond

nos. 20219(K!), 20220(K!), 20223(K!) and 20224(K!); Jaunsar, 2400 m., Gamble no. 27093(K!); Nagkunda, 2700 m., H. Collett no. 794 (K!); (without locality), Royle(K!); Thomson(K!); Matiyana, 2400 m., Gamble no. 6196 A(K!); Chamba, Bangi valley, R. Ellis no. 171 (K!); Runawar, Thomson(K!); Near Chipol, 1500-1800 m., Edgeworth (K!); Tihri-Garhwal, Duthie nos. 920(BK!) and 920 a(BK!); Chocr, Falconer(K!); Lumsden, Legge(K!); Deota, 2400 m., Gamble no. 23087 (K!); Bampa, 3300 m., Strachey & Winterbottom(K!);  
 Kashmir: Near Pirni, Chelum valley, 1500-1800 m., Duthie no. 10866 (E!, BK!); Kotihar valley, H. Johnston nos. 55(K!) and 56(L!); near Islamabad, Fuller no. 903(K!); Sonmarg, 2700 m., R. Rich no. 1161 (K!); Ranponn, 2700 m., Clarke no. 29587 A(K!); Filail, 2850 m., Clarke no. 30698(K!); near Brinagar, 2100 m., R. Stewart no. 4101(K!); Between Buti sace and Das Lurum, Winterbottom no. 311 (K!); Kishtwar, 1800-3000 m., Thomson(K!); Gagangir, R. Rich no. 1071(K!); Lahlgam, 2126 m., R. Stewart no. 3303(K!).

Geog. List: Europe, temperate Asia, S. Africa and N. America.

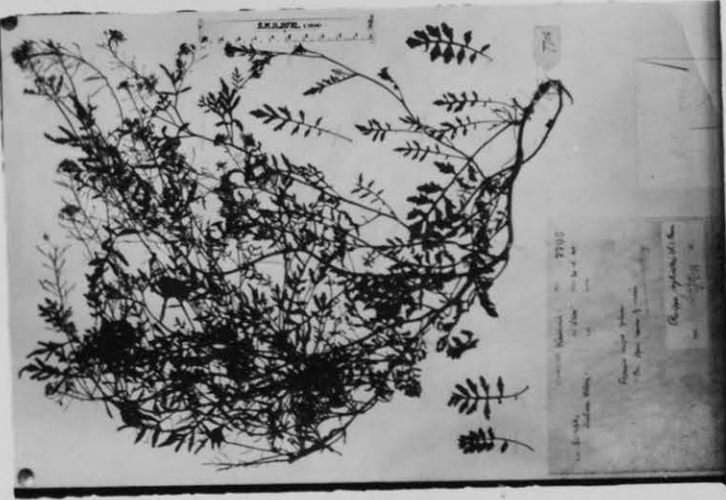
58. NASTURTIUM H.Br. in Aiton, Hort. Kew. 200. iv 109 (1812); K.F.U. 143; Clapham et al., Fl. British Isles 216 (1952).

Perennial with ascending leafy shoots rooting at the base, glabrous or with scattered simple hairs. Leaves pinnate, racemes corymbose above lax in fruits, obovate. Flowers small, white. Sepals suberect, subequal, inner pair subsaccate at the base. Petals about twice as long as the sepals, spatulate. Stamens 6, not appendaged; anthers short, blunt. Lateral nectariferous glands horse-shoe shaped, open towards the outer side; median absent. Ovary oblong, 28-48-ovuled; style short with capitate, sub-bilobed stigma. Siliquae subcylindrical, bilocular, dehiscent; valves convex, membranous, faintly 1-veined, glabrous, often with prominent ridges caused by seeds, seeds 1-2-seriate, each with numerous polygonal depressions. Septum membranous, not veined.

Two species widespread in the northern hemisphere.

#### Key to the species

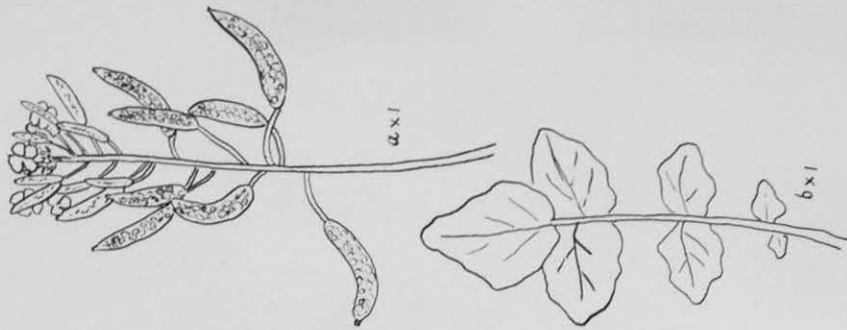
- I(a). Siliquae 2-2.5 mm. broad, finely beaded; seeds + biseriate with about 25 depressions on each face .....1. N. officinale
- I(b). Siliquae 1-1.5 mm. broad, narrow, slender, + smooth; seeds + uni-seriate, with about 100 depressions on each face .....  
 .....2. N. microphyllum



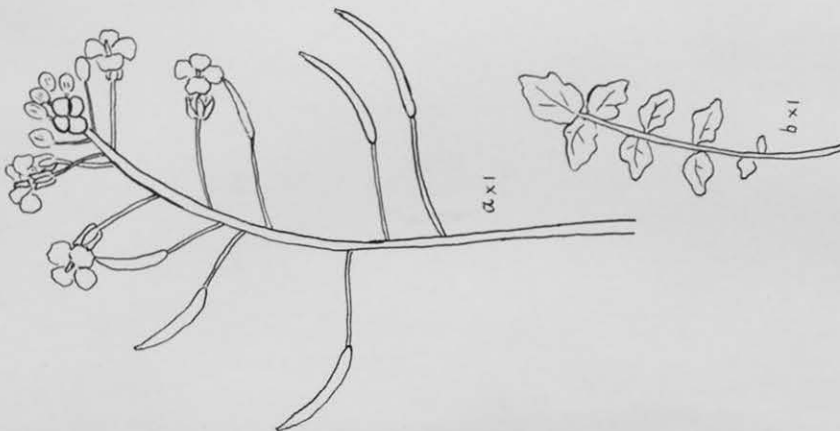
Platen no. XLII.

*Horippa sylvestris* (L.) Besser.

A



B



0 1 2 cm.

SCALE

Fig. no. 20

A - *Nesturtium officinale* R.Br.; B - *N. microphyllum* Boen. la - part of the flowering shoot; b - leaf; c - fruit; d - seed ]

I. N. officinale R.Br. in Aiton, Hort. Kew. 2ed. iv 110 (1812); F.B.I.133;  
Clapham et al., Fl. Brit. Isles 217(1952);

Syn: Sisymbrium Nasturtium L., Sp. Pl. 657(1753).

Type: Not precisely designated(Ls!)

Perennial rarely annual, 10-80 cm. long, procumbent and rooting below at the nodes, then ascending or floating, glabrous, green rarely with scattered simple hairs. Leaves lyrate-pinnate; lower stalked and with 1-5-leaflets; upper sessile, auricled at the base and with 5-9-leaflets; terminal leaflet suborbicular or broadly cordate, lateral leaflets ovate or elliptic; all leaflets entire to sinuate-toothed. Leaves and stems remaining green in autumn. Racemes 10-25-flowered, lax, increasing upto 20 cm. in fruits, ebracteate. Flowers about 4(-5) mm. across, white; pedicels 2-3 mm. long, increasing upto 15 mm. in fruit, filiform, + spreading, horizontal or slightly deflexed. Sepals about 2 x 0.7 mm. Petals 3.5-5x1.5-2.5 mm. Stamens about 2 : 3 mm.; anthers about 0.5 mm. long. Siliquae oblong, cylindrical, 10-20x2-2.5 mm., upcurved or ascending, finely beaded; valves convex, glabrous, faintly veined; style 0.5-1 mm. long; seeds many, + biseriate, ovoid, about 1 mm. long with about 25 polygonal depressions on each face. "2n=32".

W. Pakistan:

N.W.F.P: Kaghan valley, Jarid, 1500 m., Inayat no. 19156/a(K!);

Punjab: Rawalpindi, Hasan Abdal, R. Stewart no. 6995(K!); Pathankot, R. Stewart no. 1758(K!); near Rawalpindi, R. Stewart no. 13819(R-E!); Shahpur, Manza Lodi, Drummond no. 20350(E!,K!); Narsinghpur, Drummond no. 20347(E!,K!); (without locality), J.L. Stewart(E!,K!); Near Dhar, Drummond no. 20400(L!); Ferozepur, Thomson(K!);

Baluchistan: Ziarat, 2400 m., Jafri(E!); Quetta, 1680 m., Lace no. 3558(E!); Ziarat, 2400 m., H. Crookshank no. 252(K!); Quetta, Duthie no. 3572(BA!).

N.W. Himalayas:

Dashahr state, Chini, 2730 m., Lace no. 278(E!); Pangri, 2400 m., Watt nos. 924(E!) and 2226(E!); Lahul, Manali, 2100 m., M.L. Bor no. 14079(E!); Almora, 1650 m., Strachey & Winterbottom (K!); (without locality), Thomson(K!); Royle(K!); Simla, Collett (K!); Chamba, Pangri, 2550 m., Harssukh(K!); Simla, Sipti, 1800 m., Gamble no. 6243 A(K!); Malana-Fulang, Drummond no. 20217 (K!); Valley below Simla, 1650 m., H. Rich no. 210(K!);

Kashmir: Fir Panjal, 2700 m., Drummond no. 13902(K!).

Geog. Dist: Europe, Asia, N. Africa and N. America. Widely introduced.

2. \*N. microphyllum Boennigh in Rehb., Fl. Germ. Exc. 683 (1832) et Icones Fl. L. fig. 4360 (1838); Clapham et al., Fl. Brit. Isles 217 (1952).

Syn: Dictyosperma olgae Regel et Schmalh. in Ethnograph, Mosc. xxxiv (2) 2 (1882); Pirea olgae Dur., Ind. Gen. ix 494 (1888); "N. officinale" Boiss., Fl. Cr. i 178 (1867) (only Griffith's Afghanistan plant) - non R.Br.; N. uniseriatum Howard and Lanton in Ann. Bot. n.s. X 12 (1946).

Type: Germany, W. Phalia, Rechenbeck (B? - not seen).

Perennial, scarcely distinguishable vegetatively from N. officinale except by observations of the stomatal index of the leaves (ratio of number of stomata to the total number of epidermal initials, expressed as percentage), which for the lower epidermis is about 11% for N. microphyllum and 18% for N. officinale. Leaves and stems turn purple-brown in autumn. Racemes 15-30-flowered, ebracteate, increasing upto 25 cm. in fruits. Flowers about 5(-6) mm. across, white; pedicels 3-4 mm. long, increasing upto 20 mm. in fruit, spreading and often upcurved. Sepals about 3 x 1 mm. Petals 4-5 x 2-2.5 mm. Stamens about 3 : 4 mm.; anthers about 0.6 mm. long. Siliquae 15-22 x 1-1.5 mm., slender; valves glabrous, usually + smooth; seeds + uniseriate, about 0.8 mm. long with about 100 polygonal depressions on each face. "2n = 64" (Fig. no. 20 b).

W. Pakistan:

N.W.F.P.: Khyber, H. Deane (K!).

Afghanistan:

Sirai Chashma, Griffith no. 1463 (K!); Kurrum valley, Peshawar, 2550 m., Aitchison no. 894 (K!); Paghman, 2400 m., W.R. Hay no. 276 (K!); Logar, valley, 1950 m., W.R. Hay no. 209 (K!).

Geog. Dist:

Europe, C. and W. Asia, Africa and N. America.

'Apparently an allotetraploid hybrid of N. officinale, perhaps with a Cardamine sp.' (Clapham et al. l.c.)

59. ROSRIPPA Scop., Fl. Carn. 520 (1760); R.F.U. 135; Clapham et al., Fl. Brit. Isles 218 (1952).

Annual to perennial herbs with slender tap root and erect or ascending branches, glabrous or hairy with simple hairs. Leaves pinnate to subentire. Racemes corymbose above, lax in fruits, ebracteate very rarely bracteate. Flowers small, pale to deep yellow; pedicels often flexuose, + spreading. Sepals erect or suberect, subequal, inner pair subsaccate or saccate at the base. Petals often about as long as the sepals, rarely longer, sometimes suppressed (absent). Stamens 6, rarely 4 (the outer pair abortive), not appendaged; anthers short, obtuse. Lateral nectariferous glands various, often horse-shoe shaped, open towards the outer side; median absent or present. Ovary oblong to suborbicular, 36-72-ovuled; style short with capitate, sub-bilobed stigma. Siliques linear-cylindrical, ellipsoidal or spherical, bilocular, dehiscent; valves with an obscure mid-vein, convex, membranous; seeds biseriata (rarely sub-biseriate or uniseriate), suborbicular to oblong, reddish-brown, surface finely reticulated; septum membranous, not veined.

About 90 species throughout the North Temperate zone.

Distinguished from Nasturtium R.Br. primarily by its yellow flowers, suberect or erect habit and usually with a slender tap root and minute petals.

Key to the species.

- I. Leaves + simple (lower with + pinnatifid bases) ..... 3. R. montana  
 I. Leaves pinnatisect or pinnatifid:  
 2. Perennial; flowers about 5 mm. across ..... 2. R. sylvestris  
 2. Annual; or biennial; flowers about 2 mm. across .....  
 ..... I. R. islandica.

I. R. islandica (Ged.) Borbas in Balaton Fl. ii 392 (1900); Clapham et al., Fl. Brit. Isles 220 (1952).

Syn: Sisymbrium islandicum Oed., Fl. Dan. t. 409 (1761);

Sisymbrium palustre Leysser, Fl. Hal. 166 (1761); Nasturtium

palustre (Leyss.) DC., Syst. ii 191 (1821); F.B.I. 133;

R. palustris (Leyss.) Besser, Enum. Fl. Volh. 27 (1821).

Type: Not precisely designated ?

Biennial, sometimes annual, 10-60 cm. tall, suberect or erect, branched, subhairy with simple hairs; tap root slender rarely rooting at the nodes below. Lower and middle leaves lyrate-pinnatifid, 3-5-jugate, stalked, 6-15x1-3 cm.; terminal lobe subovate, sinuate-toothed; lateral lobes narrowly lanceolate or oblong, sinuate-toothed. Upper leaves sessile, deeply toothed to pinnatifid, 1.5-5x0.4-1 cm., Racemes 20-30-flowered, ebracteate, corymbose above, increasing upto 20 cm. in fruits. Flowers about 2 mm. across, pale yellow; pedicels 2-3 mm. long, increasing upto 10 mm. in fruit (about as long as the fruit), spreading, filiform. Sepals 1.2-2x0.8 mm. Petals 1.5-2x0.5-0.7 mm., spatulate, apex subrounded. Stamens about 2 : 2.2 mm.; anthers about 0.5 mm. long. Siliquae oblong-elliptic, 5-10x1.5-3 mm.; valves turgid, ± beaded; style about 0.6 mm. long; seeds many, crowded, about 0.6 mm. in diam., subrounded, pale brown.

W. Pakistan:

Chitral: 1350 m., Toppin no. 102(K!); Jambatai, Harriss no. 15900(BM!);

N.W.F.P.: Peshawar, H. Deane(K!); Hazara, Sirai valley, Inayat no. 19158(K!); Hazara, J.L. Stewart(K!);

Punjab: Rawalpindi, Aitchison no. 1007(K!); Banks of Chenab, Thomson (K!).

Afghanistan:

Kurram valley, Shalizan, common on sides of streams, Aitchison nos. 276(K!) and 690(K!).

N.W. Himalayas:

Fagwara, Jacquemont (K!); Chenab valley, Thomson(K!); Dushahr state, Lace no. 360(E!); Ravee valley, 2400 m., Watt no. 2413 (E!); Kulel, Watt no. 2041(E!); (without locality), J.L. Stewart (E!);

Kashmir: Near Srinagar, 1500-1800 m., Luthie(E!); and no. 10930 (BM!); Srinagar, Drummond no. 14360(E!,K!); Sonmarg, 3450 m., Clarke no. 30805(E!); (without locality), Thomson(E!); Jacquemont (K!); Kohli no. 19(K!); A.P. Young(BM!); Kunis, 1950 m., Fuller no. 251(K!); Srinagar, Schlagintweit no. 4506 (EM!); Baltistan, 2080 m., Schlagintweit(BM!); Baltistan, 2400 m., R. Stewart no. 20871(R-E!).

Geog. Dist: Europe, and temperate Asia. Widely introduced.

2. \*R. sylvestris(L.) Besser, Enum. Pl. Volh. 27 (1820); K.F.U. 136.

Syn: Sisymbrium sylvestre L., Sp. Pl. 657 (1753); Nasturtium sylvestre (L.) R.Br. in Aiton, Hort. Kew. 2ed. iv 110.

Type: Not precisely designated ?



Perennial, 20-50 cm tall, suberect or procumbent with ascending branches, + glabrous. Leaves pinnate or deeply pinnatifid, lower stalked, upper subsessile or sessile; lobes obovate to oblong-cuneate, sinuate-toothed to subentire, apex rounded. Racemes 20-60-flowered, ebracteate, corymbose above, increasing upto 15 cm. in fruits. Flowers about 5 mm. across, yellow; pedicels 2-5 mm. long, increasing upto 10(-12) mm. in fruit, filiform, spreading. Sepals 2-2.2x1-1.2 mm. Petals 4-5x1.5-2 mm. Stamens about 2 : 3 mm.; anthers about 0.6 mm. long. Siliquae 9-18x1.8-2.5 mm., linear-oblong, cylindrical; valves faintly veined, glabrous; style about 1 mm. long with capitate stigma; seeds many, + biseriate, about 0.7 mm. long, reddish-brown. (Plate no. XLII).

N.W.Himalayas:

Kashmir: Sumbal, Jhelum valley, 1560 m., flowers bright yellow, on open banks of river, dated- 30. 6.1940, Ludlow & Sherriff no. 7706(BM!).

Geog. Dist: Europe, C.Asia and N.Africa.

3. R. montana (Wall.) Small, Fl. S.E.U.S. 2ed. 1336 (1913).

Syn: Nasturtium montanum Wall., Cat. no. 4778 B(1828); F.B.I. 134(pro parte); Schulz in Fedde, Rep. xxxi 280 (1934); "N.indicum"H.f.et T.Anderson in Fl. Brit. India i 134 (1872)-partim(non DC.).

Type: Himalaya, Nepal, Wallich Cat. no. 4778 B(K!).

Perennial, 20-50 cm. tall, suberect or erect, usually branched above, sparsely hairy, with simple hairs. Leaves simple; lower shortly stalked, pinnatifid at the base(sublyrate); upper subsessile or sessile, entire; all leaves finely toothed, very variable in size; lower usually 5-10x1.5-3 cm.; upper 1.5-7x0.4-2 cm., linear to lanceolate. Racemes 10-25-flowered, ebracteate, increasing upto 12 cm. in fruits. Flowers 2.5-3 mm. across, yellow; pedicels 1-3 mm. long, increasing upto 6 mm. in fruit, spreading. Sepals about 2 x 0.7 mm. Petals about as long or slightly longer than the sepals, sometimes minute. Stamens about 1.5 : 2 mm.; anthers about 0.25 mm. long. Siliquae linear-oblong, cylindrical, 17-22x1-1.5 mm., slender, slightly curved; valves glabrous, faintly veined; style about 1 mm. long with capitate, sub-bilobed stigma; seeds uniseriate to sub-biseriate, many,

about 0.7 mm. long; septum not veined.

W. Pakistan:

N.W.F.P.: Hazara, Haripur, Drummond no. 20322(K!); Mirjora,  
R. Stewart no. 24260(R-E!);

Punjab: Rawalpindi, Saidpur, R. Stewart no. 16568(R-E!); Rawal-  
pindi, Sohan bridge, R. Stewart no. 418(K!, R-E!); Hasan  
Abdul, R. Stewart(K!); Salt range, Aitchison no. 38(K!);  
Fleming(E!); Drummond no. 20349(K!); (without locality),  
Thomson (K!); J.L. Stewart(E!); Karnal, Drummond nos.  
20353(E!, K!); 20346(E!, K!); 20348(K!); 20345I(E!, K!);  
20352(K!); and 20354(K!);

N.W. Himalayas:

Lahul, Drummond no. 20215(E!, K!); and no. 20214(K!); Pitthor-  
garh, c. 1500 m., Reid (E!); Mangadh valley, Thomson(K!);  
(without locality), Royle(K!); Butlej valley, Thomson(K!);  
Above Koti, Gamble no. 6304 B(K!); Simla, Mygium hills, 1950  
m., Gamble no. 6228 A(K!); Simla hills, Thomson(K!); Simla,  
1500 m., H. Collett nos. 415(K!) and 987(K!); (without locality)  
H. Rich no. 424(K!); Garhwal, 1800 m., Strachey & Winterbottom  
~~no~~(K!); Kumaon, Thomson no. 1074(K!);

Kashmir: Hajira, A.R. Khan(R-E!); Munki, 1200 m., Clarke no.  
28252 A(BE!).

Geog. Dist: China, Cochinchina and Japan. Introduced in N. America.

60. \*DONTOSTEMON Andrz., in DC., Prodr. i 190 (1824)(pro syn.); B.H.G.P. 77;  
S.E.P. 556; K.F.U. 306.

Syn: Andreoskia DC., Prodr. i 190 (1824); Hesperidopsis C. Ktze.,  
Rev. Gen. i 30 (1891).

Annuals, erect, branched, hairy with simple or branched and glandular hairs. Leaves entire to sinuate-toothed, spatulate to linear, lower stalked, upper subsessile or sessile. Racemes corymbose above, ebract-eate. Flowers mediocre, white or lilac; pedicels flexuose in fruit, glandular. Sepals erect, subequal, inner pair subsaccate. Petals about twice as long as the sepals, spatulate, apex emarginate. Stamens 6, often appendaged-dentate; anthers short, blunt. Lateral nectariferous glands in pairs, small, pyramidal; median absent. Ovary narrowly cylindrical, 20-40-ovuled; style short, stigma capitate-depressed. Siliquae linear, sub-cylindrical, bilocular, dehiscent; valves + torulose and 3-veined, gland-lar hairy; seeds uniseriate, oblong-ellipsoid, brown; septum membranous, not veined.

About 8 species mostly in C. Asia.

Key to the species.

- I(a). Plants short(2-10 cm. long), spreading; filaments edentate .....  
 .....I. D. glandulosus
- I(b). Plants tall[(12)30-75cm. long], erect; filaments of the inner  
 four stamens slightly toothed ..... ..2. D. pectinatus

I. D. glandulosus(Kar.et Kir.) Schulz in Notizblatt x 554 (1929); S.E.P.  
 557.

Syn: Arabis glandulosa Kar.et Kir. in Bull. Soc. Nat. Mosc. xv  
 146 (1842); F.B.I. 136; Sisymbrium glandulosum (kar.et Kir.)  
 Maxim., Fl. Tang. 61 (1889).

Type: C.Asia, Sarchan, Kar. et Kir.(L- not seen):

Annual, short, spreading herb, 2-10 cm. long, sparsely hairy with  
 simple and glandular hairs. Basal leaves rosulate, spatulate or obovate-  
 oblong, 1-2.5x0.3-0.5 cm., stalked, entire or sinuate-toothed; upper leaves  
 linear, 0.5-1.5x0.2-0.3 cm., sinuate-toothed to entire. Racemes 10-25-  
 flowered, ebracteate, corymbose above, increasing upto 6 cm. in fruits.  
 Flowers 3-4 mm. across, white or pinkish; pedicels 1-2.5 mm. long, increas-  
 ing upto 8 mm. in fruit, ascending, glandular. Sepals 2.2-2.5x0.8-0.9 mm. .  
 Petals 3.6-4x1.2-1.4 mm., spatulate, apex subrounded. Stamens 2-2.4 : 2.5-  
 3 mm.; filaments edentate; anthers about 0.6 mm. long. Siliquae linear,  
 subcylindrical, 2-3.5x0.7-0.8 cm., subtorulose; valves glandular, with a  
 distinct mid-vein; seeds 12-18 in each loculus, about 1 x 0.6 mm., oblong-  
 ellipsoid, brown; septum not veined.

H.W.Himalayas:

Kashmir: Ladak, J.L.Stewart(E!,K!); Ladak, Sakti, 3900 m.,  
Koelz no. 2512(R-E!); Ladak, Saser, Brangsa, 4500m.,  
Ludlow no. 589 B(BM!).

Geog. Dist: Tibet and W.China.

2. \*D. pectinatus (Fisch.)Ledeb., Fl. Ross. i 175(1842); Schulz in Notizbl-  
 -att ix 1074(1927); S.E.P.557; K.F.U. 309.

Syn: Sisymbrium pectinatum Fisch. in DC., Syst. ii 485 (1821);  
Andreoskia pectinata (Fisch.)DC., Prodr. i 190 (1824)

Type: C.Asia, Fischer ?(L,K!).

Annual, (12)30-75 cm. tall, erect, simple or sparsely branched,  
 hairy with simple and glandular hairs . Leaves pectinate dentate, 1-4x0.4-

0.9 cm. Racemes 15-30-flowered, bracteate, corymbose above, increasing upto 20 cm. in fruits. Flowers 4.5-6.5 mm. across, white or pinkish; pedicels 5-15 mm. long, increasing upto 20 mm. in fruit, filiform, glandulose, spreading or ascending. Sepals 3-4x1-1.5 mm. Petals 7-9x2-3 mm., spatulate, apex subtruncate. Stamens 2.8-3.5 : 3.2-4 mm.; filaments of the inner four stamens slightly toothed above; anthers about 0.7 mm. long. Siliquae linear, subcylindrical, 1.5-3.5 x 0.12-0.15 cm., subtortulose, often curved; valves glandulose, with a distinct mid-vein; seeds 10-18 in each loculus, about 1 x 0.6 mm., ellipsoid-oblong, brown; septum not veined.

N.W. Himalayas:

Kumaon: J.N. Reid (B-not seen).

Geog. Dist:

Tibet: Tongols, J.A. Soulie no. 403(K!).

C. and N. Asia: Mongolia, Besser (K!); Siberia, Fischer (K!); Angustinowicz (K!); N. China, Licent no. 325(K!); Manchuria, Amur, Maximovicz (K!); Romarov (K!).

Tribe VIII. Matthioleae O.E. Schulz in Pflanzenfam. (17b.) 557  
(1936).

Lateral nectariferous glands various, often semi-annular, with or without a basal process; median present or absent. Hairs stellate, branched, bipartite appressed, or simple. Sepals erect or suberect, inner pair often broad subsaccate or saccate. Stamen filaments usually without appendages, linear; anthers often oblong, and obtuse. Ovary sessile or with short gynophore; stigma short or long, <sup>+</sup> bilobed or retuse, sometimes conical with decurrent lobes, rarely appendaged. Fruits short or long siliquae, dehiscent, sometimes indehiscent but breaking transversely into several usually 2-seeded cells; seeds with or without wings.

Key to the 8 genera of the tribe Matthioleae.

1. Fruits with apical or basal 2-4- appendages (horns):
  2. Fruits indehiscent, pyramidal with two basal horns .....  
..... 63. Pyramidium
  2. Fruits dehiscent, terete-compressed with 2-4- apical horns:
    3. Siliquae with 2 - horns; hairs bipartite-appressed .....  
.....61. Notoceras
    3. Siliquae with 4 - horns; hairs stellate rarely mixed with  
long simple or forked hairs .....62. Tetracme
1. Fruits without appendages:
  4. Siliquae all alike, dehiscent:
    5. Flowering branches scapose, usually aphyllous .....  
..... 67. Parrya
    5. Flowering branches leafy:

6. Mostly perennial, robust, leafy herbs often with woody bases; siliquae long, many seeded; stigmas large, bilobed, erect (sometimes appendaged).. 64. Matthiola.
6. Annuals, sparsely leaved; siliquae short, oblong-elliptic, few seeded; stigma short, retuse, (never appendaged) ..... 68. Citharcloma
4. Siliquae alike or dimorphic; all or some indehiscent but breaking into several, often 2-seeded cells:
7. Fruits all alike; hairs simple, branched or glandular ..... 65. Chorispora
7. Fruits dimorphic; hairs bi- or tri-partite, appressed ..... 66. Diptychocarpus

61. NOTOCERAS R. Br. in Ait. Hort. Kew. ed. 2. iv. 117 (1812);  
B.H.G.P. 71; S.E.P. 559.

Syn: Diceratium Lag., Elench. Pl. 20 (1815).

Annual or biennial, stiff, branched, often spreading, hoary with bipartite appressed hairs. Leaves oblanceolate or oblong-linear, entire, subsessile or sessile. Racemes elongating in fruit, ebracteate. Flowers small, white; pedicels short and thickened, erect. Sepals suberect, equal, not saccate, inner pair slightly hooded at the apex. Petals hardly longer than the sepals, narrowly spathulate. Stamens 6, not appendaged; anthers minute, blunt. Lateral nectariferous glands in pairs, minute, pyramidal. Ovary subquadrate with two apical horns, 6-8- ovuled; style short with minute stigma. Siliquae terete, shortly oblong with two apical horns, bilocular, dehiscent; valves rigid with prominent/

prominent midrib (keel); seeds uniseriate, ovate, not winged; septum membranous, not veined.

1 species in Mediterranean region eastward to W. Pakistan.

N. bicorne (Ait.) Amoy, Fl. Penins. Iber. vi. 536 (1873); S.E.P. 560.

Syn: Erysimum bicorne Ait., Hort. Kew. ed. 1. ii. 394 (1789);

Notoceras canariense R. Br. in Ait. Hort. Kew. ed. 2.

iv. 117 (1812); B.F.O. 314; F.B.I. 140 (excl. syn.)

Type: Canary Island, Masson (BM!).

Annual or biennial, 10-25 cm. long, spreading or suberect, branched mostly from the base, hoary with bipartite, appressed hairs; main stem often soon ending into a short flowering erect axis. Leaves oblanceolate, or linear-oblong, 1-5 x 0.2-1 cm., entire, obtuse or acute, sessile or subsessile. Racemes 15-30-flowered, usually lax in fruit, ebracteate. Flowers 2-3 mm. across, white; pedicels 1-1.5 mm. long, increasing up to 2.5 mm. in fruit, thickened, erect. Sepals 1.8-2 x 0.6 mm. Petals about as long or slightly longer than the sepals, narrowly spatulate. Stamens about 1.6: 2 mm.; anthers about 0.4 mm. Siliquae 4-8 x 1.5-2 mm., oblong, terete; hoary; valves with a strong mid-rib (keeled) ending into a horn at the apex; style about 0.5 mm. long; seeds 2-5 in each loculus, uniseriate, about 1 x 0.8 mm., ovoid, brown; septum membranous.

W. Pakistan:

N.W.F.P.: Peshawer, in fields and waste places, J.L. Stewart (K!,E!); Vicary (K!); H. Deane (K!); Waziristan, J.L. Stewart (K!); Near Peshawer, Schlagintweit Cat. Nos. 104199 (BM!) and 2701 (BM!)

Punjab: Attock, Jhalar, 510 m., R. Stewart No..23577 (K!); Attock, E. Nasir (R-E!); Rawalpindi, Aitchison No. 1014 (K!); Plains of Punjab, J.L. Stewart (K!).

Baluchistan:/

Baluchistan: Lower Baluchistan, Stocks No. 732 (K!).  
Afghanistan: Abigoom, in wheat fields, not common, Griffith No. 1507  
 (K!); Khyber pass, H. Johnston No. 116 (E!,K!).  
N.W. Himalayas: Kashmir, (without locality), Falconer (K!).  
Geog. Dist.: West ward to Mediterranean region.

62. TETRACME Bunge in Delect. Sem. Hort. Dorpat. 7 (1836); B.H.G.P.  
 76; B.F.O. 316; S.E.P. 560;

Syn: Notoceras R. Br. sect. Tetraceratium DC., Syst. ii. 203  
 (1821); Tetracmidion Korsh. in Bull. Acad. Sc. St. Petersb.  
 Ser. V, ix. (5) 421 (1898); K.F.U. 301.

Annual, branched, erect with basal branches often subspreading,  
clothed with stellate or branched hairs. Leaves oblanceolate, or  
 oblong-linear, stalked or sessile, sinuate-toothed to subentire.  
 Racemes ebracteate, often lax in fruit. Flowers small, yellow;  
 pedicels usually short and stout. Sepals equal, subspreading, not  
 saccate. Petals less than or twice as long as the sepals, obovate-  
 cuneate. Stamens 6, not appendaged but often filaments broad at  
 the base; anthers short, ovate, obtuse. Lateral nectariferous  
 glands in pairs, minute, pyramidate; median absent. Ovary erect,  
 angular-oblong with 4 corns at the apex, 4-8- ovuled; stigma capitate  
 sessile or subsessile. Siliquae erect or curved, bilocular, de-  
hiscent, † tetragonate with 4 apical horns (usually erect, rarely  
 recurved); valves hairy, homo- or hetero-trichous with short branched  
 or simple forked often ciliate hairs, mid-rib prominent; seeds uni-  
 seriate, ovate, brown, not winged; septum membranous, not veined.

6 species in Central and West Asia.

Key/



Key to the species

1. Siliquae horns recurved ..... 5. T. contorta
1. Siliquae horns straight, (erect):
2. Flowers minute, 1-1.8 mm. across; petals about 1 mm. long:
3. Horns short, 0.5-0.7 mm. blunt ..... 1. T. secunda
3. Horns long, 1-1.5 mm., pointed:
4. Fruits curved, crowded on short peduncle .. 2. T. quadricornis
4. Fruits erect, straight, lax on long flexuose peduncle .....  
 ..... 3. T. pamirica
2. Flowers small, 4-5 mm. across ..... 2. T. stocksii.

1. T. secunda Boiss., Diagn. Ser. II. (1) 29 (1842); B.F.O. 316;  
 S.E.P. 560.

Type: Afghanistan, Der-Haji, gravelly plains, Griffith No.  
 1508 (G,K!).

Annual, 4-12 cm. long, erect or suberect, branched mostly from below, clothed with branched hispid hairs. Leaves few, scattered, oblanceolate, 1.5-3.5 x 0.3-0.7 cm., apex obtuse or rounded, entire. Racemes 12-20 flowered, ebracteate, corymbose above, increasing up to 4 cm. in fruit. Flowers minute, about 1.5 mm. across, yellow; pedicels about 1 mm. long, increasing up to 1.5 mm. in fruit, thickened. Sepals about 1 x 0.6 mm. Petals 1.7-2 x 0.8 mm., spatulate, apex rounded or subemarginate. Stamens about 0.8: 1 mm.; anthers about 0.5 mm. Siliquae 4-6 x 1 mm.; tetragonate; horns 0.5-0.7 mm. long, erect; stigma minute sessile; valves † hispid; seeds usually 2 in each loculus, about 1-1.5 x 0.7-0.8 mm., oblong-ovate, pale brown.

Known/

Known from the type locality only. Remarkably distinct from the other species by its short and hispid habit, tetragonate siliquae with very small blunt horns.

2. T. quadricornis (Steph.) Bunge in Delect. Sem. Hort. Dorpat. 7 (1836); B.F.O. 316; S.E.P. 560; K.F.U. 300.

Syn: Erysimum quadricornis Steph. in Willd., Sp. Pl. iii. 514 (1800); Notoceras quadricornis (Steph.) DC., Syst. ii. 204 (1821).

Type: C. Asia, Kuwan Darija deserts, Bunge No. 121 (L,K!).

Annual, 4-15 cm. tall, erect, sparsely branched from below, clothed with short branched and long simple, intermixed hairs. Racemes 20-30- flowered, ebracteate, increasing up to 15 cm. in fruit. Flowers minute, 1.4-1.8 mm. across, yellow; pedicels 1-1.5 mm. long, increasing up to 2.5 mm. in fruit, thickened, subappressed. Sepals about 1.2 x 0.5 mm. Petals about 1.4 x 0.5 mm., oblong-obovate, cuneat. Stamens about 1: 1.2 mm.; anthers about 0.4 mm. Siliquae 5-8 x 1-1.5 mm., slightly outcurved, subtorulose; Horns about 1 mm. long, erect; stigma sessile; valves clothed with short branched and long simple hairs (heterotrichous); seeds 3-4 in each loculus, about 1 mm. in diam., suborbicular, brown.

Afghanistan: North of Hindu Kush, C. 2700 m., Giles (K!).

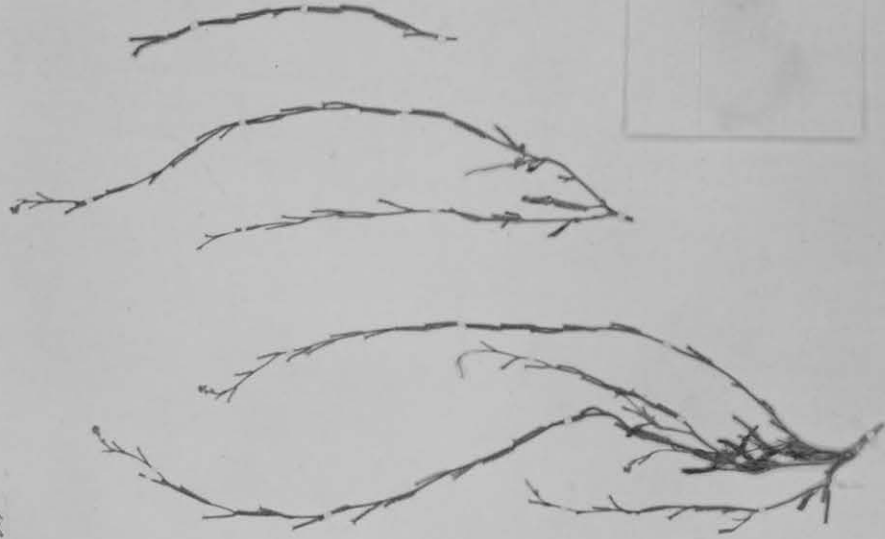
Geog. Dist.: C. Asia.

<sup>KK</sup>  
3. T. pamirica Vass. in Komarov, Fl. U.R.S.S. addenta vii. 648 (1939) et vol. viii. 300, t. xix. fig. 5 (1939).

Syn:/

KEW NEGATIVE  
NO. 2216  
August 1891

HERB. MUSEI HIST. NATUR. VINDOB.  
Aug. 1891 No. 9



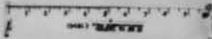
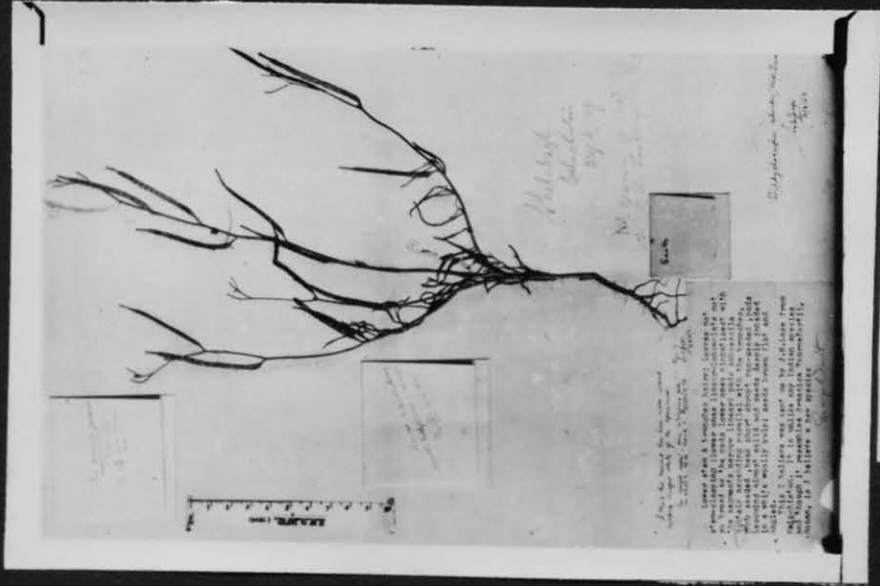
PLANT. OF AMERICA

*Tetradymia pumila* Nutt.

Walter Paepcke  
No. 10,000 ft. June 23, 1937  
Tetradymia pumila  
WALTER PAEPCKE No. 10,000

Typus

Plate no. XLIII. *Tetradymia pumila* Vass.



Diptychocarpus strictus (Fisch.) Trautv.  
No. 10,000 ft. June 23, 1937  
Diptychocarpus strictus  
WALTER PAEPCKE No. 10,000

Plate no. XLVI.

*Diptychocarpus strictus* (Fisch.) Trautv.

Syn: T. appressa Rech. f. in *Phyton*, iii. 60 (1951) - Type;  
Afghanistan, Koelz No. 12156 (V-K!).

Type: W. Pamir, Between Kazidich and Schambedah, 2200 m.,  
Alexeenko No. 3432 in *Herb. Ac. Sc. U.R.S.S.* (L - not seen).

Annual, 15-30 cm. tall, erect, branched mostly from the base with arcuate branches, clothed with short stellate hairs only. Leaves distant, oblanceolate, stalked or subsessile, 1-3 x 0.2-0.8 cm., entire or slightly and sparsely toothed. Racemes 15-30-flowered, ebracteate, lax, often very flexuose in fruit, increasing up to 7 (-10) cm. in fruit, rarely more. Flowers minute, 1-1.5 mm. across, yellow; pedicels 0.8-1.3 mm. long increasing up to 1.7 mm. in fruit, thickened above, appressed. Sepals about 1 x 0.5 mm. Petals about as long as the sepals, spatulate, apex rounded. Stamens about 1:1.2 mm.; anthers about 0.25 mm. Siliquae erect, terete with 4, spreading about 1.5 mm. long apical horns; valves subtorulose, scabrous; stigma minute, obscurely retuse, subsessile; seeds 4-6 in each loculus, about 1 x 0.6 mm., oblong, reddish brown. (Plate No. XLII).

Afghanistan: Shibar pass, dry slope, 3000 m., Koelz No. 12156 (V-K!).

N.W. Himalayas:

Kashmir: Burzi La, 3600 m., Clarke No. 29884A (K!). And No. 29884D (BM!)

Geog. Dist.: C. Asia (Pamir).

Distinguished from T. quadricornis (Steph.) Bunge by its tall, flexuose flowering axis, erect, straight siliquae covered with short stellate hairs only (not heterotrichous).

4. T. stocksii Boiss., *Fl. Or.* i. 317 (1867); S.E.P. 560.

Type:/

Type: Baluchistan (W. Pakistan), Gurghina, Stocks No. 974  
(G,K!).

Annual, 8-25 cm. long, spreading or suberect, branched, clothed with short stellate hairs. Leaves oblanceolate or oblong-linear, pinnatifid or sinuate-dentate to subentire or entire; lower 2.5-5.5 x 0.5-0.8 cm.; upper 1-4 x 0.15-0.7 cm. Racemes 20-30- flowered, ebracteate, subcorymbose, increasing up to 10 cm. in fruit. Flowers 4-5 mm. across, yellow, pedicels 2-3 mm. long, increasing up to 4 mm. in fruit, slightly thickened, erect, subappressed. Sepals 1.5-2 x 0.8-1.2 mm. Petals 2.8-3 x 1.4-1.8 mm., oblong-orbicular, cuneate. Stamens about 1: 1.5 mm.; anthers about 0.5 mm. Siliquae 8-10 x 1 mm., subtorulose, clothed with short, branched hairs; horns at the apex 0.5-1 mm. long, erect: seeds 3-4 in each loculus, about 1 x 0.7 mm., oblong, brown; septum not veined.

W. Pakistan:

Baluchistan: Paloz, Lace No. 3665 (E!); Spinolai, A.V. Munro (K!); Duki, R.P. Banerji No. 8048 (photograph only seen at Kew); Gurghina, Stocks No. 974 (K!).

Geog. Dist.: Endemic.

5. T. contorta Boiss., Fl. Or. i. 317 (1867); S.E.P. 560.

Syn: "T. recurvata" H. f. et T. in Journ. Linn. Soc. Bot. v. 154  
(1861) - non Bunge.

Type: Baluchistan (W. Pakistan), Gurghina, Stocks No. 953 (G,K!).

Annual, 6-30 cm. tall, erect or suberect, clothed with short stellate hairs, branched mostly from below. Leaves pinnatifid or sinuate-toothed, to subentire, 1.5-5.5 x 0.2-1.2 cm.; oblong-oblan- ceolate. Racemes 15-25- flowered, ebracteate, corymbose above, increasing/

increasing up to 6 (-8) cm. in fruit. Flowers about 3 mm. across, yellow; pedicels 1.5-2 mm. long, increasing up to 3.5 mm. in fruit, thickened, erect, subappressed. Sepals about 1 x 0.7 mm. Petals about 2 x 1 mm., obovate-cuneate. Stamens about 1: 1.5 mm.; anthers about 0.5 mm. Siliquae 5-10 x 1-1.2 mm.; horns 1-1.5 mm. long, recurved; apex of the fruit pyramidate above the horns with a short (about 0.3 mm. long) style and capitate stigma; valves hairy with short branched hairs; seeds 4-5 in each loculus, about 0.8 mm. in diam., suborbicular, brown.

W. Pakistan:

Baluchistan: Yaru Karez, 1500 m., Lace No. 3391 (E!); Gurghina, Stocks No. 953 (K!); Dooband (Quetta), Stocks (K!).  
Afghanistan: Choky, Griffith No. 1527 (K!).

Geog. Dist.: Endemic.

63. PYRAMIDIUM Boiss., Diagn. Ser. II. (2) 46 (1853); B.H.G.P. 97; B.F.O. 367; S.E.P. 561.

Annual, erect, branched, clothed with stellate or branched hairs. Leaves oblanceolate or oblong-elliptic, subsessile or sessile, sinuate-toothed to entire. Racemes lax, ebracteate. Flowers mediocre, white or pale pink, subsessile; pedicels very short and thickened in fruit. Sepals erect, subequal, inner pair subsaccate at the base. Petals linear, margin often crimped, about twice as long as the sepals. Stamens not appendaged; anthers linear, acute. Ovary pyramidate, 8-ovuled, beaked with short conical, bilobed stigma. Siliquae pyramidate with two upcurved horns at the base and a tapering beak-like apex, tetralocular, indehiscent; valves spongy, thickened, glabrous or densely pubescent; septum thick, yellowish. Seeds broadly ovate, /

ovate, brown, not winged.

1 species in Afghanistan.

P. griffithianum Boiss., Diagn. Ser. II. (1) 47 (1853); B.F.O. 368;  
S.E.P. 561.

Type: Afghanistan, Habul, Dair-Haj, Griffith No. 1549 (G,K!).

Annual, 12-30 cm. tall, erect, branched, clothed with soft stellate hairs; branches strict with somewhat sharp ends. Leaves oblong-elliptic, subsessile or sessile, 2-4 x 0.6-1.2 cm., entire to sinuate-toothed, apex rounded or toothed. Racemes 10-20-flowered, lax, increasing up to 15 cm. in fruit. Flowers about 5 mm. across, subsessile; pedicels very short, somewhat thickened in fruit. Sepals 6-7 x 2 mm. Petals about 12-15 x 2-2.5 mm., linear-oblong, margin crimped. Stamens about 6: 8 mm.; anthers about 2 mm. long. Fruits 1.5-2.3 x 1-1.4 cm., pyramidate-quadrangular; basal horns 3-4 mm. long upcurved, apical beak like process 5-8 mm. long; valves thick, ~~spongy~~, tomentose or glabrous; seeds 2-3 mm. long, obovate, brown; septum thick, yellowish.

Known from the type locality only.

This species and the genus is known only from Griffith's original collection from Afghanistan. There are 4 sheets of this species in the Kew Herbarium. It is interesting to note that out of these the two bear densely pubescent fruits and the other two very glabrous fruits. There are no intermediate forms seen between the glabrous and tomentose fruit habit. No doubt. ~~that~~ all these Griffith's specimens belong to one single gathering, and therefore, only further records/

records and work can explain this tomentose and glabrous nature of fruits. Here they are simply included as variants of one single species.

64. MATTHIOLA R. Br. in Ait. Hort. Kew. ed. 2. iv. 119 (1812);  
B.H.G.P. 67; B.F.O. 146; K.F.U. 285.

Mostly perennial, erect, branched, densely pubescent with stellate or branched hairs, rarely glandular or subglabrous. Leaves pinnatisect to entire, usually oblanceolate or ovate, lower † stalked, upper stalked to sessile. Racemes lax, ebracteate. Flowers large, purple or white; pedicels usually short, somewhat thickened. Sepals erect, subequal, inner pair saccate at the base. Petals linear or narrowly oblong-obovate. Stamens 6, without appendages; anthers often linear, acute. Lateral nectariferous glands various, often in pairs, each semilunar, often fusing together, simple or with short or long basal process; median absent. Ovary oblong, many ovuled; stigma bilobed, subsessile or sessile, lobes erect, with or without a lateral appendage. Siliquae often long, compressed with subconvex valves, often subtorulose, bilocular, dehiscent; valves with a distinct mid-vein, pubescent, rarely glandular; seeds uniseriate, suborbicular or orbicular, winged; septum membranous, not veined.

About 60 species chiefly in Mediterranean region, C. and W. Asia, some in S. Africa.

It is represented by 4 species in addition to two cultivated ones in the present area.

There can be no doubt that "M. odoratissima" H. f. et T.

(non/



(non (Pallas) R.Br.) of Fl. Brit. India (1872) is M. flavida Boiss. (Schulz (Notizblatt 1927), P. Wenderbo (1952)).

M. flavida Boiss. is distinguished from M. odoratissima (Pallas) R.Br. by its erect, long branches, comparatively small flower and fruits not very densely hairy, and broad, often simply toothed leaves (Plate No. XLIV). It appears to be quite common in the present area, while M. odoratissima has been recorded from Afghanistan only in our area (Aitchison No. 212 (K!, BM!), Plate No. XLV.).

M. flavida Boiss. is a very polymorphic species, and the status of the infra specific units is not definitely known.

Key to the species:

1. Annuals (rarely perennating); glandular with scattered sessile or sessile glands:
  2. Leaves oblanceolate; siliquae 7-15 x 0.25-0.4 cm.; pedicels 15-25 mm. long in fruit. .... 1. M. incana
  2. Leaves <sup>†</sup> ovate-petiolate; siliquae 5-8 x 0.2-0.25 cm.; pedicels 5-6 mm. long in fruit. .... 2. M. chenopodifolia
1. Perennials often with woody bases; never glandular:
  3. Siliquae 6-8 mm. broad; stigma much narrower than the pods  
..... 3. M. albicaulis
  3. Siliquae 1.5-3.5 mm. broad; stigma about as broad as the pods:
    4. Stigma appendaged; pedicels 1-1.5 mm. long in fruit .....  
..... 4. M. tristis
    4. Stigma not appendaged; pedicels 3-5 mm. long in fruit :
      5. Leaves lyrate or deeply pinnatifid, many-jugate .....  
..... 5. M. odoratissima

5. Leaves sublyrate, irregularly sinuate-toothed to sub-entire, 1-2- jugate ..... 6. M. flavida

1. M. incana (L.) R. Br. in Ait. Hort. Kew ed. 2. iv. 119. (1812); B.F.O. 148; S.E.P. 563.

Syn: Cheiranthus incanus L., Sp. Pl. 662 (1753).

Type: Europe (not precisely designated) No. 4 (LS!).

Annual, sometimes perennating, 15-100 cm. tall, erect, branched mostly from the base, somewhat woody at the base, covered with stellate, soft hairs and sessile or sessile glands. Radical leaves rosulate, narrowly oblanceolate or oblong-elliptic, very variable in size, 3-16 x 0.5-2 cm. entire, apex usually rounded. Racemes 15-30- flowered, ebracteate, lax, increasing up to 30 cm. in fruit. Flowers 2-4 cm. across, usually purple; pedicels 5-15 mm. long increasing up to 25 mm. in fruit and becoming strong and thickened. Sepals 8-12 x 1-2 mm. Petals 15-30 x 3-8 mm., obovate, long clawed, apex <sup>†</sup> rounded, margin entire. Stamens 7-9: 9-11 mm.; anthers about 2 mm. Siliquae 7-15 x 0.25-0.4 cm.; valves with a distinct mid-vein, pubescent; stigma bilobed <sup>†</sup> erect, sessile, somewhat thickened; seeds suborbicular, about 2 mm. in diam., brown winged.

W. Pakistan:

Punjab: Multan, Ritchie No. 19 (E!); (without locality), Royle (K!).

Afghanistan: Kandhar, Griffith No. 1443 (K!).

N.W. Himalayas: W. Tibet, Falconer Herb. East. Ind. Co. No. 139 (K!).

Geog. Dist.: S. Europe, N. Africa, and Asia minor; but widely naturalized through cultivation.

This species is cultivated in gardens in most parts of the present area. Rarely found as an escape from cultivation in the cooler parts.

\*  
2. M. chenopodifolia Fischer et Meyer in Ind. Sem. Hort. Petrop. 33  
(1835); B.F.O. 153; K.F.U. 294.

Type: Caspian region, Karelin (L,K!).

Annual, 15-30 cm. tall, erect, branched mostly from the base, clothed with <sup>+</sup> appressed, stellate hairs. Leaves ovate or elliptic, 1-7 x 0.5-2 cm., lower petiolate, uppermost sessile, broadly toothed to subentire, subfleshy, apex acute or obtuse, sometimes submucronate (sharp when dried). Racemes 10-20- flowered, lax, ebracteate, increasing up to 20 cm. in fruit. Flowers 15-20 mm. across, white; pedicels 2-5 mm. long, increasing up to 6 mm. in fruit thickened. Sepals 9-12 x 1.5-2 mm. Petals 20-30 x 3-4 mm., linear-oblong, margin crimped, clawed. Stamens 5-6: 8-10 mm.; anthers 2-2.5 mm. Siliquae 5-8 x 0.2-0.25 cm., subtorulose, clothed with branched hairs often intermingled with stalked or subsessile glands; stigma bilobed, conical, erect, decurrent; seeds 2-2.5 x 1.2-1.7 mm., suborbicular; narrowly winged, dark brown; septum yellowish, opaque, smooth, not veined.

Afghanistan:

Helmand and Seistan, A.H. McMahon (K!); Harirud Valley, common on stony ground, Aitchison No. 294.

Geog. Dist.: Persia and Trans-Caspian region.

\*  
3. M. albicaulis Boiss. in Ann. Sc. Nat. Ser. II. xvii. 46 (1842);  
B.F.O. 147; K.F.U. 289.

Syn: Hesperis alyssifolia DC., Syst. ii. 447 (1821) (nomen  
improprium).

Type: Persia, Aucher Eloy No. 108 (G,K!).

Perennial, 20-80 cm. tall, stout, with woody often forked rootstock; stems erect, sparsely branched, 5-10 mm. thick, glabrous, glaucous. Radical leaves rosulate, oblanceolate, or oblong-elliptic, shortly/

shortly stalked, 5-15 x 1-2.5 cm., entire, acute, densely pubescent with short, branched, white hairs often mixed with few longer simple hairs. Cauline leaves 3-10 x 0.5-2 cm., <sup>+</sup> like the radical leaves. Racemes 30-50-flowered, lax, ebracteate, increasing up to 50 cm. in fruit. Flowers 20-30 mm. across, purple; pedicels 5-20 mm. long increasing up to 35 mm. in fruit, thick, ascending. Sepals 10-15 x 3.8-4.2 mm. Petals 20-28 x 2.5-4 mm., narrowly oblanceolate, margin crimped, coarsely veined. Stamens 8-11: 10-14 mm.; anthers 6-7 mm. Siliquae 7-12 x 0.6-0.8 cm., valves rigid, glabrous with distinct mid-vein; stigma bilobed, much narrower than the pods (about 2 mm. broad, spreading seeds large, 7-8 x 6-6.5 mm., suborbicular, winged (wing about 1.5-2 mm. broad); septum rigid, thickened, yellowish.

Afghanistan:

Badghis, on the ridges of low sandstone hills, at l. 900 m., Aitchison No. 337 (K!).

Geog. Dist.: Persia and C. Asia.

4. M. tristis (L.) R.Br. l.c. 120; B.F.O. 153;

Syn: Cheiranthus tristis L., Sp. Pl. 2 ed. 925 (1759).

Type: Europe (not precisely designated) (LS!).

Perennial, 10-40 cm. tall, erect, branched mostly from the base, clothed with stellate hairs. Leaves narrowly oblong or linear, entire to irregular and sparsely toothed, 1-10 x 0.1-0.5 cm. Racemes spikate, 15-30-flowered, ebracteate, increasing up to 15 cm. in fruit. Flowers 10-15 mm. across, dingy yellow or purple, subsessile; pedicels 1-1.5 mm. long in fruits, somewhat thickened. Sepals 6-10 x 0.8-1.2 mm. Petals 15-20 x 2-3 mm. subcontorted; stamens 5-6: 7-9 mm.; anthers/

anthers about 1.5 mm. Siliquae 8-12 x 0.12-0.16 cm., obscurely torulose, tomentose; stigma bilobed, about as broad as the pods erect with short diverging appendages; seeds about 1.2-1.4 x 0.8-1 mm., oblong, obscurely winged.

W. Pakistan:

Punjab:? (without locality), Royle (K!).

Geog. Dist.: Native of Mediterranean region.

Cultivated in gardens in cooler parts of the present area. Several varieties of horticultural importance are known.

\*

5. M. odoratissima (Pall.) R.Br. l.c. 120; B.F.O. 149; K.F.U. 291.

Syn: Cheiranthus odoratissimus Pallas, Ind. Taur. 113 (1796)  
- nom.; MB., Casp. 116 (1800).

Type: Trans-Caspian region, Pallas (BM!).

Perennial, 15-70 cm. tall, branched, erect, villose with branched hairs; rootstock woody. Leaves lyrate-pinnatipartite 4-6- jugate, 2-10 x 0.8-2.5 cm., short stalked; lobes narrow, lanceolate. Racemes 15-30- flowered, ebracteate, lax, increasing up to 25 cm. in fruit. Flowers about 20 mm. across, purple, fragrant; pedicels 1-3 mm. long, increasing up to 4 mm. in fruit (rarely up to 6 mm.), somewhat thickened. Sepals 8-10 x 0.1-0.2 mm. Petals 16-25 x 0.2-0.4 mm., oblanceolate-oblong, margin crimped. Stamens 5-7: 7-9 mm.; anthers 2-3 mm. Siliquae 7-13 x 0.25-0.35 cm.; valves densely hairy, with a distinct vein and often with two more parallel veins; stigma bilobed thickened, about as broad as the fruit, <sup>†</sup> erect; seeds 2.5-3 x 2-2.5 mm., suborbicular, brown, narrowly winged. (Plate No. XLV).

Afghanistan:

Harirud Valley, near Khusan, not common, Aitchison No. 212 (K!, BM!)/

(K!,BM!)

Geog. Dist.: Persia and Trans-Caspian region.\*  
6.M. flavida Boiss., Diagn. Ser. I. (6) 9. (1845); B.F.O. 151;

O.E. Schulz in Notizblatt, Berlin, ix. 1089 (1927); S.E.P. 564;

P. Wendelbo in Nytt Mag. Bot. i. 33 (1952).

Syn: "M. odoratissima" H. f. et T. in Journ. Linn. Soc. Bot.

v. 134 (1861) et F.B.I. 131 (non R.Br.).

Type: S. Persia, Kuh-Ajub, Kotschy No. 392 (G,K!).

Perennial, 15-100 cm. tall, usually tomentose with stellate white hairs, branched mostly from the base. Lower leaves oblanceolate or elliptic-oblong, sometimes sublyrate, (1-2- jugate), 2-8 x 0.5-2.5 cm., stalked, broadly sinuate-dentate to subentire, apex obtuse or rounded; upper leaves 1.5-5 x 0.2-2 cm., ovate-oblong or oblanceolate, shortly stalked, sinuate-toothed to subentire; uppermost linear or narrowly spatulate, entire or subentire. Racemes 10-20- flowered, ebracteate, lax, increasing up to 35 cm. in fruits. Flowers 12-18 mm. across, purple or brownish, fragrant; pedicels 1-3 mm. long, increasing up to 5 mm. in fruit, pubescent. Sepals 8-10 x 1-1.8 mm. Petals 15-20 x 1.5-2.5 mm., oblong-linear, entire, often coiled inwards. Stamens 5-6: 6-8 mm.; anthers 2-2.5 mm. long. Siliquae linear-oblong, compressed, 7-10 x 0.2-0.28 cm.; valves pubescent, with a distinct mid-rib; stigmas narrower than the pods, erect, conical, bilobed; seeds uniseriate, 2-2.5 x 1.2-1.5 mm., suborbicular, flattened, brown with narrow membranous marginal wing; septum not veined. (Plate No. XLIV).

W./

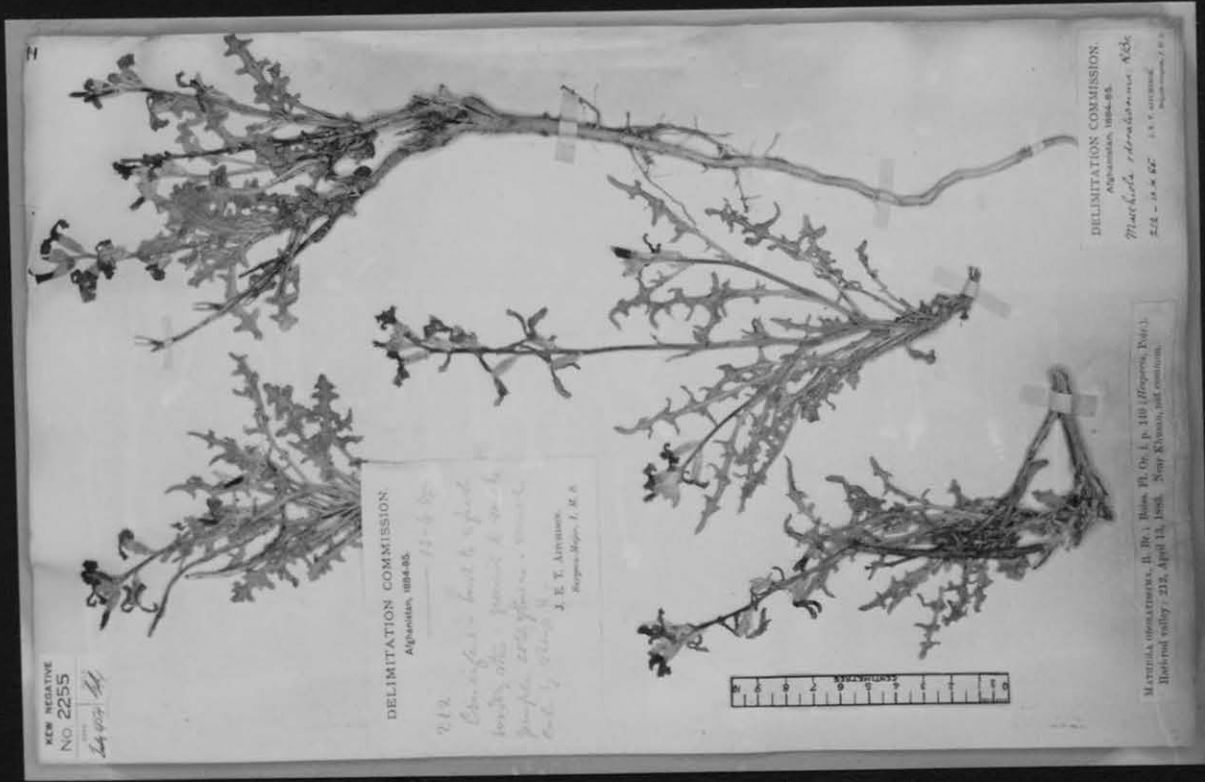


Plate no. XLV. *Matthiola odoratissima* (Fall.) R.Br.



Plate no. XLIV. *Matthiola flavida* Boiss.

W. Pakistan:Chitral: Drosh, 1350 m., Toppin No. 202 (K!).Baluchistan: Quetta, Kirani, Stocks (K!); Johan in the Rodbahar pass, Stocks (K!); near Yaru Karez, 1500 m., Lace No. 3598 (E!); Ziarat, 2400 m., Lace No. 4051 (E!).Afghanistan: Kulloo pass, 3450 m., Griffith (K!); Bameau Valley, in stony beds, Griffith (K!); Near Gazni, Johnston No. 109 (K!); Badghis, common on stony soil, 900 m., flowers smoke coloured, Aitchison No. 514 (K!); North of Hindu Kush, Giles (E!); Zangobar, Wakhan, 2700 m., Giles No. 88 (K!); Kabul, Gamble No. 57 (K!); Collett No. C57 (K!).N.W. Himalayas: Lahul, 3300-3900 m., Watt Nos. 2460 (E!) and 3109 (E!); (without locality), J.L. Stewart (E!);Kashmir: Baltistan, Duthie No. 11928 (E!, BM!); Skardo, 2550 m., Clarke No. 29993 (E!); Ladak, J.L. Stewart (K!); Baltistan, Los in Hasora, Winterbottom No. 712 (K!); Dras Valley, Batkokan, Inayat (K!); Astor, Kamrinala, Shunkergadh, Inayat No. 25486 (K!); Baltistan, Paskyum, 2850 m., dry hillside, flowers brownish-yellow, Osmaston No. 119 (K!); south of Hindu Kush, Chalt, 1800 m., Giles No. 9 (K!); Shah Jamali, 3300 m., Giles No. 452 (K!); Ladak, 2850 m., Ludlow and Sherriff No. 8352 (BM!); Ashkoley, 3000 m., Clarke No. 30398 G (BM!); Skardo, 2550 m., Clarke No. 29980 (BM!); Ladak, Leh, 3450 m., Ludlow No. 504 (BM!); Baltistan, Kiris, c. 2400 m., Ludlow No. 340 (BM!); Shigar, 2400 m., R. Stewart No. 20571 (R-E!).Karakorum: 2400 m., Clarke No. 30093 B (K!); Karakorum, Ashkoley, 3000 m., Clarke No. 30313 (E!)W. Tibet: Shayunk Valley, 3000-3600 m., Thomson (K!); Falconer No. 138 (K!).Geog. Dist.: Persia, Trans-Caspian region and C. Asia.

A very polymorphic species.

65. CHORISPORA R.Br. in DC., Syst, ii. 435 (1821); B.H.G.P. 102; S.E.P. 566; K.F.U. 310.Syn: Chorispermum R.Br. in Aiton, Hort. Kew. ed. 2. iv. 192 (1812).Annual or perennial, glabrous or hairy with simply glandular or eglandular hairs, erect or suberect, branched mostly from the base. Leaves deeply pinnatifid to entire, basal ones  $\dagger$  stalked, upper subsessile or sessile. Racemes ebracteate, corymbose, becoming lax in fruit. Flowers mediocre or large, purple or lilac, rarely yellow; pedicels/



pedicels short or long, † ascending sometimes thickened above. Sepals erect, subequal, inner pair saccate at the base. Petals about twice as long as the sepals, oblong-spathulate, apex † emarginate, clawed. Stamens 6, not appendaged; anthers oblong, obtuse. Lateral nectariferous glands usually in pairs, pyramidate or semilunar; median absent. Ovary linear with irregular margin, 8-26- ovuled; style long with short, bilobed stigma. Siliquae subcylindrical-torulose, usually breaking transversely into 2-seeded cells separated by septum, sometimes dehiscing irregularly; replum often persistent; seeds uniseriate, subglobose, not winged.

About 10 species chiefly in C. and W. Asia.

Key to the species:

1. Flowering branches scapose, aphyllous, 1- flowered (rarely 2-3- flowered) ..... 1. Ch. bungeana
1. Flowering branches sparsely leafy, many-flowered:
  2. Siliquae subcylindrical, subtorulose with a long, tapering, stout, beak-like apex ..... 2. Ch. tenella
  2. Siliquae deeply torulose or moniliform with † filiform short, style-like apex:
    3. Siliquae 1-1.4 mm. broad, moniliform ..... 3. Ch. sibirica
    3. Siliquae 1.5-2 mm. broad, irregularly torulose:
      4. Flowers yellow; pedicels 4-6 m. long increasing up to 8 mm. in fruit ..... 5. Ch. macropoda
      4. Flowers purple or lilac, sometimes dirty white; pedicels 5-10 mm. long increasing up to 15 mm. in fruit .. 4. Ch. elegans

\*  
1. Ch. bungeana Fischer et Meyer in Schrenk, Enum. i. 96 (1841);

S.E.P. 566; K.F.U. 315.

Syn: Ch. exscapa Bunge in Ledeb., Fl. Ross. i. 169 (1842)

B.F.S. 645.

Type: C. Asia, Soongaria, Schrenk (L,K!).

Perennial, short herbs, glabrous with slender root. Radical leaves rosulate, oblanceolate, pinnatifid or sinuate toothed, 2-6 x 0.3-1 cm., stalked (stalk 1-4 cm. long) with bases somewhat sheathing. Scapes 1-flowered, rarely developing into a short stem with 2 or 3 flowers, 2-4 cm. long, increasing up to 6 cm. in fruit. Flowers 1.2-2.5 cm. across, purple or lilac. Sepals 8-10 x 2 mm. Petals 16-20 x 5-7 mm. spathulate-oblong, apex emarginate. Stamens 6-8: 8-10 mm.; anthers about 3 mm. long. Siliquae about 20 x 1.5 mm., subtorulose; style 2-3 mm. long; seeds about 1 mm. in diam.

W. Pakistan:

Chitral: Tutkhoo, 2400 m., Toppin No. 221 (K!).

Afghanistan: Kurrum Valley, Karchatal ravine, 3450 m., Aitchison No. 597 (K!); Hariab dist., on the exposed ridges of hills, 3450-3600 m. The natives eat the pods, Aitchison No. 119 (K!); Safed Koh, 3600 m., H. Collett No. 100 (K!).

Geog. Dist.: C. Asia.

2. Ch. tenella (Pallas) DC., Syst. ii. 435 (1821); B.F.O. 143; F.B.I. 166; S.E.P. 556; K.F.U. 316.

Syn: Raphanus tenellus Pallas, Reise, v. (1776) app. page 509.

Type: Transcaspicum region, Pallas (BM!).

Annual, 12-40 cm. tall, branched mostly from the base, erect, glabrous or sparsely glandular. Basal leaves rosulate, oblanceolate, sinuate-toothed, 3-8 x 0.5-2 cm., stalked, acute or obtuse. Upper leaves/

Upper leaves <sup>+</sup> similar to the basal leaves, shortly stalked to sessile  
Racemes 10-20- flowered, lax, ebracteate, increasing up to 20 cm.  
 in fruit. Flowers about 10 mm. across, purple; pedicels 2-4 mm.  
 long, increasing up to 5 mm. in fruit, thickened, Sepals 5-6 x  
 1-1.5 mm. Petals 9-11 x 1.5-2 mm., oblong-spathulate, clawed.  
 Stamens about 5: 6 mm.; anthers about 1.5 mm. Siliquae 3-5 x  
 0.18-0.2 cm., cylindrical-tapering towards the apex, often curved  
 below, subtorulose; valves with a distinct mid-vein, breaking into  
 several 2-seed parts; beak-like apical sterile part (style) 1-1.5  
cm. long, ending into conical bilobed stigma with decurrent lobes;  
 seeds about 1 mm. in diam., rounded, brown.

W. Pakistan:

Punjab: Salt Range, J.L. Stewart (E!,K!) Aitchison No. 55 (K!);  
 Rawalpindi, Hasan Abdal, Aitchison No. 1016 (K!);  
 Rawalpindi, P.M. Pinfold No. 8 (BM!); J.D. Samson (R-E!)  
Baluchistan: Quetta, 1650 m., Lace No. 3624 (E!); Sibi, Jafri (E!);  
 (without locality), Monro (K!); Quetta, in muddy fields,  
Griffith (K!); Panduran, Stocks No. 895 (K!); (without  
 locality), Duthie No. 8607 (BM!).

Afghanistan: Parachenar, Harsukh No. 1474 (K!); Harirud Valley,  
 Chashma-Sabz, Aitchison No. 148 (K!); Kabul, 1680 m.,  
W.R. Hay No. 33 (K!); Charasia, W.R. Hay No. 45 (K!);  
 (without locality), Griffith No. 1411 (K!); Kurrum Valley,  
 Shalizan to Habibkalla, Aitchison Nos. 133 (K!) and 211  
 (K!); Harirud Valley, in the shade of shrubs, very common,  
Aitchison No. 1016 (K!); Sinab, in wheat fields and sandy  
 plains, Griffith (K!); Ackukzye and Erak ravine, 3300 m.,  
Griffith (K!).

N.W. Himalayas: Chenab Valley, Purti, 2250 m., R. Ellis No. 1023  
 (K!); and 2460 m., R. Ellis (K!); Kashmir, Thomson (K!);  
Falconer Herb. East India Co. No. 183 (K!); Jacquemont  
 (K!); Lahul, Keylang, 3900 m., Watt Nos. 2385 (E!); 2939  
 (E!) and 826 (E!).

Geog. Dist: Europe, Asia and N.America.

Sometimes the plants become very reduced, perhaps due  
 to very arid conditions. The following two specimens  
 from Baluchistan are very reduced forms, only 2-4 cm.  
 tall, 1-2- flowered:

Baluchistan: near Quetta, Duthie No. 8610 (E!);  
 Shelabagh, Lace, (E!).

3. Ch. sibirica (L.) DC., Syst. ii. 437 (1821); F.B.I. 167; S.E.P. 566; K.F.U. 317.

Syn: Raphanus sibiricus L., Sp. Pl. 669 (1753).

Type: Siberia (not precisely designated) (LS!).

Annual or biennial, 7-30 cm. tall, with numerous spreading branches developing from the base, sparsely hairy with glandular and eglandular hairs. Basal leaves rosulate, oblanceolate, interruptedly deeply pinnatifid, with narrow acute or obtuse lobes, 2-6 x 0.3-0.8 cm., shortly stalked; apical lobe comparatively slightly large. Upper leaves <sup>†</sup> like basal the basal leaves, shortly stalked to sessile. Racemes 10-20-flowered, ebracteate, increasing up to 15 cm. in fruit. Flowers 6-10 mm. across, yellow; pedicels 4-10 mm. long, increasing up to 14 mm. in fruit, slightly thickened, if reflexed. Sepals 2.5-3.5 x 1-1.4 mm. Petals 6-10 x 2.8-4 mm., spatulate, apex emarginate. Stamens 2.5-3: 3.5-4 mm.; anthers about 1 mm. Siliquae 2-2.5 x 0.1-0.14 cm., linear, finely torulose (or beaded), often curved on somewhat reflexed pedicels; seeds 8-10 on each side about 0.7 mm. in diameter, cells <sup>†</sup> opposite; replum persistent; valves with a distinct mid-vein, subcoriaceous, often breaking between the seeds or dehiscing completely; style 5-8 mm. long with short stigma.

N.W. Himalayas:

Kashmir: Astri, 3000-3300 m., Duthie (E!); Burzil pass, 3600 m., R. Stewart No. 19036 (R-E!); Gilgit, I. Biddulph (K!) Astor, Inayat No. 25507 (K!); Baltistan, Hasora, Winterbottom No. 704 (K!); Satpur nullah, 3300-3600 m., Duthie No. 11993 (K!); Baltistan, Shingos, 2250 m., F. Ludlow No. 243 (BM!).

Karakorum: Kero Lugona glacier, 3000-3300 m., Russell No. 1344 (BM!); Kushuchum Lungmo Valley, 2850-3150 m., Russell No. 1780 (BM!); Barpu glacier, 3000-3300 m., Russell No./

No. 1103 (BM!); (without locality), 3600 m., Clarke  
 No. 30382A (BM!) and 30382B (K!); Astor to Dogra,  
Conway (K!); Sat Village, 2400 m., Conway (K!).

Geog. Dist.: C. Asia.

4. Ch. elegans Cambess. in Jacq., Voyage Ind. Bot. iv. 15 (1844)

t. 14; S.E.P. 566; K.F.U. 315.

Syn: Ch. sabulosa Cambess., l.c. t. 15; B.F.O. 144; F.B.I. 167.

Type: Kashmir, between Shupien and Pir Parjal, V. Jacquemont  
 (P,K!).

Perennial, 5-25 cm. tall, erect or suberect, branched mostly from the base, sparsely hairy with glandular or eglandular hairs. Rosette leaves oblanceolate or spatulate, pinnatifid or sinuate-toothed, rarely subentire, stalked, 2-8.5 x 0.2-1 cm.; apical lobe usually comparatively large. Cauline leaves <sup>+</sup> similar to the radical leaves. Racemes 10-25- flowered, corymbose above, ebracteate, increasing up to 15 (-20) cm. in fruit. Flowers 8-12 mm. across purple or lilac; pedicels 5-10 mm. long, increasing up to 15 mm. in fruit, filiform or slightly thickened above. Sepals 2.8- 4 x 1-1.8 mm. Petals 6-10 x 2.8-4 mm. spatulate, apex emarginate. Stamens 2.5-4: 3.5-5 mm., anthers about 1 mm. Siliquae about 1.5 x 0.15-0.2 cm., deeply and irregularly torulose; valves rigid, somewhat tuberculated; style 1.5-3 mm. long with a short stigma; seeds 3-5 on each side about 1-1.3 mm. in diam.; cells not breaking transversely into 2-seeded parts, instead valves breaking on each side in one seeded parts; often liberating the seed free; replum persistent, complete.

W. Pakistan:  
Chitral

- Chitral: Abundant at 3000-3300 m., Toppin No. 492 (K!);  
N.W.F.P.: Kaghan, 2400 m., Drummond No. 21572 (K!); Kaghan, 3600 m., Inayat No. 19199 (K!).
- Afghanistan: (without locality), Griffith Nos. 1530 (K!) and 1412 (K!).
- N.W. Himalayas: Pangi, Parmaur Valley, 3900 m., Lace No. 1660 (E!); Charni pass, 3600 m., Lace No. 1494 (E!); (without locality), Thomson (E!); Lahul, Keylang, 4500 m., N.L. Bor No. 15078 (E!); Tespa, 3300 m., N.L. Bor No. 9457 (E!); Lahul, Jaeschke Nos. 223 (K!), 219 (K!) and 218 (K!); Patseo, 3600 m., Koelz No. 2067 (K!).
- Kashmir, Kishenganga, Barai Valley, 3150 m., Ludlow and Sherriff No. 1450 (E!); Masjid Valley, 3600-3900 m., Duthie No. 13195 (E!,BM!); Baltistan, Dras Valley, 3300-3600 m., Duthie No. 11655 (E!,BM!); Sheshnag, 3900-4800 m., Drummond No. 14242 (E!,K!); Kamri Valley, 3300-3600 m., Duthie (E!,BM!); Baltistan, 3300 m., Ludlow No. 294 (BM!); Pangtaran, A.P. Young (BM!); Nichinai, Pinfold No. 382 (BM!); Burjila, 4500 m., Clarke No. 29853 (BM!); Sinthan pass, 4200 m., Ludlow No. 185 (BM!); Gilgit, Tin pass, 3600-4200 m., Giles No. 480 (K!); (without locality), J.L. Stewart (E!); Falconer's collector Nos. 3739 (K!), 4189 (K!), 3527 (K!), 3574 (K!); 3735 (K!); 2998 (K!); 2993 (K!), 3595 (K!); Kumri pass, 3500-3900 m., Giles No. 706 (K!); Astor, Alampi La, 4200 m., Duthie No. 12171 (K!); Baltistan, Rongdo, 4050 m., Winterbottom Nos. 816 (K!) and 532 (K!); Pir Panjal, Inayat No. 25505 (K!); Burzil pass 4350 m., damp gravel, R. Stewart Nos. 22065 (K!) and 20139 (R-E!); Ladak, Hanupatta, 4200 m., B.B. Osmaston No. 40 (K!); Sheshnag, C. 3900 m., Drummond No. 14260 (K!); Saskatti transition, C. 3900 m., Drummond No. 14253 (K!); Voajan pass, 4200 m., Timins No. 199A (BM!); Rajparyan, 3300 m., Ludlow and Sherriff No. 9308 (BM!); Ladak, 3900 m., Ludlow and Sherriff No. 8375 (BM!); Tajwas, near Sonmarg, 3450 m., Ludlow and Sherriff No. 7910 (BM!); Zoji La, 3450 m., Ludlow and Sherriff No. 8314 (BM!); Zanskar and Ladak, 4200 m., Watt No. 2457 (E!).
- W. Tibet, Zanskar, Schlagintweit (BM!).
- Karakorum, W.M. Conway (K!); Baltoro glacier, 3750 m., M.S. Spender (BM!); Kero lugma glacier, 4650 m., Russell No. 1248 (BM!); Hispar glacier, C. 3500 m., Russell No. 1238 (BM!); Sokhe glacier, 4050 m., Russell Nos. 1653 (BM!); and 1665 (BM!), 1716 (BM!) and 1866 (BM!); Kero Lugma glacier, 3600-3900 m., Russell Nos. 12831 (BM!) and 1370 (BM!).

Geog. Dist.: C. Asia.

5. Ch. macropoda Trantv. in Bull. Soc. Nat. Mosc. xxxiii. 109 (1860); O.E. Schulz in Notizblatt, Berlin, ix. 1073 (1927); K.F.U. 312.

Type: C. Asia, Songaria, Schrenk (L - not seen).

Perennial, 5-15 cm. tall, branched mostly from the base, glandular especially above. Rosette leaves oblanceolate or spatulate-oblong, sinuate-toothed to subentire, 2-3.5 x 0.4-0.7 cm., stalked, sparsely ciliate hairy with simple hairs; apical lobe slightly broader than the lateral lobes. Racemes 10-15-flowered, ebracteate, increasing up to 10 cm. in fruit. Flowers 7-8 mm. across, yellow; pedicels 4-6 mm. increasing up to 8 mm. in fruit, ascending, glandular. Sepals 2.5-3 x 1-1.2 mm. Petals 5.5-6.5 x 3-3.5 mm., spatulate, apex emarginate. Stamens 3-3.2: 3.5-4 mm.; anthers about 1 mm. Siliquae about 15 x 2.3 mm. (immature), torulose, <sup>+</sup> similar to Ch. elegans Camb.

W. Pakistan:

Chitral: Shandur, C. 3600 m., Toppin No. 364 (K!).

Geog. Dist.: C. Asia.

66. DIPTYCHOCARPUS Trautv. in Bull. Soc. Nat. Mosc. xxxiii. 108 (1860); B.H.G.P. 67; B.F.O. 144; S.E.P. 566; K.F.U. 309.

Syn: Alloceratium H. f. et T. in Journ. Linn. Soc. Bot. v. 129, (1861); Orthorrhiza Stapf in Denkschr. Akad. Wien, LI. 306 (1886).

Annual, branched mostly from the base, erect or suberect with arcuate branches, clothed with bipartite or tripartite appressed hairs. Basal leaves spatulate, sinuate-toothed, stalked, deciduous; upper leaves linear, sessile, <sup>+</sup> entire. Racemes lax, ebracteate/

ebracteate. Flowers mediocre or large, purple or lilac; pedicels short, somewhat thickened in fruit. Sepals erect, subequal, inner pair saccate at the base. Petals linear-oblong to narrowly spatulate, apex emarginate or entire, clawed. Stamens 6, not appendaged, anthers oblong, obtuse. Lateral nectariferous glands apparently semiannular, median absent. Ovary slender, many ovuled; style short or long with conical, bilobed stigma with decurrent lobes. Siliquae dimorphic; upper ones compressed, bilocular, dehiscent; septum membranous, valves with a distinct mid-vein, covered with bipartite appressed hairs; seeds orbicular, winged; lower siliquae subcylindrical-terete, indehiscent but breaking transversely like those in Chorispora, seeds not winged.

1 species in C. Asia, Persia, Afghanistan and W. Pakistan.

D. strictus (Fisch.) Trautv. in Bull. Soc. Nat. Mosc. xxxiii.

108 (1860); B.F.O. 145. S.E.P. 567; K.F.U. 310.

Syn: Raphanus strictus Fisch. in MB., Fl. Taur.-Cauc. iii. 452 (1819); Chorispora stricta DC., Syst. ii. 436 (1821); Alloceratium strictum H. f. et T. in Journ. Linn. Soc. Bot. v. 135 (1861); Chorispora stenopetala Regel et Schmalh. in A.H.P. v. 239 (1877); Orthorrhiza persica Stapf. in Denkschr. Akad, Wien. LI. 306 (1886).

Type: C. Asia, Kirghis, Taucher et Hermann (L - not seen).

Annual, 10-40 cm. tall, erect or suberect, branched mostly from the base, hairy with simple soft hairs. Basal leaves often in loose rosette, oblong-elliptic, pinnatifid or distantly toothed, 3-5 x 0.4-0.6 cm.; upper leaves on the main stem † similar to the basal/



basal leaves, those on the branches or the uppermost † linear-oblong, 2-4 x 0.1-0.2 cm., entire, sessile. Racemes 10-20-flowered, ebracteate, lax, increasing up to 15 cm. in fruit. Flowers about 5 mm. across, purple; pedicels about 1 mm. long increasing up to 4 mm. in fruit, somewhat thickened. Sepals 3.5-5 x 1-1.2 mm. Petals 8-10 x 1-1.5 mm., linear-oblong. Stamens 3.5-5: 5-6 mm.; anthers about 1.5 mm. Siliquae dimorphic, upper ones 4.5-6 x 0.2-0.25 cm., linear, compressed, bilocular, dehiscent with distinct mid-veins on the valves; septum membranous, not veined; lower ones few, 3.5-4.5 x 0.2 cm., linear, subcylindrical indehiscent and breaking into 2 seeded parts as in Chorispora; valves rigid, spongy; style 2-6 mm. long and 0.5-0.7 mm. broad; seeds of the upper dehiscent siliquae orbicular winged, those of the lower indehiscent ones not winged. (Plate No. XLVI).

W. Pakistan:

N.W.F.P.: Peshawer, N. Ali (R-E!).

Baluchistan: (without locality); Stocks (K!); Shelabagh, Lace (E!), Quetta, Watt (E!).

Afghanistan: Harirud Valley, common, Aitchison No. 205 (K!).

Geog. Dist.: C. Asia and westward to Caucasus.

Specimens of this species from Baluchistan were wrongly named so far by the previous workers. Kew named the above Stocks specimens as "Chorispora tenella." Its narrow petals and hispid stems with narrow leaves are very distinct characters for its identification in the absence of mature fruits. Therefore, Ch. stenopetala Regel et Schmalh., described from C. Asia, probably on immature fruits, is conspecific with Diptychocarpus strictus (Fisch.) Trautv. G. Watt (1889) thought a specimen of this species from/

from Baluchistan to be a new Brassica species (see Plate No. XLVI) - which is evident from his remarks on the sheet, " ..... it resembles Brassica Tournefortii Gouan, is I believe a new species." Therefore, specimens of this species from Baluchistan. are for the first time correctly named here.

67. PARRYA R.Br. in Parry. Voy. Bot. 268 (1824); B.F.O. 159; F.B.I. 131; S.L.F. 567.

Perennial, with woody rootstocks, glandular or hairy with simple or furcate hairs, rarely glabrous. Radical leaves often densely rosulate, linear to lanceolate, generally sinuate pinnatipartite or pinnatifid, rarely entire or pinnatisect, + stalked with broad sheathing bases; lobes usually subtriangular. Scapes few to many flowered, rarely single flowered. Flowers large, lilac or white; pedicels strong, increasing in length in fruits and becoming thickened. Sepals oblong, erect, subobtuse, inner pair subsaccate at the base, apex not hooded. Petals + spatulate, long clawed; claws about as long as the sepals. Stamens 6, not appendaged; anthers large, linear, subobtuse. Lateral nectariferous glands + annualr, sometimes slightly opened; median present or absent, not joining the laterals. Ovary linear, many ovuled; style present with bilobed, conical stigma with lobes decurrent and erect. Siliquae often elongated, large, linear-oblong, flattened or compressed, bilocular, dehiscent; valves with a distinct mid-rib, usually glabrous; seeds 1-2-seriate, oblong, compressed, narrowly winged; septum membranous, not veined.

About 18 species chiefly in Central Asia.

Parrya has ~~been~~ sometimes been confused with Christolea(Ermania) and Cheiranthus. It is distinguished from those two genera primarily by its aphyllous, scapose, flowering shoots often sparsely hairy with simple or furcate hairs. The other important distinguishing characters are underlined in their generic descriptions.

Out of the 4 species recorded in Fl. Brit. India(1872) only two, P. exscapa C.A.M. and P. nudicaulis(L)Boiss.(P. macrocarpa R.Br.), remain

as true species. In Boissier's Fl. Orientalis (1867) only two species, P. nudicaulis (L.) Boiss. and P. pinnatifida Kar. et Kir., are recorded from Afghanistan. There are six species now in the present area. It includes one new species and one new subspecies described from Chitral (W. Pakistan) and Gilgit (N.W. Himalayas) respectively.

Typical P. stenocarpa Kar. et Kir. is perhaps confined to C. Asia (Turkestan), and has not yet been recorded from the present area. Its new subsp. gilgitica Jafri is distinguished from the type race primarily by the very elongated, narrow, sublanceolate or linear terminal lobe of the radical leaves (Plate no. XLIX). Furthermore, it is confined to Gilgit (Kashmir) and is isolated from the type race by the high mountain barrier of Hindukush and Karakorum. (Map no. 3).

The new species, Parrya chitralensis Jafri, is very distinct from the rest of the species of Parrya in its glabrous habit, pinnatisect radical leaves with all the lobes short and almost equal in size (plate no. XLVII).

Parrya is divided into the following two sections primarily on the scape character:

Sect. I. Neuroloma (Anderz.) Ledeb., Fl. Alt. iii 27 (1831); S.E.P. 567.

syn: Neuroloma Anderz. ex DC., Prodr. i 156 (1824).

Scapes few to many flowered.

1. P. nudicaulis (L.) Boiss.
2. P. pinnatifida Kar. et Kir.
3. P. minjanensis Rechinger f.
4. P. stenocarpa Kar. et Kir.
5. P. chitralensis Jafri.

Sect. II. Leiospora C.A.M. in Ledeb., Fl. Alt. iii 28 (1831); S.E.P. 567.

Scapes single flowered.

6. P. exscapa C.A.M.

#### Key to the species.

- I. Scapes single-flowered, many ..... 6. P. exscapa
- I. Scapes few to many-flowered, few :
  2. Plants glabrous; radical leaves pinnatisect, few; all lobes + alike, narrow, oblong or lanceolate ..... 5. P. chitralensis
  2. Plants + hairy with glandular or eglandular hairs; radical leaves pinnatipartite or pinnatifid rarely entire, many; terminal lobe somewhat larger than the lateral lobes, lobes broad, + subtriangular:

3. Plants glandular.....1. P. nudicaulis
3. Plants hairy with simple or furcate hairs (sometimes mixed with glandular hairs):
4. Plants hairy with glandular and eglandular hairs; leaves pinnatifid .....2. P. pinnatifida
4. Plants hairy with eglandular, simple or furcate hairs, often densely hispid; leaves pinnatipartite, ~~sometimes entire~~ or pinnatifid:
5. Radical leaves mostly entire; racemes 2-4-flowered; siliquae 3 mm. broad .....3. P. minjanensis
5. Radical leaves mostly pinnatipartite (rarely pinnatifid); racemes 6-12-flowered; siliquae 2 mm. broad.....
- .....4. P. stenocarpa

I. P. nudicaulis (L.) Boiss., Fl. Or. i 159 (1867); S.E.P. 567.

Syn: Cardamine nudicaulis L., Sp. Pl. 654 (1753); Arabis nudicaulis DC., Syst. ii 240 (1821); Neurolooma nudicaule DC., Prodr. i 156 (1824); P. macrocarpa A.Br. in Parry, Voy. app. 270 (1824); F.B.I. 131; Matthiola nudicaulis Trautv. in A.H.P. i 51 (1871).

Type: Siberia (not precisely designated) no. 3 (LS!).

Perennial, sparsely glandular, rarely subglabrous. Radical leaves densely rosulate, pinnatipartite, lanceolate, 4-15x0.5-1.6 cm., rarely subentire, petiolate, glandular rarely subglabrous; petiole upto 5 cm. long. Scapes 8-30 cm. long. Racemes 8-16-flowered, increasing upto 20 cm in fruit. Flowers 1.7-2.4 cm. across, purple, lilac or white; pedicels 5-15 mm. long, increasing upto 25(-55) mm. in fruit, strong, ascending. Sepals 8-10x1.5-2 mm. Petals 15-22x5-7 mm., spatulate, long-clawed, apex emarginate. Stamens 7-8 : 8-10 mm.; anthers 1.5-2 mm. long. Siliquae 3-6.5x0.3-0.5 cm., oblong, compressed, erect, margin often constricted between the seeds; valves rigid, glandular, with a distinct mid-vein; style 1-2 mm. long; seeds many, uniseriate, about 3-5 mm. in diam., suborbicular, prominently winged; septum not veined.

W. Pakistan:

Chitral: Chitral, Toppin no. 473(K!).

Afghanistan:

Brak pass, 3600 m., in slate rocks, Griffith(K!).

N.W.Himalayas:

(without locality), J.L.Stewart(E!,K!); Kumaon, Jacquemont(K!);  
Kunawar, Royle(K!);

Kashmir:Ladak, above Tsakskhun Tso, along streams, 5250 m., W.Koelz  
no. 2416 a (E!,K!); Ladak, in wet gravels, 5400 m., W.Koelz no.  
2508 h(R-E!); Khardong La, 4800 m., Ludlow & Sherriff no. 8423(BM!);  
Ladak, Schlagintweit(BM!); J.L.Stewart(K!); Sasser pass, 4950 m.,  
Ludlow no. 444(BM!); Khardong pass, 4740 m., R.Meinertzhagen no.52  
(BM!); Marsimih La, 5100 m., Ludlow(BM!);

W.Tibet: 4200-5400 m., Thomson(E!,K!); Plains of Tibet, 4650 m.,  
Strachey & Winterbottom(K!); Zanskar, Pig Dong La, 4500 m., Osma-  
ton no. 205(K!).

Geog. Dist: Arctic Europe, C.and N. Asia, and N.America.

2. P. pinnatifida Kar.et Kir. in Bull. Soc. Nat. xv 147 (1842); B.F.O.  
159; S.E.P.567.

Type: N.Asia, Lepsa and Sarchan, Kar.and Kir. no. 1198(L,K!).

Perennial, sparsely glandular and hairy; glands sessile or  
subsessile; hairs simple or furcate, long. Radical leaves densely rosulate,  
2-10x0.4-1 cm., pinnatifid, 5-7-jugate, shortly stalked; lobes obliquely  
triangular, ascending, alternate. Scapes 10-20 cm. tall, Racemes 8-12-  
flowered, increasing upto 10 cm. in fruits. Flowers 1.7-2 cm. across,  
lilac; pedicels 4-10 mm. long, increasing upto 20 mm. in fruit. Sepals  
8-10x2-2.5 mm. Petals 18-20x3.5-4.5 mm., spatulate, long-clawed, apex  
subemarginate. Stamens 7-8 : 8-10 mm.; anthers about 2 mm. long. Siliquae  
immature 3-4.5x0.25 cm., linear-oblong, compressed, acute; valves glandular-  
hairy, 1-veined; style 3-4 mm. long, slightly thickened; seeds many, sub-  
biseriate, immature about 1-1.5 mm. broad, suborbicular.

Afghanistan:

In sandy spots(without locality), Griffith(K!);

Geog. Dist:

C.and N.Asia : Turkestan, Socalski nos. 158(K!) and 157(K!);  
Seraschan, Kumar, 2850 m., Komarov (K!).

3. \*P. minjanensis Rechinger f. in Phytion iii 62 (1951).

Type: Afghanistan, Minjan pass, 3600 m., W.Koelz no. 12679  
(V-K!).

Perennial, sparsely hispid with simple and furcate hairs; radix partly present, 1-2.5 mm. thick. Radical leaves rosulate, oblanceolate, 2.5-5x0.4-0.5 cm., acute or obtuse, entire rarely pinnatifid(3-jugate) with narrowly linear lobes, stalked, hispid. Scapes 5-10 cm. long. Racemes 2-4-flowered, hardly increasing in length in fruits. Flowers about 1 cm. across, rose-purple; pedicels about 5 mm. long, increasing upto 10 mm. in fruit. Sepals 6-7x2-2.5 mm. Petals 13-17x3-4 mm., spatulate, long-clawed, apex emarginate. Stamens about 6 : 8 mm.; anthers about 3 mm. long. Siliquae (almost mature) about 8 x 0.3 cm., linear-oblong, compressed, glabrous, subtorulose; valves rigid, 1-veined; style about 2 mm. long with about 1 mm. long stigma.(Plate no, XLVIII).

Known from the type locality only.

4. \*F. stenocarpa Kar. et Kir. in Bull. Soc. Nat. Mosc. xv 147 (1842);

K.F.U. 265.

Type: C.Asia, Baskhan and Sarchan, Kar. et Kir no. II97(L,K!).

Subsp. I. stenocarpa

Perennial, with woody rootstock, densely hispid with simple or furcate hairs. Radical leaves densely rosulate, many, oblanceolate, pinnatifid, 3-6x1-1.5 cm., densely hispid, 3-5-jugate; terminal lobe short, upto 1 cm. long as well as broad, triangular; lateral lobes slightly shorter, + obliquely triangular; petiole short. Scapes 10-25 cm. long. Racemes 6-12-flowered, increasing upto 15 cm. in fruits. Flowers 15-20 mm. across, lilac; pedicels 5-10 mm. long, increasing upto 15 mm. in fruit, + erect, slightly thickened. Sepals 10-12x2.5 mm. Petals 17-20x6.5-8 mm., spatulate, long-clawed, apex emarginate. Stamens about ( : 10 mm.; anthers about 3 mm. long. Siliquae linear, elongated, 7-10x0.2 cm., subtorulose, acute, glabrous; valves with a distinct mid-vein and reticulate venation; style 3-4 mm. long; seeds about 25 in each loculus, uniseriate, about 2.5x1 mm., ovate-oblong, compressed, winged; septum not veined.

Geog. Dist: C.Asia.

Subsp. II. gilgitica Jafri, subsp. nov.

A typo lobo terminali foliorum valde elongatum anguste lanceolatum multo longiorum, lobis lateralibus variantibus brevibus divergit.

Folia radicalia elongata pinnatifida vel pinnatipartita rarius integra vel pinnatisecta dense hispida, lobo terminali multo longioribus, lanceolatis saepe 2-5x0.2-0.3 cm., lobis lateralibus brevi 2-6x2-4 mm. + triangulari. Racemus 3-6-florus. Siliquae (submaturae) circa 9 x 0.2 cm., lineares subtorulosae compressae acutae saepe curvatae.

Radical leaves elongated, pinnatifid or pinnatipartite, rarely entire or pinnatisect, densely hispid; terminal lobe much longer, lanceolate, usually 2-5x0.2-0.3 cm.; lateral lobes short, 2-6x2-4 mm., + triangular, Racemes 3-6-flowered, Siliquae (submature) about 9 x 0.2 cm., linear, subtorulose, compressed, acute, often curved. (Plate no. XLIX).

N.W.Himalayas:

Kashmir: Gilgit, Tin pass, 3600-4200 m., dated- 12. 7. 1886, Giles no. 476(K!); (without locality), Giles(E!).

Distinguished from the type race primarily in leaf shape, the elongated narrow lanceolate terminal lobe being much longer than the lateral lobes. The type race is confined to China(Turkestan) while the new subsp. is endemic to Kashmir(Gilgit). (Map no. 3).

5.\*\*P. chitralensis Jafri, sp. nov.

Affinis P. stenocarpae Kar.et Kir. sed habitu glabro, foliis radicalibus non congestis pinnatisectis 5-7-jugatis, lobis omnibus + aequalibus anguste oblongis ellipticis vel lanceolatis, scapo glabro in racemum 3-4-florum brevissimum protracto differt.

Herba perennis glabra; radix 4-5 mm. crassus lignaceus. Folia radicalia rosulata, pauca, non congesta 3-7x1-1.6 cm., pinnatisecta 5-7-jugata, lamina petiolo duplo longior; lobus terminalis brevis, 5-10x1.5-3 mm., acutus, lobis lateralibus 4-10x1-2.5 mm., omnibus anguste ellipticis oblongis vel lanceolatis integris. Scapus 7-18 cm. altus, erectus, glaber, racemo 3-4-floro brevissimo terminatus. Flores circa 7 mm. diam., pallide lilacini vel albi. Pedicelli 1-3 mm. longi, + erecti, glabri, in fructu elongati. Sepala 7-10x2-3 mm. oblonga, erecta, obtusa, glabra, ad marginem alba, interiora basi saccata. Petala 15-18x3-5 mm., spathulata, longe unguiculata, apice submarginata. Stamina 7-9 : 9-10 mm. longa; antherae circa 3 mm. longae, lineari-oblongae, basi auriculatae subobtusae val vix apiculatae. Stylus circa 2 mm. longus; stigma bilobatum conicum decurrens. Siliquae ignotae.

Perennial, glabrous herb, radix 4-5 mm. thick, rootstock covered with withered leaf bases. Radical leaves rosulate, few, not congested, 3-7x 1-1.6 cm., pinnatisect, 5-7-jugate; laminae about twice as long as the petiole; terminal lobe short, 5-10x1.5-3 mm., acute; lateral lobes 4-10x1-2.5 mm.; all lobes narrowly elliptic, oblong or lanceolate, entire. Scapes 7-18 cm. long, erect, glabrous; racemes 3-4-flowered, short, confined to the apex. Flowers about 7 mm. across, pale lilac or white. Pedicels 1-3 mm. long, + erect, glabrous, increasing in length in fruit. Sepals 7-10x2-3 mm., oblong, erect, obtuse, glabrous, margin white, inner ones succate at the base. Petals 15-18x5-5 mm., spatulate, long clawed, apex subemarginate. Stamens 7-9 : 9-10 mm. long; anthers about 3 mm. long, linear-oblong, auricled at the base, apex subobtuse or hardly apiculate. Style about 2 mm. long; stigma conical, bilobed, decurrent. Siliquae not seen. (Plate no. XLVII)

W. Pakistan:

Chitral: Chitral, 3500 m., dated- 3.6.1895, S.A. Harriss no. 15910(K!); Shajanali, 3150-3300 m., Toppin no. 375 (K!);

Distinguished from P. stenocarpa Kar. et Kir. by its glabrous habit, radical leaves few, not congested, pinnatisect, 5-7-jugate; all lobes short, almost equal in size and shape, elliptic, oblong or lanceolate; racemes few-flowered with flowers confined to the apex only.

6. P. exscapa C.A.M. in Ledeb., Fl. Alt. iii 28 (1831); F.B.I. 131; B.F.S. 554; S.E.P. 567.

Type: Alt. i, Ledebour(L,K!).

Perennial, + hairy with simple or forked hairs, eglandular; rootstock slender, elongated, 5-12 mm. thick. Radical leaves rosulate, oblong or narrowly spatulate, 2-5x0.5-1 cm., somewhat fleshy, petiolate, entire or irregularly toothed, apex rounded or obtuse. Scapes 1-flowered, many, 2-4.5 cm. long. Flowers 15-20 mm. across, lilac or purple; pedicels slightly thickened in fruits. Sepals 7-10x1.8-2.2 mm. Petals 15-20x5-8 mm., spatulate, long-clawed, apex subtruncate or subemarginate, copiously dark veined. Stamens 6.5-8 : 8-10 mm.; anthers 3-4 mm. long. Siliquae 4.5-8x0.45-0.6 cm., oblong-linear, flattened; valves glabrous with a distinct mid-vein and reticulate venation; stigma bilobed, conical, sessile or subsessile;



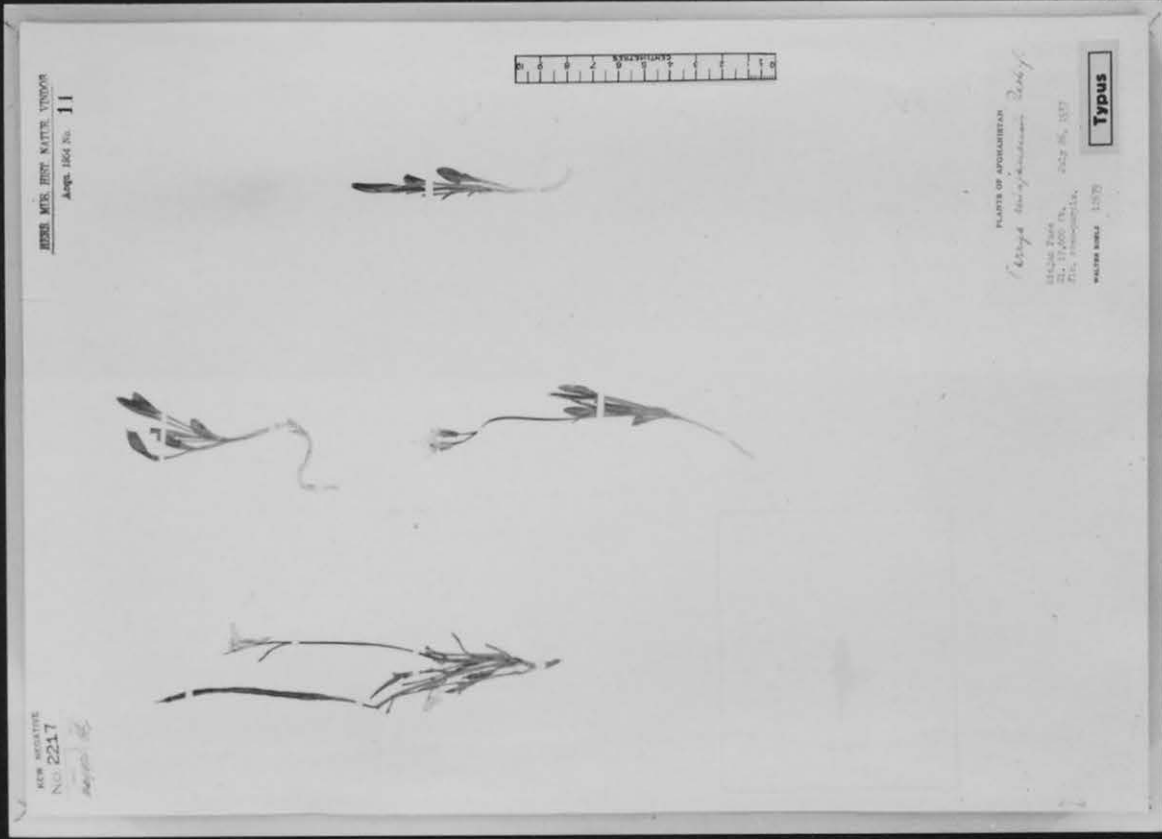


Plate no. XLVIII. *Parrya minjanensis* Rech. fil.

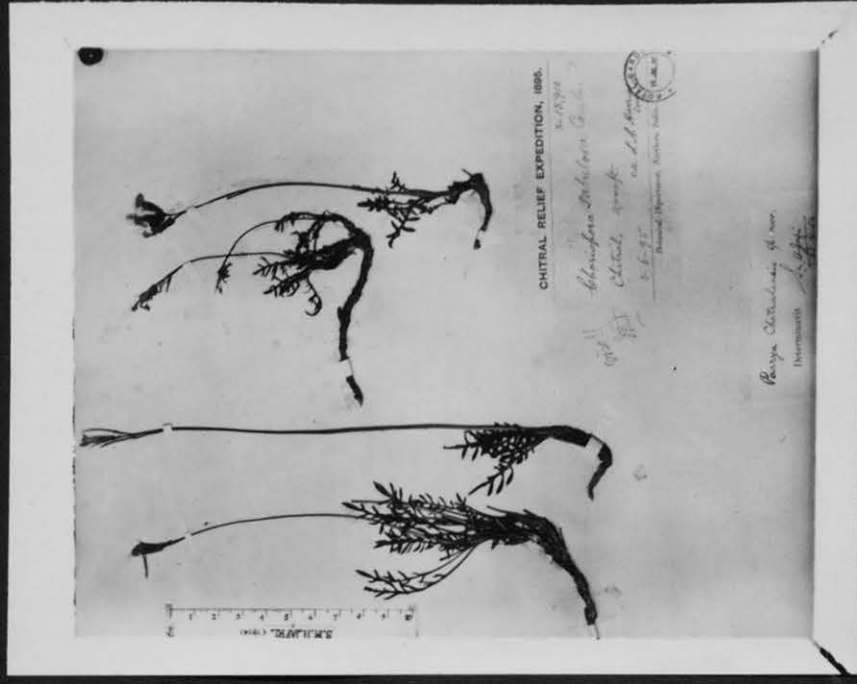


Plate no. XLVII. *Parrya chitralensis* Jafri



# W. ASIA

Scale of English Miles



- + = Parrya stenocarpa Kar. et Kir.
- = subsp. stenocarpa
- ◐ = subsp. gilgitica Jafri.
- ◑ = Parrya chitralensis Jafri

Longitude East 80 of Greenwich

Map no. 3



Plate no. XLIX.

Parrya stenocarpa Kar. et Kir.  
Subsp. gilgitica Jafri

seeds many, 1-2-seriate, not crowded, 2.5-3.5x1.8-2.5 mm., ovate-orbicular, compressed, brown, narrowly winged; septum not veined.

N.W.Himalayas:

Kashmir: Shaksgam valley, 5100-5400 m., among rocks and stones, Clifford no. 8(K!); 4200-4950 m., among shales on flats near streams, Clifford no. 2 (K!); Ladak, Depsang plains, 5100 m., Ludlow no. 456(BM!); Chong Kundong glacier, 4650 m., Ludlow no. 572(BM!);

Karakorum: found upto about 4950 m., Conway(K!).

Geog. Dist: C. Asia.

68.\*CITHARELCMA Bunge in Del. Sem. Hort. Dorpat. 6 (1843) et Linnaea xviii 149 (1844); B.H.G.P. 67; B.F.C. 238; S.E.P. 567; K.F.U. 333.

Annuals, sparsely branched, erect or ascending, clothed with stellate short hairs. Leaves simple; lower stalked, ovate-oblong; upper oblong or oblong-ovate, sometimes linear, subsessile or sessile; all leaves entire to sinuate-dentate, apex rounded. Racemes ebracteate, lax, few flowered. Flowers mediocre, white, purple or deep orange; pedicels filiform or slightly thickened, rigid, subspreading. Sepals erect, subequal, inner pair saccate at the base. Petals about twice as long as the sepals, oblong-obovate long-clawed, apex entire. Stamens 6, not appendaged; anthers oblong, obuse. Lateral nectariferous glands apparently semiannular, in pairs; median absent. Ovary oblong on short gynophore, 6-10-ovuled; style short with conical, bilobed stigma. Siliques oblong or elliptic, bilocular, dehiscent, compressed, apex and bases + rounded; valves plane-compressed, with a + distinct mid-vein, clothed with short, stellate hairs; seeds orbicular, narrowly winged, uniseriate; septum membranous, not veined.

2 species in C.Asia, and W.Pakistan, etc.

Recently Rechinger f. et Esfandiari [Phyton iii 63(1951)] described a 'new' species, Cithareloma gedrosiacum from Persian Baluchistan (Plate no. LI). This is conspecific with Eremobium aegyptiacum(Spreng.)Auchers(see discussion under Eremobium).

\*Cithareloxa lehmannii Bunge in Del. Sem. Hort. Dorpat. 6 (1843); B.F.O. 238; S.E.P. 567; R.F.U. 333.

Type: Turkestan, Lehmann no. 123(L,K!).

Annual, 10-35 cm. tall, branched mostly from below, suberect or subspreading, + clothed with short, stellate hairs. Leaves ovate-oblong, 1.5-5x0.5-2 cm., + entire, apex rounded, stellately hairy. Racemes 8-15-flowered, ebracteate, increasing upto 15 cm. in fruits, lax. Flowers 8-10 mm. across, deep orange coloured; pedicels 4-6 mm., increasing upto 15 mm. in fruit, spreading, filiform, rigid. Sepals 6-7x1-1.5 mm. Petals 10-12x1.5-2 mm., oblong-obovate, apex entire. Stamens about 6 : 8 mm.; anthers 2.5-3 mm. long. Siliquae 1.8-2.5x0.4-0.6 cm., oblong, subsinuate between the seeds, compressed, apex and base rounded; valves plane-compressed, clothed with short stellate hairs, with a distinct mid-vein; style 2.5-3 mm. long with short, conical, bilobed stigma; gynophore about 1 mm. long; seeds 2-4 in each loculus, orbicular, 3-4 mm. in diam., narrowly winged; septum not veined. (Fig. no. 21).

W. Pakistan:

Baluchistan: Between Naoshki and Sanduri, in the desert, only one specimen found, Aitchison no. 13(K!).

Geog. Dist:

C. Asia; Turkestan, Lehmann no. 123(K!).

Tribe IX. Hesperideae - according to O.E.Schulz in Pflanzenfam.  
(17 b) 568 (1936).

Lateral nectariferous glands various; median present or absent. Hairs simple or branched, sometimes bipartite-appressed. Sepals erect rarely spreading, inner pair often saccate or subsaccate at the base. Stamen filaments not appendaged, free, rarely those of the inner four connate in pairs; anthers dithealous rarely monothealous, oblong, obtuse. Ovary sessile or shortly stipitate; stigma  $\pm$  bilobed, sometimes with long decurrent lobes. Fruits usually long(siliquae), rarely short, dehiscent or indehiscent, sometimes breaking transversely into 1-seeded parts. Seeds not winged, rarely obscurely or slightly winged. Radicle incumbent or accumbent.

Key to the eleven genera of the tribe Hesperideae:

- I. Flowering axis 1-flowered, scapose .....79. Pycnoplithus
- I. Flowering axis few- to many-flowered:
  2. Siliquae bilocular, dehiscent, rarely subdehiscent or indehiscent:
    3. Fruits indehiscent; seeds 2-3 in each loculus; plants woolly .....75. Anchonium
    3. Fruits dehiscent (rarely subdehiscent); seeds many (never less than 8) in each loculus; plants not woolly but often scabrous:
      4. Leaves filiform, usually pinnatisect, rarely entire; plants apparently glabrous .....69. Leptaleum
      4. Leaves usually oblanceolate, sinuate-dentate to entire; plants hairy, often scabrous:
        5. Hairs bipartite-appressed:
          6. Plants minute; racemes lax, 2-5-flowered; first pair of cauline leaves opposite; anthers dimorphic (some dithealous and some monothealous) .....73. Atelanthera
          6. Plants usually tall, racemes usually many flowered, corymbose above; anthers alike (dithealous):
            7. Median nectariferous glands absent; flowers large .....78. Cheiranthus
            7. Median nectariferous glands present; flowers usually mediocre; .....77. Erysimum

5. Hairs simple or branched, often rigid, not appressed:

8. Septum membranous; valves convex; seeds obscurely to slightly winged .....71. Eremobium

8. Septum rigid, submembranous; valves plane or angled; seeds not winged:

9. Ovary 4-32-ovuled; seeds I-seriate; lateral nectariferous glands annular, often 3-lobed towards the outer side; plants usually ciliate hairy especially below

.....72. Hesperis

9. Ovary 30-84-ovuled; seeds I-2-seriate; lateral nectariferous glands in pairs, small, pyramidal; plants usually scabrous with short branched hairs .....

.....70. Malcolmia

2. Fruits with 2-many superimposed I-seeded cells, indehiscent but often breaking transversely:

IO. Fruits long, subcylindrical; pedicels short, thick, erect; cauline leaves not auricled at the base; plants scabrous with short, branched hairs .....74. Cryptospora

IO. Fruits short, quadrate; pedicels long, filiform, often curved; cauline leaves auricled at the base; plants ± glabrous ....

.....76. Goldbachia

69. LEPTALEUM DC., Syst. Nat. ii 510 (1821) et Prodr. i 200 (1824); B.H.G. P. 81; B.F.O. 242; S.E.P. 568; K.F.U. 302.

Annual, small herbs, branched mostly from the base, erect, or subspeading, glabrous or sub-hairy with simple or forked, sometimes glandular hairs. Leaves usually filiform, multifid to entire, rarely narrowly linear. Racemes few flowered, lax. Flowers mediocre, white or pale rose; pedicels short, thickened, ± spreading, rarely suberect. Sepals erect, almost equal, not saccate. Petals oblanceolate, apex rounded. Stamens 6, rarely the outer two abortive; filaments of the inner four free or connate; anthers short, obtuse. Nectariferous glands fragmentary, laterals cubical, median narrow. Ovary oblong, many ovuled; stigma conical, bilobed, large, erect, sessile or subsessile. Siliquae linear, subcompressed or subcylindrical, bilocular, subdehiscent; valves glabrous or subhairy, ± coriaceous,

often with a distinct mid-vein; seeds 1-2-seriate, many, oblong, not winged with an elongated funicle; septum subfungosous, complete.

2 species in N.Africa, C. and W. Asia, Afghanistan and W.Pakistan.

Lace and Hemsley (1891), while describing their new species, L.hamatum from Baluchistan, mention that O.Stapf thinks that there remains no difference between Leptaleum and Malcolmia after the discovery of their new species. Duthie has also remarked on one sheet of L.hamatum Lace & Hems. that Dr. O.Stapf thought that it should have better gone under Malcolmia. There can be no doubt that Leptaleum is very closely allied to Malcolmia, but the filiform leaves, almost glabrous habit and presence of median nectariferous glands are so characteristic in Leptaleum that it can never be confused with Malcolmia.

The taxonomic status of L. longisiliquosum Freyn and Sint. is not definitely known, but this is definitely intermediate between L.hamatum and L.filifolium (Willd.) DC. It is rather difficult to say ~~how~~ how far this elongated habit of the siliquae is a constant character in L.hamatum and L. longisiliquosum, but so far <sup>as</sup> the records in the herbaria are concerned, L.hamatum remains quite distinct from the above two by its hooked fruits and simple, narrowly linear leaves. But still its taxonomic status remains doubtful, although I have preferred to keep it as a distinct species till further information is available. Schulz (S.E.P.568) recognizes only one species, L.filifolium, under Leptaleum.

L.filifolium is widely distributed from N.Africa and Orient to the present area and C.Asia, while L.hamatum is known from Baluchistan only. L.longisiliquosum was described from Trans-Caspian region.

Key to the species:

- I(a). Siliquae 1.5 - 2.5 cm. long; seeds biseriate (at least at the base of the pods); fruits slightly curved and broad at the base .....  
 .....1. L. filifolium
- I(b). Siliquae 4.5 - 5.5 cm. long; seeds uniseriate; fruits + subcylindrical, hooked at the apex .....2. L. hamatum

1. L. filifolium (Willd.) DC., Syst. 510 (1821); B.F.O. 24B; S.E.P. 568;  
K.F.U. 302.

Syn: Sisymbrium filifolium Willd., Sp. Pl. iii 495 (1800);  
L. pygmaeum DC., l.c.

Type: Siberia, Kumam, Pallas (B- not seen).

Annual, 5-12 cm. tall, branched, glabrous or subhairy, with short, simple or furcate hairs, rarely glandular. Leaves filiform, multifid to entire, 1-5 cm. long. Racemes 5-10-flowered, lax. Flowers 4-6 mm. across, white or pale rose; pedicels 1-3 mm., increasing upto 4 mm. in fruit, slightly thickened or not, spreading. Sepals 4.5-6x1 mm. Petals 9-II x1-1.8 mm., oblanceolate, apex rounded. Stamens about 5 : 6 mm.; anthers about 1 mm. long. Siliquae linear, 1.5-2.5x0.15-0.25 cm., quadrangular, acute, straight or slightly curved especially below; valves with a distinct mid-vein and coarsely reticulated venation; stigma bilobed, somewhat conical; seeds biseriate (at least below), many, about 1 mm. long, oblong; septum subfungosous.

W. Pakistan:

N.W.F.P.: Peshawer, Vicary(K!); J.L. Stewart(E!,K!); H. Deane  
(K!); Aitchison(K!); Sher Ahmad(R-E!).

Baluchistan: Nihara near Kelat, Stocks no. 908(K!); Quetta,  
Killa Abdulla, Duthé no. 859I(K!,BM!); Quetta,  
1650 m., Lace no. 3573(E!,K!).

Afghanistan:

Khyber pass, H. Johnston no. 50(E!); (without locality), Giles  
(E!); Griffith no. 1529(K!); Harirud valley, abundant in  
shingly places, Aitchison no. 159(K!); Killa Panja, 2700 m.,  
Giles no. 112(K!).

Geog. Dist:

N. Africa and Orient, C. Asia.

2.\*L. hamatum Lace et Hemsley in Journ. Linn. Soc. Bot. xxviii 38 (1891).

Type: Baluchistan(W. Pakistan), Shelabagh, 1800 m., Lace  
no. 3325(E!).

Annual, 5-12 cm. tall, erect or subscending, branched, apparently glabrous. Leaves narrowly linear, 2-5x0.1-0.25 cm., ± entire,



sessile. Racemes 4-10-flowered, lax, ebracteate, increasing upto 5 cm. in fruits. Flowers 4-5 mm. across, white; pedicels 1-2 mm. long, increasing upto 6 mm. in fruit, thickened. Sepals about 5x1 mm. Petals about 7x1 mm., oblong-obovate or oblanceolate, apex rounded. Stamens about 5 : 5.5 mm.; anthers about 1 mm. long. Siliquae 4.5-5.5x0.15 cm., linear, subcylindrical, apex hooked; valves convex with a distinct mid-vein at least below; stigma conical, bilobed, sessile; seeds uniseriate, about 1 mm. long, oblong; septum submembranous.

W. Pakistan:

Baluchistan: Shelabagh, 1800 m., Lace no. 3325(E!,K!); Khojak pass, Duthie no. 8571(BM!).

Geog. Dist:

Endemic to Baluchistan.

70. MALCOLMIA R.Br. in Hort. Kew. 2 ed. iv 121 (1812)- nomen conservandum; B.H.G.P. 77; B.F.O. 221; S.E.P. 568; K.F.U. 273.

Syn: Wilckia Scop., Introd. 317 (1777); Strigosella Boiss., Diagn. ser. II (4) 22 (1859); Fedtschenkenoa Regel et Sch. in Regel, Descript. Pl. Nov. Fedtsch. 8 (1882).

Annual, rarely biennial, often suberect or subprostrate, hairy with simple and branched hairs, often scabrous, rarely glabrous, branched mostly from the base. Leaves usually oblanceolate, entire to deeply pinnatifid. Racemes often lax, ebracteate. Flowers small to large, white or lilac; pedicels often short and thickened. Sepals erect, subequal, inner pair saccate or subsaccate at the base. Petals slightly to three times as long as the sepals, oblanceolate or oblong-obovate, rarely linear. Stamens 6, not appendaged; anthers oblong, obtuse. Lateral nectariferous glands in pairs, small, pyramidal; median absent, Ovary oblong or linear, 30-84-ovuled; stigma conical, bilobed with lobes decurrent, subsessile (rarely with a distinct style). Siliquae subcylindrical or subcompressed, + terete, bilocular, dehiscent; valves rigid, pilose to glabrous, with a distinct midrib; seeds 1-2-seriate, oblong, not winged, funicle short; septum submembranous rarely membranous, not veined.

About 25 species chiefly in C. and W. Asia and Mediterr. region.

It is represented by 6 species in the present area.

"M. strigosa" H.f. et T. (non Boiss.) as given in Fl. Brit. India I 46 (1872), needs a word. A careful study of the specimens included by H.f. and T. Anderson under their "M. strigosa" (at Kew) shows that most of them actually belong to M. cabulica Boiss. and the description given for M. strigosa in Fl. Brit. India is erroneous. Boissier's type specimen of M. strigosa Boiss. [Persia, Aucher Eloy no. 4068 (G, K!)] and description [Ann. Sc. Nat. 70 (1842)] show very distinct characters ~~xxxxix~~ from M. cabulica Boiss. For M. strigosa it says, "Flores. .... floribus M. africanæ dimidio minores, albi ungue flavescentes, sessiles" - which tallies exactly with the type specimen. The present studies show that M. strigosa Boiss. is present in Baluchistan and Afghanistan only, while M. cabulica Boiss. is common throughout W. Pakistan (except Sind and Karachi) and Afghanistan. The main difference <sup>between</sup> the two is primarily in the size and colour of the flowers: the flowers are small (about 4 mm. across), white or yellowish in M. strigosa Boiss. with very narrowly linear petals, while in M. cabulica Boiss. the flowers are large (6-12 mm. across), mostly lilac or pale rose in colour with comparatively broad petals. Thus, Fleming's and Stewart's specimens from Punjab quoted under "M. strigosa" in Fl. Brit. India actually belong to M. cabulica Boiss. Similarly Schulz's variety macrantha of "M. strigosa" [Notizblatt ix 1087 (1927)] is really M. cabulica Boiss. M. cabulica is a very polymorphic species. Therefore, M. Toppinii Schulz described from Chitral [Notizblatt ix 1088 (1927)] and M. Koelzii Rech. f. from Afghanistan [Phyton iii 64 (1951)] must be cited as synonyms of M. cabulica Boiss. It shows a wide range of variation, especially the indumentum character on fruits (fig. 22): they are densely pilose to glabrous. The length of fruits and pedicels and the incision of leaves also show a wide range of variation. Separation of taxa on these characters is, therefore, valueless due to the presence <sup>of</sup> intermediate forms. The present description of M. cabulica includes the entire range of variation. Fig. 22, also shows the distinguishing characters of M. strigosa Boiss.

Another species, M. grandiflora (Bunge) O. Ktze. (M. Bungei Boiss.), recorded by the previous authors, needs a word.

Burt and Lewis [Kew Bull. 293 (1949)] have clearly discussed that the valid specific name for this species is M. grandiflora and

not M. Bungei Boiss. Boissier's Fl. Or. cites only Lehman's specimen from Turkestan under the type race of M. Bungei, while under its var. glabrescens it cites only Griffith's and Stocks' specimens from Afghanistan and Baluchistan. That means that the type race was from C. Asia and the variety was from the present area. Boissier quoted M. circinata H.f. et T. as the synonym of the above variety. Burt et Lewis (1949) make a new combination for the variety as, M. grandiflora var. glabrescens (Boiss.) Burt et Lewis, and record this variety from Arabia also, remarking, "The Arabian specimens differ rather markedly from Bunge's type of M. grandiflora in their rather thicker more glabrous leaves and more or less glabrous stems; the hairy plants of Stocks' collection mentioned above and other specimens from Afghanistan form, however, geographical and morphological links and we therefore follow the current practice in retaining the Arabian and Iraq materials in varietal rank."

Regel and Schmalh. (1882) described a new genus and species, Fedtschenkoa turkestanica, which Regel previously regarded as a variety of M. Bungei [M. Bungei var. lasiocarpa Regel in Bull. Soc. Nat. Mosc. i (1870)]. Litwinow regarded it as a species of Malcolmia and made a new combination, M. turkestanica (Regel et Schmalh.) Litw. [Sched. Herb. Fl. Ross. iv (1900)]. The same is followed in Komarov's Fl. U.R.S.S. viii 275 (1939).

How far M. turkestanica is a distinct species from M. grandiflora is an open question, but the two are, no doubt, from C. Asia (Turkestan). I have seen the type specimen of both the species at Kew + Bunge's plant bears young fruits which apparently look glabrous, but a careful observation reveals that minute young hairs are present all over the young pods; while Regel's specimens bear mature fruits with very dense hairs. The leaves are narrow and elongated and densely pubescent in both the specimens.

On the other hand the Afghanistan, Baluchistan, Persia, Iraq and Arabian specimens are subglabrous to almost glabrous with + glabrous siliquae, and short and broad leaves. So far as the present records are concerned, the C. Asian plants look very distinct <sup>from</sup> the Orient ones, and no doubt they are two distinct species.

Recently Rechinger f. [Phytom iii 64 (1951)] described a new

species, M. behboudiana Rechin. f., from Persia which tallies exactly with the plants of the so called M. grandiflora var. glabrescens. H.f. and Thomson (1861) ~~therefore~~ were perfectly right in regarding these plants as a distinct species, but the name M. circinata H.f. et T. becomes invalid due the pre-existing species, M. circinata (Bunge) Boiss. [Dontostemon circinatus Bunge (1848)]. I have, therefore, recognized M. behboudiana Rechinger f. as a distinct species from M. grandiflora (Bunge) O.Ktze.; the latter does not occur outside Central Asia.

Rechinger f. (1951), apparently not knowing<sup>of</sup> the existence of M. grandiflora (Bunge) O.Ktze., draws affinities of M. behboudiana with M. Bungei Boiss. which is an invalid name. He also regards M. turkestanica and M. Bungei as conspecific. In that case, therefore, he should have recognized M. Bungei as the valid name, but strangely enough he recognizes M. turkestanica which is evident from his remark, "Differt a M. turkestanica (Reg. et Schmalh.) Litw. (M. Bungei Boiss.) ....." [Phyton iii 64 (1951)].

#### Key to the species

- I. Flowers large, usually about 1 cm. across (6 - 12 mm. across), lilac or purple:
  2. Fruits long, 3-6 cm.; plants apparently + glabrous....2. M. behboudiana
  2. Fruits short, 1-2.5(-3) cm.; plants usually densely hispid with short and long, simple and branched hairs .....6. M. cabulica
- I. Flowers mediocre or small, usually about 5 mm. across (4-7 mm. across), white or pale pink (rarely yellowish):
  3. Seeds large, 1.2-1.4x0.8-0.9 mm.; racemes condensed, 5-8-flowered, increasing only upto 1 cm. in fruits .....5. M. taraxacifolia
  3. Seeds small, about 1x0.5 mm.; racemes + lax, 10-20-flowered, increasing upto 5-20 cm. in fruits:
    4. Petals 0.6-0.8 mm. broad; siliquae 2-3 cm. long....4. M. strigosa
    4. Petals 1-1.5 mm. broad; siliquae (3)4-7 cm. long:
      5. Fruits straight, 4-7x0.1-0.15 cm., + hairy....1. M. africana
      5. Fruits circinate, 3-4x0.08-0.1 cm., glabrous, subtorulose .....3. M. circinata

I. M. africana (L.) R.Br. in Ait., Hort. Kew. 2 ed. iv 121 (1812); F.R.I. 146; S.E.P. 569; K.F.U. 276.

Syn: Hesperis africana L., Sp. Pl. 663 (1753); M. laxa DC., Syst. 440 (1821); M. intermedia C.A.M., Verz. Pfl. Cauc. 186 (1831); M. stenopetala Bernh., Hort. Erf. (1832); Ledeb., Fl. Ross. i 170 (1842); Arabis arvensis Edgew. in Trans. Linn. Soc. xx 32 (1851).

Type: Africa (not precisely designated)(LS!).

Annual, 15-50 cm. tall, branched, erect or suberect, leafy, ± hairy with simple or furcate hairs, often rough, rarely glabrous. Leaves oblanceolate, very variable; lower stalked; upper shortly stalked to sessile; all leaves sparsely toothed to subentire, acute. Racemes 15-30-flowered, ebracteate, lax, increasing upto 20 cm. in fruits. Flowers 4-7 mm. across, lilac or white; pedicels 1-3 mm., increasing upto 5 mm. in fruit, thickened. Sepals 3.5-4.5 x 1 mm. Petals 8-10x1.2-1.5 mm. Stamens 3-4:5-5.5 mm.; anthers about 1 mm. long. Siliquae 4-7x 0.1-0.15 cm., linear-oblong, terete; valves ± hairy, rarely glabrous, sometimes slightly prolonged at the apex into an obscure blunt appendage; stigma conical, bilobed; seeds uniseriate, about 1x0.5 mm., oblong.

#### W. Pakistan:

Chitral: Drosh, 1350 m., and Mastung, 2400 m., Toppin no. 56 (K!).

N.W.F.P.: Peshawar, Vicary (K!); J.L. Stewart (K!); Hazara, Drummond no. 20390 (E!, K!).

Punjab: Rawalpindi, Aitchison no. 315 (K!); Lahore, cornfields, Edgeworth (K!); Attock, E. Nasir no. 19327 (R-E!); Lahore, Cleghorn (E!); Thomson (E!, K!); Shahpur, Drummond nos. 20396 (K!) and 20398 (K!); Ludhiana, Drummond nos. 20406 (K!), 20407 (K!) and 20408 (K!); Above Shigar river, Drummond no. 24839 (K!); Khangah to Sangla hill, R. Stewart no. 1459 (K!); Salt range, Drummond no. 13851 (K!).

Baluchistan: (without locality), Stocks no. 699 (K!); Ziarat, 2400 m., on limestone hills, H. Crookshank nos. 175 (K!) and 268 (K!); Killa Abduhla, Duthie no. 8579 (K!, BM!); Quetta, Duthie no. 8580 (K!); Sibi, Jafri (E!); Kutchlak, Jafri (E!); Sibi, Lace (E!, K!); Quetta, Yaru karez, Lace no. 3641 (E!); Quetta, 1650 m., Lace no. 3644 (E!).

#### Afghanistan:

Khyber, pass, H. Johnston no. 39 (E!); (without locality), Griffith nos. 1451 (K!), 1454 (K!) and 1455 (K!); Kabul, c. 1650 m., corn-

-fields, W.R.Hay nos. 89(K!), 163(K!) and 106(K!); Harirud valley, Aitchison (K!);

N.W.Himalayas:

Kashmir: Baltistan, Duthie no. 11847(E!); Hungu Rd., Pilchi to Numul, 1500 m., cultivated ground, Giles no. 5(K!); Furpo, in Gilgit, Winterbottom no. 270(K!); Shigar, 2310 m., Clarke nos. 30054 A(K!) and 30054 C(BM!); Ladak, below Kangi, 3750 m., along streams, Koelz no. 2811(K!); Sycpur, 1560 m., Clarke nos. 29135 A(K!) and 29135(BM!); Ladak, 3000 m., banks of streams, Ludlow & Sherriff no. 8365(BM!); Srinagar, 1500-1800 m., Duthie no. 10843(BM!); Baltistan, Chutrum, 1800 m., Ludlow no. 278(BM!);

Karakorum: Barpu glacier, 3000-3300 m., Russell no. 1085(BM!); and no. 1090(BM!); Conway nos. 73(K!), 103(K!) and 112(K!);

W.Tibet: Zanskar, 3600 m., Thomson(E!,K!); Falconer no. 158(K!).

Geog. Dist:

S. and S.E.Europe, N.Africa and Orient, C.Asia and China.

2\*M. behboudiana Rechinger f. et Esfandiari in Phyt. iii 64 (1951).

Syn: "M. circinata" H.f. et T. in Journ. Linn. Soc. Bot. v 155 (1861) [non (Bunge) Boiss.]; M. Bungei Boiss. var. glabrescens Boiss., Fl. Or. i 226 (1867); "M. turkestanica" Schulz in Notizblatt ix 1089 (1927) [non (Regel) Litw. in Sched. Herb. Fl. Ross. iv 32 (1900)]; M. grandiflora (Bunge) O. Kuntze var. glabrescens (Boiss.) Burt et Lewis in Kew Bull. 293 (1949).

Type: Persia, Lauristan, Behboudi no. 109(V- not seen).

Annual, 16-35 cm. tall, branched mostly from the base, erect, apparently glabrous or subglabrous, sometimes slightly hispid below; hairs simple or forked. Basal leaves rosulate, oblong-obovate or broadly oblanceolate, 2.5-7 x 1.2-2 cm., stalked, sinuate-toothed to subentire, sometimes sublyrate, apex rounded or obtuse; lower cauline leaves + similar to the basal leaves; upper leaves small, linear-lanceolate, cuneate, sessile or subsessile, sinuate-toothed to entire, acute or obtuse. Racemes 20-30-flowered, lax, ebracteate, increasing upto 20 cm. in fruits. Flowers 7-12 mm. across, violet, rose or pale pink; pedicels 1-2 mm. long, increasing upto 3 mm. in fruit, slightly thickened. Sepals 3.5-4 x 1 mm. Petals 9-12 x 1.5-2.5(-3) mm., oblanceolate, apex subrounded. Stamens about 3 : 4 mm.; anthers about 1.5 mm. long. Siliquae 3-6 x 0.1 cm., linear, often variously

curved; valves + torulose and glabrous; stigma conical, bilobed with decurrent lobes, sessile; seeds about 1 mm. long; septum not veined.

W. Pakistan:

N.W.F.P.: Near Peshawar, H. Collett (B- not seen).

Baluchistan: Gurgina, Stocks no. 975(K!); Peshin, c. 1500 m.,  
Lace no. 3583(E!, K!).

Afghanistan:

(without locality), Griffith no. 1469(K!);

Geog. Dist:

Persia: Laurestan, Behboudi no. 109(V- not seen).

Iraq: Assyria, Jabel Harmin, Bornmuller no. 879(K!); Guest no. 5087(K!); Between Zubair and Jaliba, Guest no. 5059(K!).

Arabia: Kuwait, Arafjan, Dickson no. 27(K!).

3. \*M. circinata (Bunge) Boiss., Fl. Or. i 227 (1867); K.F.U. 281.

Syn: Dontostemon circinatus Bunge in Arb. d Naturf. Verz. zu Riga i no. 99 (1848).

Type: Turkestan, Kisil Kum, Lehmann no. 94 (G- not seen).

Annual, 15-30 cm. tall, erect, sparsely branched, sparsely hairy with minute, forked, rigid hairs. Lower leaves oblanceolate, 3-9x0.8-1.5 cm., stalked; upper leaves shortly stalked to sessile; all leaves sinuate-toothed to slightly toothed, sparsely hairy. Racemes 10-18-flowered ebracteate, lax, increasing upto 20 cm in fruits. Flowers 4-6 mm. across, white or pale lilac; pedicels about 1 mm., increasing only upto 1.5 mm. in fruit, thickened. Sepals 3.5-4x1 mm. Petals 4-7x1 mm., oblong-linear. Stamens about 3 : 3.5 mm.; anthers about 0.8 mm. long. Siliquae 3-4x0.08-0.1 cm., linear, subcylindrical, often circinate at the apex, glabrous, obscurely torulose, mid-vein distinct below; stigma short, conical; seeds uniseriate, about 1 x 0.5 mm., oblong, brown.

Afghanistan:

Harirud valley, Aitchison no. 1006(K!); (without locality),  
Aitchison no. 302(K!).

Geog. Dist:

C. Asia.

4. M. strigosa Boiss. in Ann. Sc. Nat. 70 (1842); B.F.O.224.

Type: Persia, Ispahan, Aucher Eloy no. 4068(G,K!).

Annual, 5-15(-20) cm. long, + decumbent or subspreading, branched mostly from the base, clothed with short, branched hairs. Basal leaves subrosulate, oblanceolate, 2-5.5x0.3-0.8 cm., shortly stalked, sparsely and broadly toothed to subentire, apex obtuse or rounded; upper leaves few, distant, subsessile or sessile, 1-4x0.2-0.7 cm. Racemes 10-15-flowered, spikate, increasing upto 6 cm. in fruits. Flowers about 4 mm. across, white or yellowish; pedicels only about 1 mm. long in fruit, and thick. Sepals 2.5-3x0.7-0.9 mm. Petals 4.5-6(-7)x0.6-0.8 mm., narrowly linear apex rounded. Stamens 2.5-2.9 : 2.9-3.2 mm.; anthers about 1 mm. long. Siliquae 2-3x0.17-0.2 cm., linear, quadrate, often slightly curved, spreading; valves rigid, + sparsely hairy with short, simple or furcate hairs; stigma short, conical; seeds biseriate( at least below), about 1 x 0.5 mm.; septum not veined.( Fig. no. 22).

W. Pakistan:

Baluchistan: Nichara, Stocks no. 9II(K!); Ziarat, 2400 m., maximum height of the plants 6", flowers white, common on shaded limestone soils, H. Crookshank no. 259(K!); (without locality), Lace (E!); Killa Abdulla Duthie no. 8569(BM!); Peshan, 1560 m., Lace no. 3310 (E!);

Afghanistan:

Kabul, Gamble no. 13(K!); Chokey, in ravines, petals erect white, Griffith no. 1456(K!); Kabul, c. 2400 m., gravelly slopes, W.R. Hay no. 290(K!).

Geog. List:

Persia: Ispahan, Aucher Eloy no. 4068(K!); S.E. Persia, Dehaneh Baghi, W.E. James(K!).

5. \*M. taraxacifolia Balb., Cat. Hort. Taur. app. 10 (1814); DC., Syst. ii 439 (1821); K.F.U.283.

Syn: M. runcinata C.A.M., Enum. Casp! Cauc. 186 (1831); B.F.O. 223; Schulz in Notizblatt ix 1087 (1927).

Type: Trans-Caspian region, Balb.?(L- not seen).



Annual or biennial, short herb, 1-5 cm. long, branched mostly from the base, subspreading or procumbent, hairy or glabrous; hairs short, rigid, simple or forked; branches usually with a crown of leaves at the apex; tap root slender. Leaves oblanceolate or elliptic, rosulate, 2-6x0.5-1.5 cm., runcinate-pinnatifid to sinuate-toothed, shortly stalked or subsessile, sparsely hairy. Racemes condensed, spikate, 5-8-flowered, hardly increasing upto 1 cm. in fruits. Flowers about 5 mm. across, white, subsessile; pedicels upto only 1 mm. long and thick in fruit. Sepals 2.5-3.5x0.7-0.9 mm. Petals 6.5-8x1-1.5 mm. Stamens 2.8-3 : 3-3.7 mm.; anthers about 1 mm. long. Siliquae 2-4x0.12-0.2 cm., linear-quadrate, straight or variously curved, apex blunt with short conical stigma; valves rigid, minutely rough hairy to glabrous, + 3-parallel veined; seeds uniseriate, 1.2-1.4x0.8-0.9 mm., oblong, pale brown.

W. Pakistan:

Chitral: F.E. Younghusband (Herb. Dehradun, only photograph seen at Kew).

Geog. Dist:

Persia: Kerman, Bunge (K!); W. Ispahan, Cowan & Darlington no. 688(K!); Ispahan, Aucher Eloy no. 4167(K!).

Iraq: Mohmara, Noe (K!).

Trans-Caspicum region: Baku, C.A. Meyer(K!).

6.\*M. cabulica (Boiss.) H.f. et T. in Journ. Linn. Soc. Bot. v 156 (1861).

Syn: Strigosella Cabulica Boiss., Diagn. ser II (i) 22 (1853); M. Cabulica (Boiss.) Boiss., Fl. Or. i 224 (1867); S.E.P. 570; "M. strigosa" H.f. et T. Anders in Fl. Brit. India i 146 (1872)-non Boiss.; "M. strigosa var. macrantha Schulz in Notizblatt ix 1087 (1927); M. Toppinii Schulz l. c. 1088; M. Koelzii Rechinger f. in Phytion iii 64 (1951).

Type: Afghanistan, Kabul, Pushut, Griffith no. 1542(G,K!).

Annual or biennial, (8)15-50 cm. tall, branched mostly from the base, erect, subspreading or ascending, + hairy, often densely hispid especially below with simple or furcate hairs. Basal leaves, rosulate, or subrosulate, very variable, often oblanceolate, 2-10x0.5-1.5 cm., sinuate-dentate to subentire, sometimes runcinate, shortly stalked to subsessile,

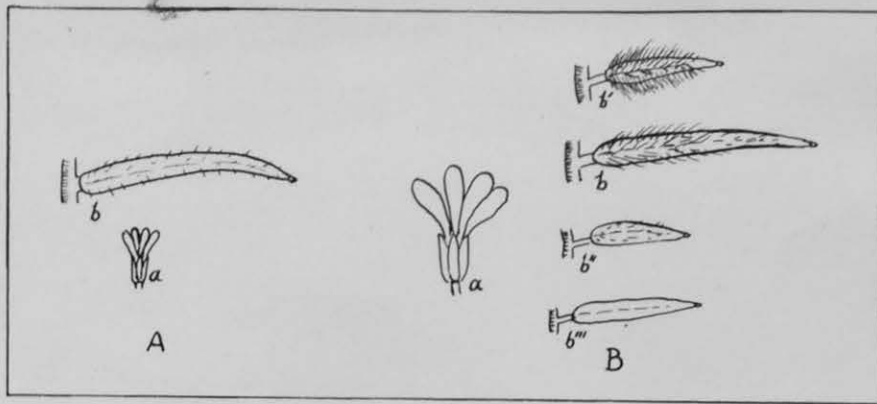


Fig. no. 22

A - *Malcolmia strigosa* Boiss.; B - *M. cabulica* (Boiss.) H.f. et T. [a - flower; b - fruit (in *M. cabulica* the fruits show a wide range of variation in size and indumentum characters)]



Plate no. I. *Malcolmia cabulica* (Boiss.) H.f. et T.

apex acute or obtuse. Cauline leaves distant, sometimes crowded below, + similar to the basal leaves but smaller. Racemes 20-50-flowered, subspikate, ebracteate, increasing upto 20(-30) cm. in fruits. Flowers 6-12 mm. across, lilac or purple; pedicels 0.7-2 mm. long, increasing upto 3(-5) mm. in fruit, often slightly thickened. Sepals 3-5x1-1.2 mm. Petals 7-15x1.2-2.5 mm. Stamens 3-5 : 3.5-6 mm.; anthers 1-2 mm. long. Siliquae 1-2.5(-3)x0.15-0.2(-0.25) cm., linear-terete, very variable in size and hairyness; valves often ciliate hairy below, rarely subglabrous or glabrous; style 0.5-1 mm. long; seeds 1-2-seriate, about 1 x 0.5 mm., oblong, brown.(Plate no. L.).

W. Pakistan:

Chitral: Drosh, 1350 m., Toppin no. 106(K!).

N.W.F.P.: Peshawar, Vicary(K!); H. Deane(K!); Landikotal, Khyber pass, Lester-Garland (K!); Khyber pass, G. Taylor (BM!); Waziristan, 1200 m., Duthie no. 1570(K!); Barga, Doa, Lester-Garland(K!); Parachinar, Barbour(BM!).

Punjab: Hazara to Jhelum, J.L. Stewart (K!); Rawalpindi, Topi park, Pinfold no. 24(BM!); Kohat to Kalabagh, Schlagintweit no. 10734(BM!); Rawalpindi, Hurroo, Aitchison no. 1010(K!) and no. 316(K!); H. Rich no. 460(K!); Salt range, J.L. Stewart(K!); Fleming(K!); Karak, Drummond no. 24105(K!), 20391(K!), and 13841(K!); Shahpur, Drummond nos. 20397(K!), 20395(K!), 20394(K!) and 20395(K!); Hazara, Drummond no. 20392(K!); Near Hasan Abdal, R. Stewart no. 6949(R-E!).

Baluchistan: Harnai, 900 m., Lace no. 3670(K!,E!).

Afghanistan:

Kabul, Pashut, Griffith no. 1542(K!); Harirud valley, Aitchison no. 1005(K!); Tangi Gharu, 1650 m., W.R. Hay no. 49(K!); Khyber pass, stony nullah, 1080 m., H. Johnston no. 36(E!,K!).

Geog. Dist:

Endemic.

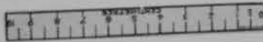
A very polymorphic species.

71. \*EREMOBIUM Boiss., Fl. Or. i 156 (1867); S.E.P.570.

Annuals, often much branched from the base, + spreading, clothed with stellate, short, somewhat rigid, white hairs. Leaves oblong-obovate or linear, entire, sessile or subsessile, apex rounded or obtuse. Racemes lax, ebracteate. Flowers mediocre, white or pink; pedicels filiform, rigid, short, spreading, Sepals about, subequal, inner pair subsaccate at the

Kew Negative  
No. 2224  
Aug 1892

HERB. MET. INST. NATUR. YNGOR  
Aug 1892 No. 12



PLANTAE THAMOM

in herbario Museo Agri-Industriae, Thamo

*Eleusine galienensis* *Boiss.*

*Boiss.*

*Boiss.*

Typus

1892

by *Boiss.*

1892

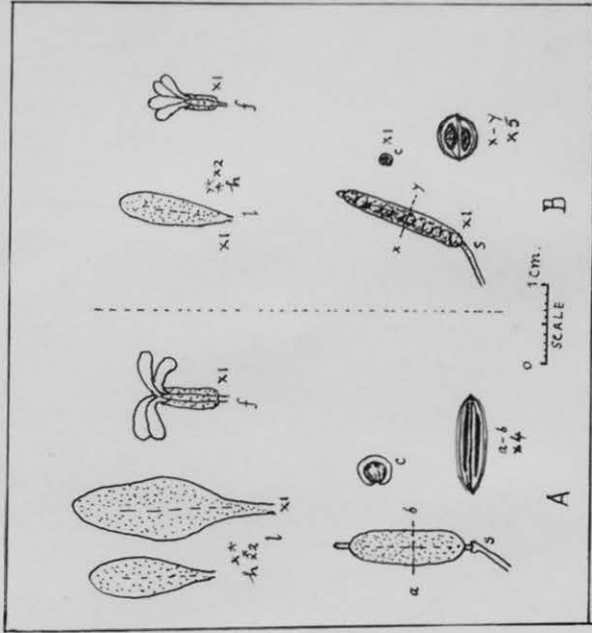


Fig. no. 21

A - *Cithareloma Lehmannii* Bunge; B - *Eremobium aegyptiacum* (Spreng.) Ascherson.

l - leaf; h - hairs; f - flower; s - fruit; a-b, transverse section of fruit showing plane-convex valves; x-y, t.s. showing convex valves.]

Plate no. LI. *Eremobium aegyptiacum* (Spreng.) Ascherson

Type: Egypt, Pyramides, Sieber (G,K!).

Annual, (3)10-30 cm. long, spreading or subspreading, clothed with short, stellate, white hairs, branched mostly from the base. Leaves small, narrowly oblong-obovate, or linear-cuneate, sessile, 0.5-2x0.1-0.4 cm., entire, apex rounded or obtuse. Racemes 8-20-flowered, ebracteate, lax, increasing upto 15 cm. in fruits. Flowers 4-5 mm. across, white or pale pink; pedicels 1-2 mm., increasing upto 4 mm. in fruit, filiform, rigid, + spreading. Sepals 3-4.4x1-1.2 mm. Petals 6-8x1-1.2 mm., narrowly oblonge obovate, apex rounded. Stamens 3-4 : 4.5-5 mm.; anthers about 1 mm. long. Siliquae 10-20(-25)x1-1.5 mm., linear, torulose; valves convex, stellately hairy, 1-veined; seeds 3-9 in each loculus, uniseriate, 1.2-1.5(-1.8) mm. in diam., suborbicular, obscurely to slightly winged. (Plate no. LI).

Baluchistan: Hudiyān, Cah-Kamber, Bornmuller (B- not seen); Makran, Iranshahar, Salvatiān no. 250 E(V-K!).

Geog. Dist:

Arabia: Dubai, Dickson no. 356 H(K!);

Sinai: Shabetai(K!).

Egypt: Sieber(K!); Aucher Eloy no. 131(K!).

Libya: Gilt Kebir, Shaw no. 14(K!).

72. HESPERIS L., Sp. Pl. 663 (1753); B.F.O.230; S.E.P.571; K.F.U.242.

Syn: Lochneria Heist. in Fabf., Enum. Pl. Hort. Helmstad. 2 ed. 295 (1763); Deilosma Andr. ex DC., Prodr. i 450 (1824), in syn.; Spach, Hist. Nat. Veg. Phan. vi 397 (1836); Plagioloba Rechb., Nom. 182 (1841); Kladnia Schur., Enum. Pl. Transilv. 53 (1866).

Perennial, rarely annual, erect, branched, hispid often with stiff long and short, simple or furcate hairs, especially below. Leaves usually oblanceolate, toothed or sinuate-dentate, lower stalked, upper short-ly stalked to sessile. Racemes corymbose above, ebracteate, lax in fruits. Flowers usually large, purple, white or yellowish; pedicels + spreading and slightly thickened. Sepals erect, subequal, inner pair saccate at the base. Petals about twice as long as the sepals, obovate-oblong, clawed. Stamens 6, not appendaged; anthers oblong, obtuse. Lateral nectariferous glands

annular, often 3-lobed towards the outer side; median absent. Ovary linear, subquadrate, 4-32-ovuled; stigma bilobed, often erect and sessile. Siliquae linear-oblong, + terete, bilocular, dehiscent; valves somewhat rigid, with a distinct mid-vein, glabrous or hairy; seeds uniseriate, oblong, not winged; septum rigid, often septulated.

About 24 species in Europe, Mediterranean region and C. Asia. It has not yet been recorded from Afghanistan or Chitral, although there is every possibility of its occurrence in these areas. Only one specimen was found lying undetermined in Watt's herbarium, Edinburgh. This is from cultivated plants of H. matronalis L. from Simla. (Plate no. LII). Thus, the genus is, at present, known from cultivated species only.

Hesperis matronalis L., Sp. Pl. 663 (1753); B.F.S.601; K.F.U. 244.

Type: Italy( not precisely designated),

Biennial or perennial, sparsely branched above, 40-100 cm. tall, erect, leafy, ± hairy with short stellate and simple hairs. Lower leaves oblong-lanceolate, stalked; upper oblong-ovate, cuneate at the base or slightly stalked; all leaves finely toothed and roughly hairy, acute or acuminate. Racemes 15-25-flowered, corymbose above, ebracteate, increasing upto 15 cm. in fruits. Flowers 10-15 mm. across, white or pinkish; pedicels 3-5 mm. long, increasing upto 15(-25) mm. in fruit, spreading or ascending. Sepals 5-9x1-1.5 mm. Petals 15-20x2-2.5 mm., oblong-obovate, apex retuse. Stamens 5-6 : 7-8 mm.; anther 2-2.5 mm. long. Siliquae very variable in length, (3)5-9x0.25-0.35 cm. , torulose or constricted between the seeds; valves rigid with a distinct mid-vein, glabrous; seeds about 3 x 1.5 mm. (Plate no. LII).

N.W.Himalayas:

Simla, 2250 m., cultivated in gardens, G.Watt(E!).

Geog. Dist: Europe, W. and C. Asia.

Cultivated at higher altitudes in the present area.

73. ATELANTHERA Hooker f. et Thomson in Journ. Linn. Soc. Bot. v 138(1861); F.B.I. 133; S.E.P.572.

Annuals, minute, erect, slender, simple or very sparsely branched above, somewhat roughly hairy with bipartite, appressed hairs;

stem filiform, often violet coloured below. Cotyledons often persistent, minute, oblong, sessile, glabrous, entire. Basal leaves absent or represented by cotyledons only. Cauline leaves few, the first two opposite, the third and fourth (if present) alternate, oblong-elliptic or oblong-cuneate, sessile, entire, covered with bipartite-appressed hairs, apex rounded rarely acute. Racemes few flowered (2-5 only), lax. Flowers small (2-2.5 mm. across), white, sometimes turning violet; pedicels short, filiform. Sepals 4, short, suberect, equal, oblong, obtuse, hairy, margin white. Petals 4, about twice as long as the sepals, oblong-obovate, apex sub-emarginate. Stamens 5 or 6; outer two short, with ditheous, usually subapiculate anthers; inner alike or dimorphic, apiculate (all 4 with monotheous anthers, or 2 monotheous and one ditheous). Ovary oblong, subcylindrical, 14-24-ovuled; style about 1 mm. long with capitate, sub-bilobed stigma. Siliquae linear, compressed, subterete, bilocular, dehiscent; valves hairy with bipartite-appressed hairs, with a distinct mid-rib; septum membranous, somewhat rigid, not veined; seeds 1-seriate, oblong subcompressed, brown.

2 species in N.W.Himalayas and C. Asia.

Atelanthera H.f.et T. , one of the most interesting genera of the family Cruciferae, was described in the year 1861 by Hooker f. and Thomson. Since then it has been represented by only one species, A.perpusilla H.f.et T.

W.B.Hemsley suggested that it was conspecific with Erysimum sisymbrioides C.A.M. , which is evident from an interesting correspondence (in Herb. Kew!) between T.S.Sprague and Miss Arber during the year 1931. Sprague in his reply to a letter from Arber says, " Our only material of A. perpusilla is Thomson's original specimen from Zanskar(W.Tibet)..... I find, however, that A.perpusilla has been recorded by Korshinsky from Turkestan ..... Korshinsky gives a redescription of the species mentioning that the anthers of the long stamens are unilocular.....(.....1898)."

It is interesting to note that the specimen of the present new species, A.pentandra Jafri, was already present in the Kew herbarium when Sprague replied to Arber, but was laid in among the unidentified Crucifers. This specimen was communicated to the Kew herbarium during 1928

by B.B.Osmaston. Although Osmaston's plants are not in fruit, they could have been easily identified even from the stamen character and the general habit of the plants. (Plate nos. LIII and LIV).

However, in the same letter Sprague gives the distinguishing characters of A. perpusilla and Erysimum sisymbrioides in the following words:

" Atelanthera perpusilla : Anthers apiculate, those of the long stamens monothealous. Siliquae with definite slender style about 0.8 mm. long.

Erysimum sisymbrioides: Anthers not apiculate, all dithealous. Siliquae without a distinct style."

The above mentioned characters leave out a most important vegetative diagnostic character which I have not seen mentioned, even in any Flora. The leaves of Atelanthera are few (3-5 only) and the first two are opposite (Plate no. LIII); in Erysimum sisymbrioides there are no opposite but several alternate leaves. This and the stamen characters of the present new species have, therefore, obliged me to give an adequate generic description of Atelanthera H.f. et T.

Specimens collected by Duthie [no. 857I(K!)] from Khojak pass, Baluchistan, and published in Burkill's list of flowering plants of Baluchistan (1909), were wrongly identified as Atelanthera perpusilla. They are Erysimum sisymbrioides. Thus, the only record which I have seen of the type species of the genus is still Thomson's original gathering from Zanskar (W. Tibet). From Korshinsky's description, however, there can be no doubt that his specimens are A. perpusilla. Therefore, this species is recorded from W. Tibet and Turkestan only.

The present new species, A. pentandra Jafri, is from Kashmir. It can be easily distinguished from A. perpusilla by its five stamens only, and ~~the~~ even the outer ones apiculate. Furthermore, the inner stamens are only three; of these, two have monothealous and one dithealous anthers (Plate no. LIII; Fig. no. 23).

This curious genus of Cruciferae is the only one in which we find some monothealous anthers. Although the suppression of the two outer stamens [cf. Cardamine hirsuta L. or Lepidium apetalum Willd (floral diagram no. i, fig. no. 23)], or the four inner stamens [cf. Coronopus didymus



(L)Sm. (floral diagram no.ii, fig. no. 23)] is well known in Cruciferae, the type of variation and dimorphism of anthers found in Atelanthera is confined to this genus. The discovery of the present new species, A.pentan-  
-dra, raises an interesting question: has this genus 6 or 4 as the basic number of stamens, or is it 6 in one species and only 5 in the other? According to the various Floras concerned, the number of stamens mentioned for Atelanthera is 6 - the usual number present in Cruciferae. But the present new species has only five stamens: the 2 outer ones are normal as in other members of this family, but the 3 inner are dimorphic - one ditheous and two monothecous. In A.perpusilla the inner stamens are four, like most of the other Crucifers, but they are all monothecous. It appears, therefore, as though the two monothecous stamens represent a split condition of one ditheous stamen; in that case the basic number of the stamens in the genus would be four only [see floral diagram (hypothetical) no.iii, fig. no. 23]. Then the present species, A.pentandra, would then hold an intermediate position in which only one of the two inner stamens has split [floral diagram no.iv, fig. no. 23]. If the basic number is six, as in A. perpusilla (floral diagram no. v, fig. no. 23), then the present new species has got two of the inner stamens fused together giving a ditheous condition, while the other inner two have still remained monothecous (as in the type species). However, <sup>the</sup> exact nature can be clarified only by further anatomical and developmental studies. I have examined several flowers from different plants of the present new species and find this stamen character constant. In the absence of any such information, I have preferred to describe one species as having 6 stamens and the other 5 stamens, irrespective of the original basic number.

In the absence of fruit, only technical staminal characters have been found to separate the new species from A. perpusilla. It is possible, however, that further material in future may show that this remarkable floral difference is not a constant character sufficient to justify distinct specific rank. In the meantime, however, describing it as a new species attention is drawn to what is a unique floral condition in the Cruciferae. Furthermore, it also reveals that the generic description given by the previous authors as, "4 inner stamens monothecous", is not sufficient. And the presence of ditheous condition in one inner stamen

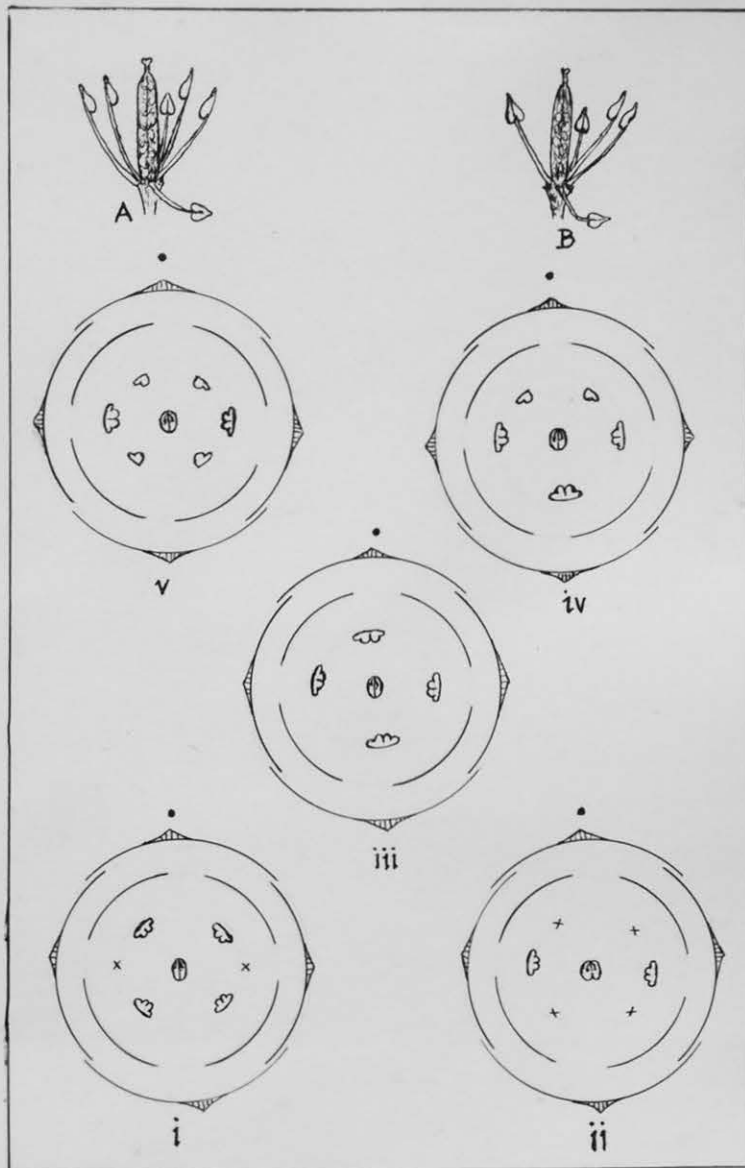


Fig.no.23

- A - part of the flower showing the stamens of Atelantha perpusilla H.f.et T.(4 inner long stamens monotheccous)
- B - part of the flower showing the stamens of Atelantha pentandra Jafri(inner long stamens only 3; dimorphic - one ditheccous, and two monotheccous).
- i - v, floral diagrams [i - Cardamine hirsuta L.; ii - Coronopus didymus(L.)Sm.; iii - hypothetical; iv - Atelantha pentandra Jafri; v - A. perpusilla H.f.et T.]



Plate no. LIV.  
Atelanthera pentandra Jafri

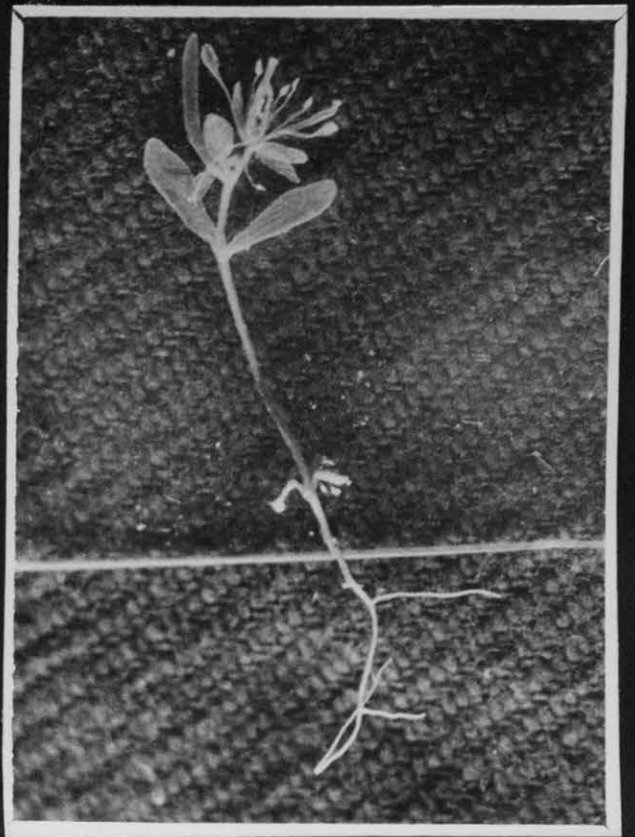


Plate no. LIII.  
Atelanthera pentandra Jafri



Plate no. LII. Hesperis matronalis L.

of A. pentandra Jafri brings Atelanthera (which <sup>so far</sup> stood quite aloof from the other Crucifers by having only monothealous inner stamens ~~saxifra~~) more close to the other Crucifers which all have only dithealous anthers.

Key to the species:

- I(a). Stamens 6; inner four alike, monothealous ..... I. A. perpusilla  
 I(b). Stamens 5; inner 3 dimorphic (2 monothealous and 1 dithealous) ..  
 ..... 2. A. pentandra

I. A. perpusilla H.f. et T. in Journ. Linn. Soc. Bot. v 138 (1861); F.B.I. 133; Korshinsky in Bull. Acad. Imp. Sc. Petersb. ser. V ix 414 (1898); S.E.P. 572.

Syn: A. tenuissima H.f. et T. in litt. (BM!);

Type: W. Tibet, Zanskar, Thomson (K!).

Annual, minute herb, 3-5 cm. tall, , erect, simple rarely branched above, hairy with bipartite-appressed, somewhat rough hairs. Leaves oblong-elliptic or linear, 1-1.5x0.1-0.3 cm., sessile, entire, apex rounded or acute. Racemes 2-5-flowered, lax, ebracteate. Flowers 2-2.5 mm. across, white or turning violet; pedicels short, hardly 1 mm. long in fruits. Sepals 1.7-2x0.6-0.7 mm. Petals 3-3.2x0.8-1 mm. Stamens 6; outer two 2.8-3 mm. long, dithealous, apex of the anthers blunt or subapiculate; inner four alike, 3.2-3.5 mm. long, monothealous, apiculate. Ovary oblong, about 24-ovuled, hairy. Siliquae about 2x0.1 cm., linear-oblong, compressed-terete; valves covered with bipartite-appressed hairs, with a distinct mid-rib; style about 0.8 mm. long with a capitate stigma; seeds 7-10 in each loculus, about 0.7x0.4 mm.; septum not veined.

N.W. Himalayas:

W. Tibet: Zanskar, Thomson (K!, BM!).

Geog. Dist:

C. Asia: Turkestan, Alaj valley, by the river Karasu, c. 3000 m., Korshinsky (L- not seen).

2.\*\*Atelantha pentandra Jafri, sp. nov.

Affinis A. perpusillae H.f.et T. sed staminibus 5, omnibus apicualtis, interioribus solum 3, dimorphicis-(2 antheris monotheccis et I anthera ditheca) divergit.

Herba annua, minima, 1-2 cm. alta; caules erecti, filiformes, inferne violacei, pilis bipartitis appressis. Cotyledones persistentes, minutissimi, circa 2 x 1 mm., oblongi, sessiles, carnosuli, glabri, violacei. Folia caulina saepe dua, simplicia, opposita, 3-5x0.6-1.2 mm., oblongo-elliptica sessilia, pubescentia, apice rotundata, ad marginem integra. Racemus 1-3-florus, laxissimus. Flores 2.5 mm. diam., albi; pedicelli 1-1.5 mm. longi, filiformes. Sepala 2 x 0.8 mm. oblonga, suberecta, obtusa, aequalia, pubescentia. Petala 3.5 x 1 mm., oblongo-ovata, emarginata. Stamina 5; 2 exteriora 2 mm. longa, antheris 0.4 mm. longis dithecis; 3 interiora 3 mm. longa, dimorphica, antheris 0.6 mm. longis, 2 monotheccis et I dithecis; antherae omnes apiculatae. Ovarium oblongum, subcylindricum, circa 14-ovulatum; stylus circa 0.6 mm. longus; stigma capitatum sub-bilobatum. Siliquae ignotae.

Minute annual, 1-2 cm. tall; stems erect, filiform, violet coloured below; hairs bipartite-appressed. Cotyledons persistent, minute, about 2 x 1 mm., oblong, sessile, fleshy, glabrous, violet coloured. Cauline leaves usually two, opposite, 3-5x0.6-1.2 mm., oblong-elliptic, sessile, pubescent, apex rounded, margin entire. Racemes 1-3-flowered, lax. Flowers 2.5 mm. across, white; pedicels 1-1.5 mm. long, filiform. Sepals 2x0.8 mm., oblong, suberect, obtuse, equal, pubescent. Petals 3.5x1 mm., oblong-ovate, emarginate. Stamens 5; 2 outer 2 mm. long, anthers 0.4 mm. long, ditheccous; 3 inner 3 mm. long, dimorphic, anthers 0.6 mm. long, 2 monotheccous and I ditheccous; all anthers apiculate. Ovary oblong, subcylindrical, about 14-ovuled; style about 0.6 mm. long, stigma capitate, sub-bilobed. Siliquae not seen.

N.W.Himalayas:

Kashmir: Suru, 3090 m., a tiny plant on sand, flowers white, B.B.Osmaston no. 224, Typus in Herb. Kew.

Geog. Dist: Endemic to Kashmir.

This species is very closely allied to A. perpusilla H.f.et T. but can be easily distinguished by having only five stamens- inner longer stamens only three, dimorphic (two monotheccous and one ditheccous).

74. \*\*CRYPTOSPORA Kar.et Kir. in Bull. Soc. Nat. Mosc. xv 161 (1842);

B.H.G.P.101; S.E.P.573; K.F.U.284.

Syn: Maximowasia O.Ktze., Rev. Gen. i 34 (1891).

Annual, erect, sparsely branched, + hairy with short, furcate, stiff hairs. Lower leaves elliptic-cuneate; upper oblong-ovate or elliptic, sessile, not auricled at the base, semiamplexicaule; all leaves submembranous, broadly to obscurely toothed, scabrous with short, branched rigid hairs, apex acute or obtuse. Racemes many flowered, corymbose above, lax in fruits, ebracteate. Flowers small or mediocre, white; pedicels short, erect, thickened especially above. Sepals almost equal, not saccate. Petals about twice as long as the sepals, obovate-oblong, apex emarginate. Stamens 6, not appendaged; anthers short, oblong, obtuse. Lateral nectari-ferous glands semiannular, open towards the outer side; median absent. Ovary linear-cylindrical, 3-7-ovuled, hairy; stigma sub-bilobed, short, subsessile. Siliquae linear, subcylindrical, curved, subtorulose, indehis-  
-cent with several I-seeded, superimposed cells; valves thick, coriaceous,  
+ scabrous; seeds uniseriate, large, oblong, not winged.

One species in C. and W. Asia.

\*\*Cryptospora falcata Kar.et Kir. in Bull. Soc. Nat. Mosc. xv 161 (1842);

S.E.P! 573; K.F.U.285.

Syn: "Sisymbrium himalaicum" Aitchison in Trans. Linn. Soc. ser.

II iii 34 (1888)-non H.f.et T.

Type: C.Asia, Soongaria, Kar.et Kir. no. I249(L,K!).

Annual, 25-50 cm. tall, erect, sparsely branched, hairy with branched, stiff hairs. Lower leaves elliptic-cuneate, 3.5-10x1-3 cm., slightly and distantly toothed; upper leaves elliptic-ovate or oblong-ovate, 1.5-6x0.5-2 cm., acute or obtuse, semiamplexicaule, slightly toothed to entire or subentire, scabrous. Racemes 25-50-flowered, ebracteate, corymbose above, increasing upto 20 cm. in fruits. Flowers 5-6 mm. across, white; pedicels 2-5 mm. long, increasing upto 6 mm. in fruit, thickened especially above, subappressed. Sepals 2.2-2.9x1-1.2 mm. Petals 5-7x2-3 mm. Stamens about 2.5 : 3 mm.; anthers about 1 mm. long. Siliquae 2-3.2x0.2 cm., linear, + cylindrical, torulose; valves thick, coriaceous, scabrous (heterotrichous); seeds 3-7, about 3x0.9 mm., oblong. (Plate no. LV).



Plate no. LV. *Cryptospora falcata* Kar. et Kir.

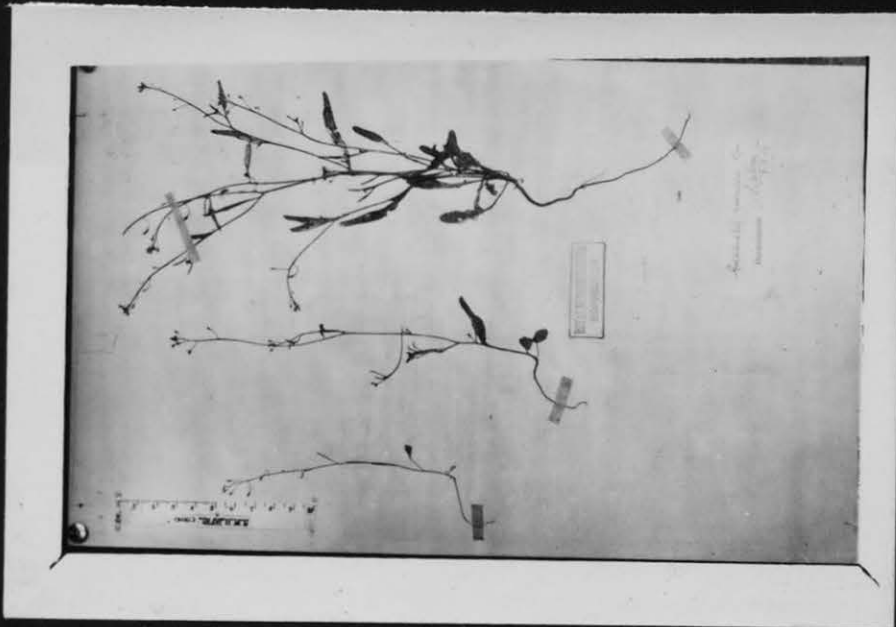


Plate no. LVI. *Goldbachia verrucosa* Komarov

Afghanistan:

Badghis, common in sandy soils, Aitchison no. 519(K!).

Geog. Dist:

Persia: Khorrasan, Mt. Kopet Dagh, Rechinger f. no. I734(K!).

Trans-capsicum region: Aschabad, P.Sintenis no. 54(K!).

C.Asia: Taschkent, Popov Herb. AS. Med. no. 93(K!).

Aitchison (1888) wrongly called his plants [no. 519(K!)] from Afghanistan: "Sisymbrium himalaicum". They are Cryptospora falcata Kar. et Kir. (Plate no. LV).

75. \*ANCHONIUM DC., Syst. Nat. ii 578 (1821) et Prodr. i 212 (1824); B.H.G. P. 101; B.F.O.239; S.E.P.574; K.F.U.320.

Perennial, erect, sparsely branched or simple, tomentose with stellate, white, soft hairs; rootstock woody. Leaves oblanceolate, or linear, entire, acute, tomentose, lower stalked. Racemes corymbose above, ebracteate, lax in fruits. Flowers large, yellow or purple; pedicels slightly thickened, + spreading. Sepals subequal, erect, inner pair subsaccate at the base. Petals about twice as long as the sepals, spatulate. Stamens 6, not appendaged, filaments of the inner stamens connate below in pairs; anthers oblong, obtuse. Lateral nectariferous glands annular or semiannular, (open towards the inner side); median absent. Ovary ellipsoid, 4-6-ovuled, hairy or glabrous; stigma conical, bilobed. Siliquae short or long, linear-terete, indehiscent, + constricted between the seeds; valves rigid, thick, glabrous or woolly with a distinct mid-vein; seeds large, oblong; septum thick, septulated.

About 4 species in W. and C. Asia.

\*Anchonium elichrysifolium (DC.) Boiss., Fl. Or. i 240 (1867); S.E.P.574; K.F.U.321; J. Bornmüller in Bot. Centralbl. lix 290 (1939).  
Syn: Sterigma elichrysifolium DC., Syst. 581 (1821); A. Tournefortii <sup>Boiss.</sup> in Ann. Sc. Nat. ser. II xvii 386 (1842).  
Type: Armenia, Tournefort (G- not seen).

Perennial, 10-30 cm. tall, branched mostly from the base, softly woolly with white, stellate hairs. Radical leaves oblanceolate, 4-10x0.3-1 cm., stalked, entire, acute; cauline leaves narrowly oblanceo-



-late, 1-6x0.2-0.6 cm., subsessile or sessile, entire, acute; all leaves softly pubescent. Racemes 15-30-flowered, ebracteate, corymbose above, increasing upto 15 cm. in fruits. Flowers 10-14 mm. across, yellow; pedicels 2-8 mm., increasing upto 10 mm. in fruit. Sepals 6-8x2-3 mm. Petals 12-17x4-6.5 mm., spatulate, clawed. Stamens about 8 : 10 mm.; anthers about 1.5 mm. long; filaments of the inner four stamens connate below in pairs. Siliquae 1.5-3.5x0.3 cm., linear-terete, ± constricted between the seeds; valves thick, woolly to glabrous, with a distinct mid-vein; seeds 2-4 in each loculus, 3-4x1.5-2 mm., oblong; septum thick, yellowish, transversely thickened between the seeds.

Baluchistan:

Bazman, Bornmuller no. 78(B- not seen).

Geog. Dist:

Persia: Near Takhte Sulaima, 3300 m., A.C.Trott no. 174 (K!).

Iraq: Ser Kurawa, J.B.Gillett no. 974I(K!).

Asia Minor: Anatolia, Bornmuller no. 1919(K!); Cappadocia, Aucher Eloy no. 87(K!).

Armenia: Goldagh, Bornmuller no. 5243(K!); Mt. Tech dagh, Huet du Pavillon (K!).

I have not seen any specimen of this species from Baluchistan and have cited only Bornmuller's specimen. It is <sup>a</sup>very distinct species, and is widespread from Asia <sup>Minor</sup> to Persia, and therefore there is every possibility of its occurrence in Baluchistan also.

76. GOLDBACHIA DC., Syst. Nat, ii 576 (1821) et Prodr. i 212 (1824); B.H.G.P.101; B.F.O. 243; F.B.I. 166; S.E.P.575.

Annuals, erect, branched, glabrous or very sparsely hispid, with simple or forked hairs. Leaves oblanceolate or lanceolate, sinuate-toothed to subentire, basal cuneate, upper usually semiamplexicaule or amplexicaule, auricled or cuneate at the base. Racemes many flowered, ebracteate, corymbose above, somewhat lax in fruits. Flowers small, pale rose or white; pedicels filiform, flexuose, slightly to much longer than the fruit, often decurved. Sepals subspreading, equal, not saccate. Petals about twice as long as the sepals, spatulate, apex rounded. Stamens 6, not appendaged; anthers short, obtuse. Lateral nectariferous glands

annular, apparently open towards the outer side; median present, joining the laterals. Ovary elliptic-terete, 4-6-ovuled; stigma capitate on short, thickened style. Fruits quadrangular, short, indehiscent, often breaking transversely into two halves, constricted between the seeds; valves thick, coriaceous; seeds oblong, usually one mature in each, 2-3 (rarely 1) superimposed locules.

2(4?) species in C. and W. Asia.

Schulz (1936) recognizes 2 species of Goldbachia, while Vassilczenko in Fl. U.R.S.S. (1939) recognizes 4 species. The status of Vassilczenko's new species is not definitely known. There can be no doubt that G. laevigata (M.B.) DC. is a very polymorphic species, and its different forms have been given different names by the previous authors. But a careful study of large number of specimens from different gatherings leaves no doubt that they all belong to this species. Therefore Blatter and Hallberg's species, G. hispida (1919) from Baluchistan, is nothing but a state of G. laevigata.

G. verrucosa Komarov is a distinct species from G. laevigata and can be easily distinguished from the latter by its sparsely leaved branches, narrow and cuneate cauline leaves, and mostly 1-celled, smooth fruits. I found three undetermined sheets of this species from Baluchistan lying in Edinburgh Herbarium and collected by Lace. (Plate no. LVI).

Key to the species:

- I(a). Cauline leaves amplexicaule with broad, auricled bases; fruits 2-3-celled, constricted between the seeds ..... 1. G. laevigata  
 I(b). Cauline leaves cuneate at the base (not auricled at the base); fruits mostly 1-celled ..... 2. G. verrucosa

1. G. laevigata (M.B.) DC., Syst. 577 (1821); B.F.O. 243; F.B.I. 166; S.E.P. 575.

Syn: Raphanus laevigatus M.B., Fl. Taur.-Cauc. ii 129 (1808);  
G. torulosa DC., l.c.; G. hispida Blatter and Hall. in  
 Journ. Indian Bot. i 56 (1919).

Type: Astrakan, Bieb. (G- not seen).

Annual, 15-50 cm. tall, erect, apparently glabrous, branched, usually with scattered simple hairs below, sometimes margins of the

basal leaves sparsely hispid. Basal leaves rosulate, oblanceolate, 3-10x 1-2.5 cm., obtuse or acute, sinuate-toothed to subentire, sessile; cauline leaves lanceolate or linear-oblong, 1-6x0.2-1.5 cm., sessile, amplexicaule with broad auricled bases, + toothed, rarely entire. Racemes 15-30-flowered, ebracteate, corymbose above, lax in fruits, increasing upto 20 cm. Flowers 2-3 mm. across, white or pale rose; pedicels 2-4 mm. long, increasing upto 10 mm. in fruits, filiform, + deflexed. Sepals about 2 x 0.7 mm. Petals about 4 x 1 mm. Stamens about 1.8 : 2 mm.; anthers about 0.3 mm. long. Fruits (8) 10-12x(2) 2.5-3.2 mm., quadrangular, + constricted between the seeds, often with a prominent constriction in the middle, usually upcurved, apex somewhat compressed, acute; valves thick, coriaceous, glabrous, with a prominent mid-rib; stigma short, depressed, subbilobed, sessile; seeds about 2 x 1 mm., oblong-subterete, pale brown.

W. Pakistan:

N.W.F.P.: Peshawer, H. Deane (K!).

Punjab: Salt range, Aitchison no. 65 (K!); Drummond nos. 13795 (K!), 20344 (E!, K!) and 20345 (E!, K!); Fleming (E!); Rawalpindi, R. Stewart no. 4079 1/2 (K!); Rich no. 458 (K!); Trans Indus Region, J.L. Stewart (K!); (without locality), Edgeworth (K!); Rawalpindi, field edges and ditches, R. Stewart no. 16250 A (R-E!);

Baluchistan: Quetta, 1680 m., Lace no. 3468 (E!, K!); Peshin, 1560 m., Lace no. 3500 (E!, K!); Yaru karez, Lace (E!); Killa Abdulla, Duthie no. 8606 (K!); (without locality) Stocks no. 727 (K!) {with Isatis minima}; Fort Sandeman, Harsukh no. 20460 (K!); (without locality), Vicary (K!); H. Crookshank no. 271 (K!).

Afghanistan:

Khyber pass, 1080 m., H. Johnston no. 38 (E!); Harirud valley, Aitchison no. 1015 (K!); (without locality), Griffith no. 1544 (K!); Harirud valley, common in loamy soil, Aitchison no. 162 (K!).

N.W. Himalayas:

Kashmir: 1500 m., Jacquemont (K!); (without locality), Thomson (K!); J.L. Stewart (E!).

Geog. Dist: Persia, Iraq, C. Asia, and Transcaspicum region.

A very variable species

2. \*\*G. verrucosa Komarov in Trav. Soc. Nat. Petersb. Bot. xxvi 98 (1896);  
S.E.P.575; K.F.U.237;

Type: C.Asia, Komarov(L- not seen).

Annual, 12-25 cm. tall, erect, sparsely branched, glabrous, subglaucous. Basal leaves subrosulate, narrowly spatulate, 2-5x0.5-1 cm., apex rounded, margin subentire or entire, sometimes slightly toothed; middle leaves + similar to the basal leaves; upper leaves small, oblong-linear, 1-4x0.15-0.7 cm., entire or subentire, sessile, cuneate at the base. Racemes 10-15-flowered, corymbose above, ebracteate, lax, increasing upto 10 cm. in fruits. Flowers about 2 mm. across, lilac; pedicels 4-6 mm. long, increasing upto 10(-12) mm. in fruit, filiform, spreading or subdeflexed. Sepals about 1 x 0.6 mm. Petals 2-2.5x1 mm. Stamens about 1 : 1.2 mm.; anthers about 0.25 mm. long. Fruits tetragonal, 3-5x1.8-2 mm., usually without a middle constriction and 1-celled, apex short; seeds about 2x1.5 mm.(Plate no. LVI).

W. Pakistan:

Baluchistan: (without locality), Lace (E!); Quetta, Lace (E!); (without locality), Lace (K!)(with Torularia aculeolata)

Geog. Dist:

C.Asia: Samarkand, Popov et Vvedensky(no. 83(E!,K!)).

77. ERYSIMUM L., Sp. Pl. ii 660 (1753); B.H.G.P.79; B.F.O.186; F.B.I. 152; S.E.P.576; K.F.U. 92.

Syn: Cheirinia Link, Enum. ii 170 (1822); Cuspidaria Link, Handb. ii 315 (1831); Agonolobus Reichenb., Nom. 183 (1841); Strophades Boiss. in Ann. Sc. Nat. ser. II xvii 82 (1842); Erysimastrum Rupr., Fl. Cauc. 76 (1869); Palaeoconringia Krause in Archiv Ver. Freunde Naturg. Meckl. Neue Folge ii 135 (1927).

Annual, biennial or perennial, sometimes woody at the base, erect, branched, pubescent with 2-4-partite, appressed hairs; stems often very leafy, tetragonate. Leaves simple, entire to pinnatifid, stalked or sessile, often broadly linear or elliptic, pubescent, teeth often + triangular. Racemes usually many flowered, corymbose, ebracteate (rarely

bracteate), elongating conspicuously in length in fruits. Flowers usually mediocre, yellow, rarely purple, pedicellate. Sepals erect, pubescent, inner pair broad, + saccate at the base, often hooded at the apex. Petals obovate, long clawed, obovate, apex usually rounded. Stamens 6, without appendages; anthers oblong-linear, alike (ditheous). Lateral nectariferous glands annular or semiannular; median short, not joining the laterals, often two or three lobed. Ovary linear-cylindrical, pubescent, 32-72-ovuled; style short with + bilobed, capitate stigma. Siliquae elongated, + 4-angled, pubescent, with 2-4-partite, appressed hairs; valves with a distinct mid-rib; seeds numerous, uniseriate, oblong or ellipsoid, often slightly angular, brown; septum membranous or submembranous, not veined.

About 80 species mostly in Mediterranean region, C. and W. Asia.

It is represented by only 17 species in the present area.

Hooker f. and Thomson in Journ Linn. Soc. Bot. v 164-167 (1861) record 11 species, including three doubtful species: E. pulvinatum ? J. Gay, E. odoratum ? Ehrh., and E. altaicum ? C.A.M. These doubtful taxa were retained as doubtful by Hooker f. and T. Anderson in Fl. Brit. India (1872). These three doubtful taxa need an explanation. The type gathering (Griffith no. 1441(K)) from Afghanistan) of "E. pulvinatum", written in Hooker's own handwriting on one sheet, is the same as that of Cheiranthus Griffithii H.f. et T. on the other sheet. Both the sheets bear Griffith's no. 1441 and are from the same locality, (Kohi Baba, 4200-4500 m.,) in Afghanistan. There is no doubt that they are Erysima. Boissier correctly transferred Cheiranthus Griffithii H.f. et T. to Erysimum, but as the specific name was already occupied by Boissier's earlier species, E. griffithianum (1842), he gave it a new name, E. Hookeri Boiss. in Fl. Or. i 203 (1867). Boissier does not mention any thing about "E. pulvinatum" H.f. et T. (non J. Gay) from Afghanistan; on the other hand he cites E. pulvinatum J. Gay as a synonym of E. aucheri Boiss., which is an entirely different species and does not include the above Griffith's specimen. E. hookeri Boiss. is very closely allied to E. pulvinatum J. Gay. As a matter of fact all Griffith's specimens bearing no. 1441 (at Kew) belong to E. hookeri Boiss. This shows that such conscientious taxonomists as Hooker f. and Thomson were also puzzled

by these specimens when they placed a part of them under Cheiranthus and remainder under Erysimum.

"E. odoratum" H.f. et T. (non Ehrh.) was described as a new species, E. melicentae Dunn ~~in Kew Bull.~~ in Kew Bull. 336 (1920). Apparently not knowing this, Schulz described another 'new' species, E. Parkeri Schulz [Notizblatt ix 1083 (1927)], quoting "E. odoratum" H.f. et T. (non Ehrh.) as its synonym. He later realized his mistake and quoted his E. Parkeri as a synonym of E. melicentae Dunn [Fedde, Rep. xxxi 333 (1933)].

There is no doubt that E. altaicum C.A.M. is a distinct species confined to Kashmir in the present area, but extending into C. Asia.

Out of the remaining 8 species, only four were recorded from the present area by H.f. and Thomson (1861). These are: "E. repandum" (includes E. griffithianum Boiss. as synonym.), E. subulatum J. Gay; E. thomsonii H.f. et T. and E. hieracifolium L. (which they called E. strictum Gaert.). The remaining four were from E. Himalaya (Sikkim) only.

Boissier (1867) recorded only four species from Afghanistan and Baluchistan: E. perofskianum F. et M., E. griffithianum Boiss., E. Stocksianum (Boiss.) Boiss. and E. hookeri Boiss.

Schulz (Notizblatt ix 1927) described four new species from the present area: E. aitchisonii, E. cachemicum, E. erosum, and E. Parkeri. Of these, E. Parkeri is conspecific with E. melicentae Dunn (1920) as already discussed ~~before~~. E. cachemicum Schulz should be included in E. pachycarpum H.f. et T. as a subspecies for the reasons discussed under that species.

Schulz again described two more new species in Notizblatt (1931): E. schlagintweitianum and E. remotiflorum. The latter species is nothing but Farsetia hamiltonii Royle (See full discussion under Farsetia)!

Figure no. 24 shows the leaf, flower, fruit and hair character of the 17 species of the present area.

Key to the species

## I. Annuals:

2. Homotrichous; siliquae erect ..... I. E. sisymbrioides
2. Heterotrichous; siliquae + spreading:
3. Racemes bracteate; pedicels 2-3 mm. long in fruit: .....  
 .....2. E. griffithianum
3. Racemes ebracteate (rarely 1-2-bracteate); pedicels 5-10 mm.  
 long in fruit: .....3. E. repandum

## I. Biennials or perennials:

## 4. Homotrichous:

5. Hairs stellate .....II. E. stockdianum
5. Hairs bipartite:
6. Flowers 4-8 mm. across, petals 1.5-2.5 mm. broad:
7. Siliquae 1.5-2.5 cm. long .....I3. E. erosum
7. Siliquae 6-9 cm. long .....I4. E. thomsoni
6. Flowers 10-18 mm. across, petals 4-9 mm. broad:
8. Siliquae + horizontal-spreading; pedicels upto 5 mm. long,  
 stout, thickened; stigma sessile ...I5. E. aitchisonii
8. Siliquae + erect; pedicels upto 15 mm. long, thin; stigma  
 on 2-5 mm. long style:
9. Perennial; branches many, arising from the base; leaves  
 narrowly linear, 1-3 mm. broad .....I7. E. altaicum
9. Biennial; stem simple rarely branched; leaves oblanceo-  
 late, or oblong-elliptic, usually 5-12 mm. broad:
10. Pedicels 5-7 mm. long in fruit; petals 4-5 mm.  
 broad .....I2. E. profskianum
10. Pedicels 10-15 mm. long in fruit; petals 6-9 mm.  
 broad .....I6. E. melicentae

## 4. Heterotrichous:

## II. Plants 5-9 cm. tall in fruit: :

- I2. Flowers 5 mm. across; siliquae about 3.5 x 0.1 cm. with  
 25-30 seeds .....4. E. schlagintweitianum
- I2. Flowers 7-8 mm. across; siliquae 1.5-2.2 x 0.15-0.17 cm.  
 with 8-12 seeds .....5. E. hookeri

## II. Plants 15-100 cm. tall in fruits:

13. Pedicels 1-3 mm. long in fruit:

14. Petals 5-6 mm. long; anthers 1 mm. long...9. E. subulatum

14. Petals 8-11 mm. long; anthers 2 mm. long:

15. Flowers about 7 mm. across; radical leaves 1.5-4 mm. broad .....10. E. persepolitenum

15. Flowers about 5 mm. across; radical leaves 4-6 mm. broad .....8. E. leucanthemum

13. Pedicels 5-10 mm. long in fruits:

16. Flowers 6-9 mm. across; siliquae + erect, 1.5-1.8 mm. broad; pedicels not thickened ....6. E. hieraciifolium

16. Flowers 10-12 mm. across; siliquae + spreading, about 2.5 mm. broad; pedicels thickened....7. E. pachycarpum

I. \*E. sisymbrioides C.A.M. in Ledeb., Fl. Alt. iii 150 (1831); B.F.O. 188.

Type: C. Asia, Altai, Ledebour (L, K!).

Annual, 5-25 cm. tall, erect, stem simple or sparsely branched, hairy with bipartite-appressed hairs. Leaves oblanceolate or oblong, 1-5x0.2-0.8 cm., alternate, many, lower stalked, upper sessile, apex obtuse or rounded, entire. Racemes 5-15-flowered, ebracteate, lax, increasing upto 8 cm. in fruits. Flowers about 3 mm. across, yellow; pedicels 0.7-1 mm. long, increasing upto 1.6 mm. in fruits, slightly thickened, suberect. Sepals 2-2.8x0.8-0.9 mm. Petals 3-5x1 mm, apex rounded. Stamens about 2.8 : 3 mm.; anthers about 0.7 mm. long, dithecal, blunt. Siliquae linear-terete, 1.5-2.5x0.1 cm., erect, straight or slightly curved; valves hairy with bipartite-appressed hairs, with a distinct mid-rib; stigma sessile or subsessile, sub-bilobed, capitate; seeds 10-15 in each loculus, about 0.8x0.5 mm., ellipsoid, brown; septum not veined.

W. Pakistan:

Punjab: Rawalpindi, 540 m., R. Stewart no. 7743(K!);

Baluchistan: Khojak pass, Duthie no. 8571(K!).

Afghanistan:

Sarai chashma, 2250 m., W.R. Hay no. 165 A(K!); Harirud valley, Aitchison no. 1009(K!); Wakhan-Langar to Serhad, 3600 m., Giles no. 44(K!).

N.W. Himalayas:

Kashmir: Gilgit, Giles (E!).



Geog. Dist:

C. Asia, Trans-Caspicum region, Asia Minor and Persia.

This species has often been confused with Atelanthera perpusilla H.f. et T. (See full discussion under Atelanthera H.f. et T.). It is distinguished from the latter primarily by its many flowered racemes, many alternate leaves, all ditheous anthers and sessile or subsessile stigma.

2. E. griffithianum Boiss., Diagn. ser. II i 28 (1842); B.F.O. 189.

Type: Afghanistan, Sinab, sandy plains, common, Griffith no. 1442(G,K!).

Annual, 10-20 cm. tall, erect, branched mostly from below, hairy with 2-3-partite, rough, appressed hairs. Leaves oblanceolate or oblong-cuneate, 1.5-5x0.2-0.6 cm., lowers stalked, upper sessile, apex rounded, entire. Racemes 10-15-flowered, bracteate, increasing upto 15 cm. in fruits. Flowers 3.5-4.5 mm. across, yellow, subsessile; pedicels 1-2 mm. long in fruits, thickened, + spreading or ascending. Bracts leafy. Sepals 2.8-3.2x0.5-0.8 mm. Petals 4.5-5x1 mm., spatulate, clawed, apex rounded. Stamens 4 : 5 mm.; anthers 0.6-0.8 mm. long. Siliquae oblong-linear, 2.5-3.5x0.1 cm., subcylindrical, ascending; valves hairy with 2-3-partite appressed hairs, 1-veined; stigma capitate, bilobed, subsessile or sessile; seeds 15-20 in each loculus, about 0.8x0.5 mm., ellipsoid, brown; septum membranous, not veined.

W. Pakistan:

Baluchistan: Quetta, Lace no. 3632(E!,K!); Michara, Stocks no. 909(K!); Shelabagh, Khojak pas, Duthie no. 8589(BM!).

Afghanistan:

Sinab, sandy plains, common, Griffith nos. 1442(K!) and 1438(K!).

Geog. Dist:

Endemic.

Distinguished from E. repandum L. by its short habit, entire leaves, bracteate **racemes**, short ascending fruits on very short pedicels.

The two species, E. griffithianum and E. repandum, remain quite distinct in the present area.

Hooker f. and Thomson (1861) consider E. griffithianum conspecific with E. repandum. Boissier in Fl. Or. (1867) recognized the former as a distinct species, but later in Suppl. Fl. Or. (1888) he reduced it to a variety of E. repandum.

E. griffithianum is common in Baluchistan, but I have not seen any specimen of E. repandum L. from that part of the present area.

3. E. repandum L. in Amoen Acad. iii 415 (1756); H.f. et T. in Journ. Linn. Soc. Bot. v 164 (1861)-partim; B.F.O. 189; K.F.U. II 6.

Type: Europe (not precisely designated) no. 5 (LS!).

Annual, 12-60 cm. tall, erect, branched mostly from below, hairy with 2-3-partite, appressed hairs. Branches slender, often spreading. Leaves narrowly oblanceolate or oblong-elliptic, 1-10 x 0.2-1 cm., lower stalked, upper sessile, sinuate-toothed to subentire rarely entire, apex acute or subobtuse. Racemes 15-30-flowered, corymbose above, ebracteate (rarely 1-2-bracteate), increasing upto 30 cm. in fruits. Flowers 4-5 mm. across, yellow; pedicels 1-2 mm., increasing upto 10 mm. in fruit, often horizontally spreading, thickened. Sepals 3.5-4.5 x 0.8-1.2 mm. Petals 7-8 x 1.5-2 mm., spatulate, clawed, lamina suborbicular. Stamens 4 : 5 mm.; anthers 0.6-0.8 mm. Siliquae 2-10 x 0.1-0.15 cm., oblong-linear, subcylindrical; valves hairy with 2-3-partite appressed hairs, with a prominent mid-vein; stigma depressed, bilobed, subsessile; seeds many, 1 x 0.6 mm., oblong-ellipsoid, + trigonal, brown; septum not veined, membranous.

W. Pakistan:

N.W.F.P.: Abbottabad, 1260 m., R. Stewart no. 16368 (R-E!).

Punjab: Rawalpindi, 600 m., R. Stewart no. 16286 (R-E!).

Afghanistan:

Kurrum valley, Para chenar, Harsukh no. 14749 (K!); Harirud valley, very common in the shade of bushes in sandy soils, Aitchison no. 195 (K!); Kurrum, Aitchison no. 67 (K!).

N.W. Himalayas:

(without locality), Thomson (K!);

Kashmir: Srinagar, Winterbottom no. 269 (K!).

Geog. Dist: Europe, Asia and America.

4. \*E. schlagintweitianum Schulz in Notizblatt xi 227 (1931).

Type: Tibet, Gurai Khorsum, South of the Suttlej, Herb. Schlagintweit no. II 7048(B- not seen).

Biennial or perennial, 2 - 9 cm. tall, erect; stem simple rarely branched from the base, hairy with 2-4-partite appressed hairs; root thick, slender, elongated. Radical leaves densely rosulate, narrowly oblanceolate, 2-3x0.2-0.5 cm., runcinate-dentate to subentire, obtuse, stalked. Cauline leaves few, linear, + entire, sessile, 0.8-2.5x0.15-0.3 cm. Racemes 8-20-flowered, corymbose, ebracteate. Flowers about 5 mm. across, yellow; pedicels 2-5 mm. long, ascending, increasing in length in fruit, lowermost sometimes bearing one leaf (bracteole). Sepals 4-6x 1-1.2 mm. Petals 8-11x2 mm., oblong-obovate, clawed, apex rounded. Stamens 6-7 : 8-9 mm.; anthers 1.5-2 mm. long. Ovary 32-36-ovuled; style about 1 mm. long with capitate, subbilobed stigma. Siliquae (immature) about 3.5x0.1 cm., subcylindrical, linear, pubescent.

N.W. Himalayas:

Kumaon, Johar, 3300-3600 m., Herb. Schlagintweit no. II 9676 (B- not seen).

Geog. Dist:

Tibet: Gurai Khorsum, S. of the Suttlej, Schlagintweit no. II 7048(B- not seen); Gugi plains, 4650 m., Strachey & Winterbottom no. 2(K!).

5. E. hookeri Boiss., Fl. Or. i 203 (1867).

Syn: Cheiranthus Griffithii H.f. et T. in Journ. Linn. Soc. Bot. v I37 (1861); "E. pulvinatum" H.f. et T. l.c. I65 [non J. Gay, Erys. 5 (1842)].

Type: Afghanistan: Kohi Baba, 4200-4500 m., Griffith no. I441 (G,K!).

Perennial, caespitose, upto 6 cm. tall in fruits; rootstock branched. Radical leaves densely rosulate, linear, 1.5-3x0.1-0.2 cm., + entire, acute or subobtuse, pubescent with 2-4-partite appressed hairs. Cauline leaves + similar to the radical leaves but smaller. Racemes 5-10-flowered, ebracteate, subcorymbose, increasing upto 3 cm. in fruit. Flowers

7-8 mm. across, yellow; pedicels 1-2.5 mm. long, increasing upto 3.5 mm. in fruit. Sepals 4-5x1-1.2 mm. Petals 8-10x1.5-2 mm., obovate, long clawed, apex rounded. Stamens 5-6 : 6-7 mm.; anthers about 1.8 mm. long. Siliquae small, 1.5-2.2x0.15-0.17 cm., linear, subcompressed, pubescent, with 2-4-partite appressed hairs; valves with a distinct mid-vein; style about 1 mm. long with a capitate, subbilobed stigma; seeds 4-6 in each loculus, large, about 2 x 1.2 mm., ellipsoid, subcompressed, brown; septum not veined, membranous.

Known from the type locality only.

6. E. hieraciifolium L., Cent. Pl. i 18 (1755); F.B.I. 153.

Syn: E. virgatum Roth., Cat. i 75 (1797); E. strictum Gaert. in Meyer et Schreb, Fl. Wett. ii 451 (1800); H.f. et T. in Journ. Linn. Soc. Bot. v 166 (1861); B.F.C. 196.

Type: Europe (not precisely designated) (LS!).

Biennial, 30-100 cm. tall, erect, stem simple or branched, + hairy with 2-4-partite appressed hairs. Basal leaves subrosulate or rosulate, very variable, oblanceolate or oblong-elliptic, stalked, 5-10x 0.5-1 cm., acute, + toothed, sometimes entire; cauline leaves 3-8x0.4-1 cm., oblanceolate or linear-oblong, subsessile or sessile, toothed or entire. Racemes 20-60-flowered, ebracteate, corymbose above, increasing upto 40 cm. in fruits. Flowers 6-9 mm. across, yellow; pedicels 3-6 mm., increasing upto 10 mm. in fruit, not thickened. Sepals 5-6x1.3-1.7 mm. Petals 8-10x3-3.5 mm., obovate, long clawed, apex rounded. Stamens 5-6 : 7-8 mm.; anthers about 2 mm. long. Siliquae linear-oblong, terete, erect, 2-7.5x0.15-0.18 cm., strict; valves with a distinct mid-rib, pubescent with 2- rarely 3-4-partite appressed hairs; style 0.5-1.5 mm. long with capitate-bilobed stigma; seeds 25-35 in each loculus, 0.8-1.5x0.5-1 mm., oblong-ellipsoid, brown; septum not veined.

W. Pakistan:

Chitral: Ziarat, 3000 m., Harriss no. 15902(K!); Shajanali, c. 3000 m., Toppin no. 372(K!);

N.W.F.P.: Hazara, Kaghan valley, Chanki miranjan, 2940 m., Inayat no. 19165(K!); Kaghan, Bhonja, Inayat (K!); Kaghan, Shinu, Inayat no. 21132(K!).

Punjab: Murree hills, Changla gali, 2400 m., R. Stewart no. 14114 A(R-E!).

N.W. Himalayas:

Kunawar, Drummond nos. 20283(K!), 20284(K!), 20285(K!), 20287(K!), and 20288(K!); Chur, Drummond no. 20286(K!); Simla, Drummond no. 20289(K!); Kunawar, Jacquemont no. 1376(K!); Kumaon, J.M. Legge (K!); Pekha, 2100-2700 m., Edgeworth no. 107(K!); Simla, Gamble no. 1473 A(K!); Simla, Matiyana, 2100 m., Gamble no. 15(K!); Below Nagkunda, Thomson (K!); Jaunsar, Bodyar, 2400 m., Gamble no. 2705(K!); Tihrigarhwal, Ganges valley between Suki and Jhala, 2400-2700 m., Duthie no. 907 a(K!); and no. 907(BM!); Garhwal, Jacquemont no. 760(K!); and no. 615(K!); Matiyana, 2400 m., Collett(K!); (without locality), Royle(K!); Chamba, Belj valley, 2100 m., fairly common near cultivation, and in stony nullah, Parker(K!); Garhwal, Falconer, Herb. East India Co, 173(K!); Jaunsar, Beaban range, 2100-2700 m., W.Gollan(BM!); Simla, Parkinson no. 7383(E!); Bashahr state, 2400m., Lace no. 114(E!); Chamba, Lace no. 1600(E!); (without locality), Watt no. 9931(E!); Shoultu, 1650 m., Watt no. 4836(E!); 1200 m., Watt no. 3316(E!); 2100 m., Watt no. 3263(E!); Dhujkoti, 2400 m., Keshav nand(E!); Hursar, 3000 m., Watt no. 2589(E!).

Kashmir: Baramula, pass, 1350 m., Winterbottom(K!); Pahlgam, 2100 m., Coventry nos. 567(K!) and 1362(K!); Mt. behind Dal Lake, R.Stewart no. 3259(K!); Upper chenab, Ashdari, Fadar, R.Stewart no. 2880(K!); Between Baltal and Sonmarg, Jacquemont no. 1039(K!); (without locality), 1800-3000 m., Royle(K!); Pahlgam, 2160 m., R.R. & I.D. Stewart no. 5297(K!); Sonmarg, H.H. Rich no. 1169(K!); Kufri, H.H. Rich no. 289(K!); Gund to Gagangar, A.P. Young (BM!); Gadsar nullah, 3300 m., Pinfold no. 324(BM!); Kinslwan, 2325 m., Clarke no. 29472 B(BM!);

Geog. Dist: Europe and temperate Asia.

A very polymorphic species. The status of its infra-specific units is not definitely known.

7. \*E. pachycarpum H.f. et T. in Journ. Linn. Soc. Bot. v 167 (1861);

F.B.I. 153.

Type: East Himalaya, Sikkim, 3000 m., J.D. Hooker(K!).

Subsp. I. pachycarpum

Biennial, sometimes perennating, 30-60 cm. tall, erect, stout, hairy with 2-3-partite appressed hairs. Basal leaves rosulate, oblanceolate, 5-10x0.4-0.7 cm., stalked, toothed to entire, acute, hairy; cauline leaves distant, oblanceolate, or elliptic-oblong, shortly stalked or sessile, entire or toothed, acute. Racemes 10-20-flowered, corymbose, increasing upto 20 cm. in fruits, ebracteate. Flowers 10-12 mm. across, yellow, lower 1-2 bracteate; pedicels 1-2 mm., increasing upto 9 mm. in fruit, thick, spreading. Sepals 5-6x1.2-1.6 mm. Petals 10-12x2.8-3.2 mm., obovate, long clawed, apex sub-

-emarginate. Stamens 6-7 : 7-8 mm.; anthers about 2.3 mm. long. Siliquae 5-7x0.25 cm., oblong-linear, terete ; valves with a prominent mid-rib, hairy with 2-3-partite appressed hairs; style about 1 mm. long, thickened, with capitate, large, sub-bilobed stigma; seeds 20-30 in each loculus, about 1.4x0.9 mm., oblong-ellipsoid, brown; septum submembranous, rigid.

Known from the type locality only.

Subsp. 2. cachemiricum (Schulz) Jafri, comb. et stat. nov.

Syn: Erysimum cachemiricum Schulz in Notizblatt ix 1080 (1927).

Type: Kashmir: Kishenganga valley, Tilel, 3300-3600 m., Keshavanand no. 1473(B- only photograph seen at Kew).

Perennial, 50 cm. tall in fruit. Basal leaves up to 12 cm. long; cauline leaves few, about 8 only. Racemes about 40-flowered, ebracteate, increasing up to 25 cm in fruits. Flowers similar as in the type species. Siliquae 3-5x0.25 cm.

N.W. Himalayas:

Kashmir: Kishenganga valley, Tilel, 3300-3600 m., Keshavanand no. 1473(B- only photograph seen at Kew); Burzil pass, chowki, 3600 m., R. Stewart no. 22122(R-E!).

Geog. Dist: Endemic to Kashmir.

The type species is very little known, the only record of it being Hooker's original collection from Sikkim (E. Himalaya). The subspecies appears to be confined to Kashmir and is distinguished from the type race by its many-flowered raceme and somewhat short fruits. It is possible that more records from Himalaya may bridge the present differences between the two.

8. \*E. leucanthemum (Steph.) Fedtsch., Consp. Fl. Turkest. 70 (1906);

B.F.S. 533; K.F.U. 116.

Syn: Cheiranthus leucanthemus Steph. in Willd., Sp. Pl. iii 521 (1800); C. versicolor M.B., Fl. Taur.-Cauc. ii 119 (1808); E. versicolor (M.B.) Andr. in DC., Prodr. i 198 (1824); B.F.O. 197; J. Bornmüller in Bot. Jahrb. lxvi 220 (1934).

Type: North Persia, Willdenow?(B- not seen).

Biennial, (10) 15-60 cm. tall, canescent with 2-3-partite appressed hairs. Basal leaves rosulate, narrowly spatulate, long stalked, 4-6x0.3-0.6 cm.; lamina elliptic, sinuate-dentate to entire, acute or subobtus. cauline leaves linear-oblong, 1-5x0.1-0.5 cm., entire. Racemes 15-30-flowered, corymbose, ebracteate, increasing upto 25 cm. in fruits. Flowers 4-5 mm. across, pale yellow; pedicels very short, 0.5-0.8 mm., increasing upto 2mm. (rarely upto 4 mm.) in fruits, slightly thickened. Sepals 4-6x1-1.4 mm. Petals 8-11x1-1.8 mm., spatulate, lamina suborbicular. Stamens 6-7 : 8-9 mm.; anthers about 2 mm. long. Siliquae linear, subcylindrical, 1.8-4.5x0.07-0.09 cm., erect, straight; valves canescent with 2-3-partite appressed hairs, with a distinct vein; style hardly upto 1 mm. long, stigma capitate, sub-bilobed; seeds 15-20 in each loculus, about 1x0.6 mm., ellipsoid, brown; septum not veined.

Afghanistan:

Kabul, 1740 m., gravelly slopes, W.R.Hay no. 298(K!); Kabul, 1950 m., rocky slopes, common, W.R.Hay no. 99(K!); Berg Babur, C.Manger no. 96(ex Bornmüller - B- not seen); Darul Aman, König no. 34(ex Bornmüller-B-not seen).

Geog. Dist: S.E.Europe, Asia Minor, TransCaspicum region, Persia and C.Asia.

9. E. subulatum J.Gay, Erys. 8 (1842); H.f.et T. in Journ. Linn. Soc. Bot. v 165(1861).

Syn: E. persicum Boiss. in ANN. Sc. Nat. ser.II xvii 49(1842); B.F.O.198; K.F.U.118.

Type: Persia, Azerbaijan, Aucher Eloy no. 4105(P,K!).

Biennial, (12) 15-25 cm. tall, often very branched from below, erect or suberect, hoary with 2-3-partite appressed hairs. Basal leaves densely rosulate, ; all leaves narrowly linear, 2-5x0.1-0.3 cm., entire, acute, pubescent. Racemes 25-35-flowered, ebracteate, corymbose above, increasing upto 20 cm. in fruits. Flowers 3-5 mm. across, yellow, subsessile; pedicels about 1 mm. long in fruit, thickened. Sepals 2-3.5x1-1.2 mm. Petals 5-6x1-1.5 mm., obovate, long clawed, apex rounded. Stamens about 3 : 4 mm.; anthers about 1 mm. long. Siliquae linear, terete, 2-2.6x

0.1-0.12 cm.; valves hairy with 2-3-partite appressed hairs, with a distinct mid-vein; style about 1 mm. long with a capitate, sub-bilobed stigma; seeds 14-18 in each loculus, about 1 x 0.5 mm., ellipsoid, brown; septum not veined.

Afghanistan:

(without locality), Griffith ?(K!)(pasted on the type sheet).

Geog. Dist:

Persia: East of Zorab, 1200 m., Cowan & Darlington no. 1774 (K!); N.Persia, Tabriz, B.Gilliat-Smith no.1729(K!); near Tabriz, B.Gilliat-Smith nos. 1817(K!) and 1822 (K!).

Transcaaspicum region: Caucasus, between Bilar and Diza, L.Prilipko (K!).

I could not find any definite specimen of this species among Griffith's collection from Afghanistan at Kew. There are two specimens pasted on the type sheet of E. subulatum (E.persicum). The upper one is definitely Aucher Eloy's no. 4105 from Persia, which is quoted by Hooker f. also in Journ. Linn. Soc. Bot. v 165(1861). The lower specimen does not bear any label but is perhaps the Griffith specimen of this species from Afghanistan cited by Hooker f.

Both E.subulatum J.Gay and E. persicum Boiss. were published in 1842. Gay's publication definitely shows that it was published in the month of January. Therefore, I have followed Hooker f. and Thomson(1861) in recognizing the former as the valid name for the species.

10.\*\*E. persepolitatum Boiss. in Diagn. II (1853); B.F.O.203.

Syn: E. ischnostylum Freyn et Sint. in Bull. Herb. Boiss. ser.II iii 570 (1903); K.F.U.IIO.

Type: Persia, Persepolis, Kotschy no. 261(G, E!, K!)  
Perennial, 15-50 cm. tall, erect, branched, strict, hoary  
 with 2-4-partite appressed hairs. Radical leaves densely rosulate, narrowly oblanceolate, (2)4-7x0.15-0.4 cm., stalked, acute, entire. Cauline leaves linear, shortly stalked or sessile, acute; all leaves pubescent, entire.  
Racemes 15-45-flowered, ebracteate, corymbose above, increasing upto 20 cm. in fruits. Flowers 6-8 mm. across, yellow; pedicels 1-2 mm. long, increasing



upto 3 mm. in fruit. Sepals 5-6(-8)x1.4-1.7 mm. Petals 9-12x2-2.5 mm., oblong-obovate, long clawed, apex rounded. Stamens 7-8 : 8-9 mm.; anthers about 2 mm. long. Siliquae linear-terete, 2.5-4.2x0.8 cm., + straight; valves hairy with 2-4-partite appressed hairs, with a distinct mid-vein; style 1-1.5 mm. long, slightly thickened, stigma capitate, bilobed; seeds 20-30 in each loculus, about 1.2 x 0.5 mm., oblong-ellipsoid, brown; septum not veined.

Afghanistan:

Kurrum valley, between Alikhel and Bergal, Aitchison no. 475(K!)

Geog. Dist:

Persia: Persepolis, Kotschy no. 261(E!,K!); (without locality), Aucher Eloy no. 165(K!); West of Tehran, Cowan and Darlington no. 866(K!); North of Tehran, A.C. Trott no. 422(K!); Khorassan, above 1800 m., Aitchison no. 687 (K!); Hazar Cham, 2700 m., A.C. Trott no. 378(K!); Kerm-an shah, Th. Strauss (K!); Koh Bil, Stapf no. 689(K!).  
TransCaspicum region: Turkomania, Aschabad, Litwinow no. 216 a (E!); Aschabad, P. Sintenis no. 836(E!).

II. E. stocksianum (Boiss.) Boiss., Fl. Or. II 199 (1867).

Syn: Cheiranthus Stocksianus Boiss. in Diagn. ser. II 19 (1842);

H.f. et T. in Journ. Linn. Soc. Bot. v 136 (1861).

Type: Baluchistan, Kelat, Stocks no. 923(G,K!).

Biennial, 20-50 cm. tall, erect, branched; stems glabrous pale yellow, shining, somewhat glaucous. Lower leaves oblanceolate or spatulate, 4-12x0.5-2 cm., slightly toothed or subentire, shortly stalked or subsessile, apex rounded or obtuse; upper leaves oblong-elliptic, sessile, 1-5x0.3-1.5 cm., acute or subobtuse, + entire; all leaves densely covered with short, stellate, rough, rigid, white hairs. Racemes 12-25-flowered, panicled, ebracteate, increasing upto 20 cm. in fruits. Flowers 5-9 mm. across, yellow; pedicels 1.5-3 mm. long, increasing upto 5 mm. in fruit, slightly thickened. Sepals 5-6.5x1.1-1.3 mm. Petals 7-10x1.5-2.5 mm., spatulate, long clawed, lamina suborbicular. Stamens 4-4.5 : 5-6 mm.; anthers about 2 mm. long. Siliquae 3.5-8x0.1-0.15 cm., linear-oblong, subcylindrical, densely clothed with rough stellate hairs; style about 1 mm. long, with capitate, bilobed stigma; seeds many, about 1.6x0.6 mm., oblong-ellipsoid, black or dark brown; septum thin, not veined.

W. Pakistan:

Baluchistan: Yaru karez, 1500 m., abundant in stony ground, much grazed by animals, Lace no. 3477(E!,K!); Kelat, 1500 m., Stocks no. 923(K!); Sarsan, Harsukh no. 20462(K!); Quetta, Luthie no. 8590(K!,BM!); Quetta, Hydozae and Sinab, common on gravelly plains and stony grounds, Griffith nos. I439(K!) and I440(K!); Quetta, 1650 m., H. Crookshank nos. I27(K!) and I37(K!).

Afghanistan:

(without locality), Griffith no. I449(K!); Kandahar, 900 m., very common, hillsides and deserts, W.R. Hay no. 490(K!).

Geog. Dist: Probably endemic to the present area.

12. E. perofskianum F. et M. in Ind. Sem. Hort. Petrop. iv 36 (1841-1842); B.F.O. I89; S.E.P. 578.

Type: Not precisely designated ?

Biennial, 15-40 cm. tall, erect, sometimes woody at the base, rarely branched, hairy with bipartite-appressed hairs. Basal leaves + rosulate, oblong-elliptic or oblanceolate, 5-10x0.5-1.2 cm., stalked, denticulate to subentire, acute; cauline leaves 2-6x0.2-1 cm., oblong-elliptic, entire or toothed, acute, shortly stalked or sessile; all leaves hairy with bipartite-appressed hairs. Racemes 20-40-flowered, ebracteate, corymbose, increasing upto 15 cm. in fruits. Flowers 10-14 mm. across, orange-yellow; pedicels 2-5 mm. long, increasing upto 7 mm. in fruit, ascending. Sepals 7-8x1.5-1.8 mm. Petals 15-18x4-5 mm., spatulate, long clawed, lamina suborbicular. Stamens 8-10 : 10-13 mm.; anthers about 2.5 mm. long. Siliquae oblong-linear, 4-6x0.15 cm., terete; valves hairy with bipartite-appressed hairs, with a distinct mid-rib; style 3-5 mm. long with capitate, sub-bilobed stigma; seeds many, about 1.7x0.8 mm., oblong-ellipsoid, dark-brown; septum not veined.

W. Pakistan:

Baluchistan: cultivated (without locality), Stocks no. 824(K!).

Afghanistan:

Koonur, garden, Griffith no. I437(K!).

Geog. Dist: Probably native of Central and W. Asia. Introduced in Europe and probably also in Asia minor.

The original home of this species is uncertain. Schulz (Pflanzenfam. 1936) gives its geog. distribution as Afghanistan and Baluchistan. I have seen only two specimens, one from Afghanistan and one from Baluchistan, and they are both cultivated specimens, as is evident from the collectors' remarks.

13. \* E. erosum Schulz in Notizblatt ix IO8I (1927).

Type: Chitral (W. Pakistan), Kala Drosh, 1440 m., Harriss no. I590(B,K!).

Biennial, 30-60 cm. tall, sparsely branched, canescent with white, bipartite-appressed hairs. Basal leaves rosulate, sinuate-toothed, often runcinate-dentate, 3-4-jugate, obtuse, 5-6.5x0.5-0.8 cm., stalked; cauline leaves 2.5-6x0.15-0.5 cm., sinuate-dentate to entire, uppermost often linear and sessile; all leaves canescent. Racemes 30-40-flowered, ebracteate, corymbose above, increasing upto 25 cm. in fruits. Flowers 4-5 mm. across, yellow; pedicels 1-3 mm. long, not thickened, ascending. Sepals 3-4x1 mm. Petals 6.5-7.5x1.5-2 mm., spatulate, long clawed, apex rounded. Stamens 4-4.5 : 5-6 mm.; anthers about 2 mm. long. Siliquae 1.5-2.5(-3)x0.08-0.1 cm., linear-terete, erect, often slightly upcurved; valves canescent with bipartite-appressed, white, hairs, with a distinct mid-vein; style about 1 mm. long, slightly thickened with capitate, sub-bilobed stigma; seeds 8-10 in each loculus, 1.5-1.8x0.5 mm., oblong-ellipsoid, dark brown; septum not veined.

W. Pakistan:

Chitral: Kala Drosh, 1440 m., Harriss no. I590i(K!); Drosh 1350 m., Toppin no. I36(K!).

Geog. Dist: Endemic to Chitral (W. Pakistan).

14. E. thomsoni Hooker f. in Journ. Linn. Soc. Bot. v 165 (1862); F.B.I.154.

Type: N.W. Himalayas, Kunawar, 2400-3600 m., Thomson (K!).

Biennial or perennial (lower parts not seen), very branched, tall, erect, hoary with bipartite-appressed hairs. Cauline leaves small, linear-oblong or lanceolate, obscurely toothed, shortly stalked or sessile. Racemes about 15-flowered, lax, ebracteate. Flowers 7-8 mm. across,

yellow; pedicels 1-3 mm. long, increasing upto 10 mm. in fruit, slightly thickened. Sepals 5-6x1.4-1.7 mm. Petals 9-IIx2-2.5 mm., oblong-obovate, long clawed, apex rounded. Stamens 7-8 : 8-9 mm.; anthers about 2 mm. long. Siliquae linear-terete, elongated, 6-9x0.16-0.19 cm.; valves hairy with bipartite-appressed hairs; style 2-2.7 mm. long, thickened with capitate, subbilobed stigma; seeds 25-35 in each loculus, large, about 2.7x1 mm., oblong, ellipsoid, subterete, slightly winged towards the apex, brown; septum rigid, submembranous, not veined.

Only known from the type locality. Very closely allied to E. longisiliquum H.f. et T, which has a simple stem and broader leaves, and is recorded from the E. Himalaya only. Both the species are very little known. How far this very branched habit in one/<sup>species</sup> and not branched in the other is a constant character is not definitely known. It is possible that further records may reveal that they are conspecific.

Thomson's specimen does not bear the lower parts, so that it is difficult to say whether it is perennial or biennial. It is in fruiting stage with only few flowers.

15.\*E. aitchisonii Schulz in Notizblatt ix 1080 (1927).

Type: Afghanistan, Harirud valley, Aitchison no. 298(B,K!).

Biennial, 25-60 cm. tall, erect, robust, branched, hairy with bipartite-appressed hairs. Basal leaves + rosulate, oblanceolate, 5-8x0.5-1 cm., stalked, entire or slightly and distantly toothed, acute; cauline leaves 1.5-6x0.15-0.8 cm., oblong-elliptic or linear, shortly stalk-ed or sessile, entire or slightly toothed, acute. Racemes 30-50-flowered, ebracteate, corymbose above, increasing upto 30 cm. in fruits. Flowers 9-12 mm. across, yellow; pedicels 1-2 mm. long, increasing upto 5 mm. in fruit, thick and spreading. Sepals 6-8x1.6-2 mm. Petals 12-14x3-4 mm., obovate, long clawed, apex subtruncate. Stamens 8-9 : 9-11 mm.; anthers about 2 mm. long. Siliquae linear, subcylindrical, 4-5x0.1-0.12 cm., straight, spreading, often horizontal; valves pubescent with bipartite-appressed hairs, with a prominent mid-vein; stigma capitate, bilobed, sub-sessile ; seeds 25-32 in each loculus, about 1.4x0.9 mm., oblong-ellipsoid, brown; septum not veined.

Afghanistan:

Harirud valley, common in sandy loamy soil in open plains,  
Aitchison no. 298(K!); Gulran, profuse in sandy plains, Aitchison  
 no. 153(K!).

Geog. Dist:

Persia: Khorasan, between Meshhed and Turbate Haidari, Rechinger  
 f. no. 1546(K!).

16. \*E. melicentae Dunn in Kew Bull. 336 (1920); Schulz in Fedde, Rep. xxxi  
 333 (1933).

Syn: "E. odoratum" H.f. et T. in Journ. Linn. Soc. Bot. v 166  
 (1861) [non Ehrh., Beitr. vii 157 (1792)]; F.B.I. 154;

E. Parkeri Schulz in Notizblatt ix 1083 (1927).

Type: Kashmir, 2100-2400 m., Thomson(K!).

Key to the varieties

I. Racemes ebracteate:

2. Biennial; basal leaves 5-10 cm. long ..... var. 1. melicentae

2. Perennial; basal leaves mostly 10-15 cm. long, narrow,  
 elongated, sinuate-toothed ..... var. 2. falconerianum

I. Racemes bracteate ..... var. 3. multibracteatum.

var. I. melicentae

Biennial, 20-100 cm. tall, erect, stems simple or branched,  
 leafy, hairy with bipartite-appressed hairs. Basal leaves rosulate, oblanceo-  
 late, stalked, 5-10(12)x0.5-1 cm., obtusely toothed, sometimes entire,  
 rarely sinuate-dentate, apex obtuse or subobtuse. Cauline leaves oblong-  
 elliptic, lanceolate or linear, shortly stalked, 4-9x0.4-0.6 cm., entire or  
 slightly toothed. Racemes 20-70-flowered, ebracteate, corymbose, increasing  
 upto 15 cm. in fruits. Flowers large, 10-15 mm. across, yellow, sometimes  
orange-yellow; pedicels 4-10 mm. long, increasing upto 15 mm. in fruit.  
 Sepals 7-9x2.5-3.5 mm. Petals 12-20x6-9 mm., obovate, long clawed, apex  
 subrounded. Stamens 8-10 : 9-12 mm.; anthers about 3 mm. long. Siliquae—  
 3.5-7.5x0.1-0.15 cm., linear-terete; valves densely hairy with bipartite-  
 appressed hairs, with a prominent mid-rib; style 2-4 mm. long with large,

capitate, sub-bilobed stigma; seeds 15-20 in each loculus, large, about 1.5-2x1 mm., oblong, tetrangonate; septum not veined.

N.W.Himalayas:

Kashmir: Darwai pass, 2700 m., Winterbottom(K!); (without locality), Thomson(K!); South of Ferozepur nullah, close to Gulmarg, Melicent Wathem(K!); Lidder valley, Lidderwat, Inayat(K!); Tolian, Inayat(K!); Pass to Gurais, Winterbottom no. 530(K!); Pir Panjal, Jacquemont(K!); (without locality), 2700-3600 m, Thomson(K!); Sonmarg, Rich no. B 174(K!); Kishtawar, Thomson(K!); Astanmarg, 3600 m., Coventry no. 465(K!); Haribol, Drummond no. 12945(K!); Chorwan to Kamri, 2850 m., sunny hillside, R.Stewart no. 22627(K!); Sonmarg, 2400-2700 m., R.Stewart no. 6920 I/2 (K!); Kishtwar side, Seythan pass, 2700 m., R.Stewart no. 3080(K!); Matyan on the Dras rd. 3000 m., R.Stewart no. 7424(K!); Mt. behind Dal lake, R.Stewart no. 3289(K!); Sonmarg, 2700 m., R.Stewart nos. 3471(K!) and 9245(K!); Pahlgam, 2550 m., R.Stewart no. 5710 I/2(K!); Tragbol, 2610 m., R.Stewart no. 4929(K!); Mistahoi, Ladak Rd., 3000 m., R.Stewart no. 1006(K!); Atchilal, 1800 m., P.Timins no. 77(BM!); Sind valley below Baltal, 2700-3000 m., Duthie no. 11557(BM!); Ladak, Zojila, 2700-3300 m., Ludlow no. 812(BM!); (without locality), Palmer(BM!); 2700 m., Prescott-Decie(BM!); Dorikan, pass to Gures, Schlagintweit no. 7575(BM!); Ladak, 3150 m., Ludlow & Sherriff no. 8316(BM!); Zojila, 3450 m., Ludlow & Sherriff no. 8034(BM!); Barnej nullah, 3000 m., Ludlow & Sherriff no. 912(BM!); Mohmarg, 2250 m., Ludlow & Sherriff no. 8150(BM!); Jhelum valley, 1950 m., Ludlow & Sherriff no. 7718(BM!); Kishtawar, 2700 m., Ludlow & Sherriff no. 9229 (BM!);

Geog. Dist: Himalayas.

var.2. falconerianum Jafri, var. nov.

A typo habitu perenne, foliis valde elongatis angustis sinuato-dentatis divergit.

Perennis. Folia radicalia dense rosulata, elongata, linearia, sinuato-dentata, circa 15 cm. longa, acuta, dentibus triangularibus. Caulis simplex; folia caulina elongata. Flores typo similes. Siliquae immaturae.

Perennial, Radical leaves densely rosulate, elongated, linear, sinuate-dentate, about 15 cm. long, acute. Stems simple; cauline leaves elongated. Flowers as in the type race. Fruits immature.

N.W.Himalayas:

Kashmir: (without locality), Falconer's collector no. 2147 (Herb. East India Co. no. 175)(K!); 1500-3000 m.,

Thomson(K!).

Easily distinguished from the type race by its perennial habit, elongated, narrow, sinuate-dentate leaves.

[ Falconers specimens were included with double question marks in 'E. strictum' ]

var. 3. multibracteatum Schulz in Notizblatt ix 1084 (1927).

Type: Kashmir: Baltistan, Duthie no. 13834(B-not seen).

Racemes bracteate. Other characters like the type race.

N.W.Himalayas:

Kashmir: Baltistan, Duthie no. 13834(B-not seen).

Geog. Dist:

E.Himalaya: Sikkim, without collector's name (K!).

17. E. altaicum C.A.M. in Ledeb., Fl. Alt. iii 153 (1831); F.B.I.154.

Type: Altai, Ledebour (L,K!).

Perennial, 5-55 cm. tall, branched mostly from the base, erect, hoary with bipartite-appressed hairs. Basal leaves densely rosulate, narrowly oblong-linear or oblanceolate, stalked, entire or slightly toothed, very variable in size. Cauline leaves linear, sessile or sessile. All leaves 1-5 mm. broad, hairy with bipartite-appressed hairs. Racemes 20-50-flowered, corymbose, ebracteate, increasing upto 30 cm. in fruits. Flowers about 1 cm. across, yellow; pedicels 1-5 mm. long, increasing upto 10 mm. in fruit (rarely upto 17 mm. ). Sepals 7-8.5x2.5-3 mm. petals 12-18x5-8 mm., broadly obovate, long clawed, apex subtruncate. Stamens 7-9 : 9-10 mm.; anthers about 2.5 mm. long. Siliquae 4-12x0.15-0.25 cm., linear-oblong, terete, erect; valves hairy with bipartite-appressed hairs, with a prominent mid-rib; style 1.5-5 mm. long with capitate, subbilobed stigma; seeds many, large, 1.5-2x1 mm., oblong-ellipsoid, brown; septum rigid, not veined.

N.W.Himalayas:

Kashmir: Gilgit, Toppin no. 1037(K!); (without locality), Falconer's collector no. 3006(K!); Kurmi pass, 3300-3900 m., Giles no. 715(K!). (without locality); Jacquemont(K!).

Geog. Dist: C.Asia, westward to Asia <sup>M</sup> minor.

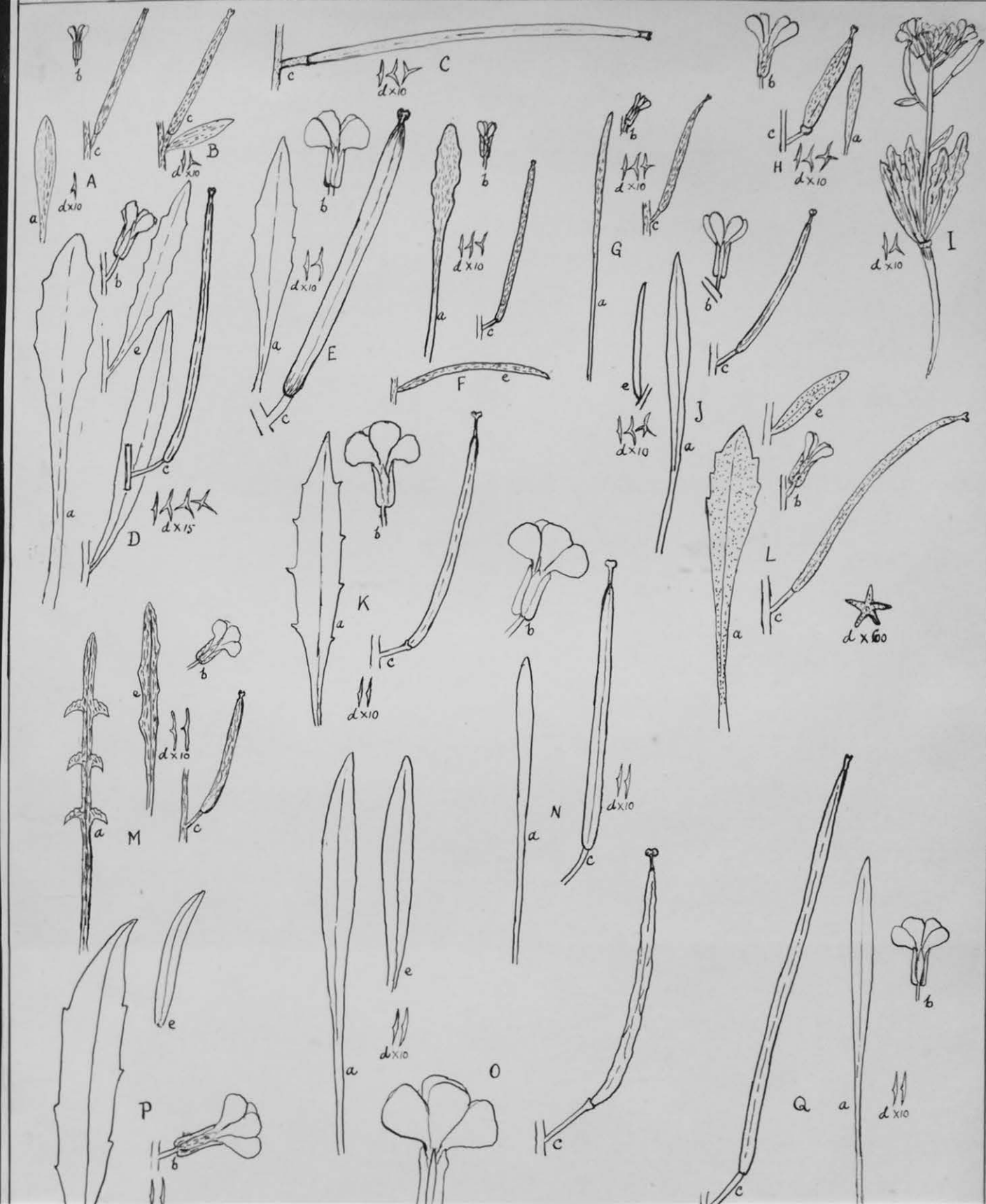


Fig. no. 24

Erysimum spp.

A - Erysimum sisymbrioides C.A.M.; B - E.griffithianum Boiss.; C - E.repandum L.; D - E.hieraciifolium L.; E - E.pachycarpum H.f.et T.; F - E.leucanthemum(Steph.)Fedtsch.; G - E.subulatum J.Gay; H - E.hookeri Boiss.; I - E.Schlagintweitianum Schulz; J - E.persepolitenum Boiss.; K - E.perofskianum F.et M.; L - E.stocksianum(Boiss.)Boiss.; M - E.erosum Schulz; N - E.altaicum C.A.M.; O - E.melicentae Dunn; P - E.aitchisonii Schulz; Q - E.thomsonii Hooker f. [a-radical leaf; b- flower; c- siliqua; d- hairs; e-cauline leaf]



78. CHEIRANTHUS L., Sp. Pl. ii 661 (1753); S.E.P.579.

Syn: Cheiri Adans., Fam. ii 418 (1763).; Erysimum sect. Cheir-anthus (L.)Wettst. in "Österr. Bot. Zeitscher. xxxix 283 (1889).

Perennial, herbaceous or suffruticose, erect; stems leafy, branched, covered with adpressed branched hairs. Leaves narrow, oblong-linear, entire or toothed, covered with similar hairs as on stems. Racemes ebracteate, corymbose above, increasing in length in fruits. Flowers large, yellow, rarely purple, pedicellate. Sepals erect, inner pair saccate at the base. Petals long clawed; lamina broad, obovate-orbicular. Stamens 6, not appendaged. Lateral nectariferous glands annular, median absent. Ovary linear-cylindrical, hairy, 16-60-ovuled; style short with bilobed (lobes often + spreading) stigma. Siliquae compressed-terete; valves hairy with branched adpressed hairs, with a prominent mid-rib and faint reticulate venation; seeds many, 1-2-seriate, compressed; septum membranous, not veined.

About 10 species from Maderia and the Canary IIs. to C.Asia, Himalaya and N.America.

It is represented by only one cultivated species, Cheiranthus cheiri L., in the present area. Hooker f. and Thomson in Jour, Linn. Soc. Bot. v 136-137 (1861) recognize 3 species, and Hooker f. and T.Anderson in Fl. Brit. India 133 (1872) four species. These all have been transferred to other genera as follows:

1. Cheiranthus Stocksianus Boiss. = Erysimum stocksianum (Boiss.) Boiss.
2. C. himalaicus H.f. et T. and C. himalayensis Camb. = Christolea himalayensis (Camb.) Jafri.
3. Cheiranthus Griffithii H.f. et T. = Erysimum hookeri Boiss.
4. C. parryoides Kurz. = Phaeonychium parryoides (Kurz) Schulz.
5. C. Stewartii T.Anders. = Christolea stewartii (T.Anders.) Jafri.
6. C. albifloras T.Anders. = Christolea albiflora (T.Anders.) Jafri.

Cheiranthus is best distinguished from Erysimum by the absence of median nectariferous glands. It has also entirely different habit & characters from Christolea (Ermania) and Phaeonychium.

Cheiranthus cheiri L., Sp. Pl. ii 661 (1753); B.F.O. 185; Clapham et al., Fl. Brit. Isles 227 (1952).

Type: Europe (not precisely designated) no. 2 (LS!).

Perennial, 20-60 cm. tall; tap root slender; stems leafy, woody below, angled, covered with branched appressed hairs. Basal leaves rosulate, oblanceolate or linear, 5-10 cm. long, shortly stalked; cauline leaves many, often crowded, subsessile; all leaves oblong-lanceolate or oblanceolate, entire, hairy with branched, appressed hairs especially beneath. Flowers 20-25 mm. across, bright orange-yellow. Sepals erect, inner pair saccate. Petals at least twice as long as the sepals. Siliquae 2.5-7 x 0.2-0.4 cm.,  $\pm$  erect on ascending 5-15 mm. long pedicels; valves hairy with branched-appressed hairs, with a prominent mid-rib; seeds many, uniseriate, sometimes sub-biseriate, about 3 mm. long, suborbicular, winged at the apex, pale brown.

Afghanistan:

Nooner, Badshah's garden, Griffith (K!).

Geog. Dist:

Native of the eastern Mediterranean region—on limestone cliffs (verbal information from Dr. P.H. Davis, Royal Botanic Garden, Department of Botany, Edinburgh). Naturalized widely in Europe through cultivation.

An important ornamental plant with several different-coloured varieties. Cultivated in gardens throughout the present area.

79. \*PYCNOPLINTHUS Schulz in Pflanzenreich (86) 198 (1924); S.E.P. 583.

Perennial, densely caespitose, glabrous, small herbs; caudex thick, slender. Rosette leaves linear, sessile, fleshy, glabrous, acute. Scapes 1-flowered, about as long as the leaves, filiform. Flowers large, white. Sepals erect or suberect, caducous, subequal, obtuse, glabrous, inner pair subsaccate at the base. Petals about twice as long as the sepals, obovate-cuneate, apex truncate or subemarginate, densely veined. Stamens 6, erect, not appendaged; anthers oblong, subobtus. Lateral nectariferous glands semiannualr, median present, torose, joining the laterals. Ovary oblong, sessile, about 12-ovuled; style short, thickened with capitate, subbilobed stigma. Siliquae short, oblong, subcylindrical, often curved above,

subtorulose, bilocular, dehiscent; valves glabrous, subconvex, thickened, slightly reticulately veined; seeds uniseriate, large, ovoid, not mucous when wet; septum white, submembranous, obscurely I-veined.

One species in Tibet .

Pycnoplithus uniflorus (H.f.et T.)Schulz in Pflanzenreich (86) 199 (1924);  
S.E.P.583.

Syn: Braya uniflora H.f.et T. in Journ. Linn. Soc. Bot. v 168  
(1861); F.B.I. 155; Sisymbrium uniflorum Fourn., Rech. Crucif.  
133 (1865); Hesperis uniflora O.K! Rev. Gen. ii 935 (1891).

Type: W.Tibet: Nubra, 4500-5100 m., Thomson(K!).

Perennial, caespitose, glabrous; caudex 5-7 mm. thick, fusi-  
-form, slender, with persistent leaf bases. Radical leaves narrowly linear,  
1-2x0.15-0.2 cm., entire, subsessile or sessile, acute, glabrous. Scapes  
I-flowered, the flowers protruding above the leaves. Flowers 6-8 mm. across,  
white turning to pale violet, Sepals 3.2-3.5x1.2-1.5 mm. Petals 5.5-6x2-2.5  
mm., obovate-cuneate. Stamens 3-3.5 : 3.5-4 mm.; anthers about 1 mm. long.  
Siliquae oblong-linear, subcylindrical, 10-15x1.4-1.6 mm., ± curved above;  
valves glabrous, subconvex, faintly reticulately veined; style short, thick  
with capitate, subbilobed stigma; seeds uniseriate, 5-6 in each loculus,  
about 1.5x1 mm., ovoid, brownish, finely reticulated ; septum white, with  
a faint mid-vein.

N.W.Himalayas:

Nubra, 4500-5100 m., Thomson(K!).

Geog. Dist:

Tibet: 5280 m., sandy gravelly soil, flowers white, Thorold  
no. 23(K!); 5100 m., flowers white with faint purple  
veins; root when split smells something like horse radish,  
A.Pike no. 809(K!); 4950 m., Welby & Malcolm (K!);  
Yarkand expedition, Henderson no. 34((K!);

Tribe X. Sisymbrieae — according to O.E.Schulz in Pflanzenreich  
(86) 1924; S.E.P.584.

Lateral nectariferous glands semiannular or annular, open towards the inner side, rarely in pairs and short; median often joining the laterals, torose and + thickened in the middle, rarely short, conical and not joining the laterals. Hairs simple or branched, sometimes absent, often rigid or ciliate, rarely glandular. Sepals suberect or spreading. Stamen filaments not appendaged but sometimes broad at the base; anthers often oblong, obtuse. Stigma depressed-capitate, often sub-bilobed. Fruits usually long(siliquae), rarely short(siliculae); valves often + convex and rigid; style mostly short, rarely absent; septum usually complete, rarely perforated or absent, not or 1 - veined, rarely 2 - 4 - veined; seeds usually oblong, very rarely winged.

The 15 genera of this tribe are classified as follows into 7 subtribes:

Key to the 7 subtribes

- I. Leaves simple or lyrate-pinnatifid; plants rarely glandular:
  2. Seeds not mucous when wet:
    3. Seeds large, longitudinally striated; basal leaves cordate  
..... 1. Alliariinae.
    3. Seeds small, not striated but granulated or reticulated; basal leaves not cordate:
      4. Median nectariferous glands joining the laterals; laterals + annular:
        5. Fruits (siliquae) elongated, linear .....2. Sisymbriinae.
        5. Fruits (siliculae) short, mostly oblong .....  
.....3. Pachycladinae.
      4. Median nectariferous glands not joining the laterals; laterals mostly in pairs, short .....4. Brayinae.
  2. Seeds mucous when wet:
    6. Radical or basal leaves + stalked; glands not separated; funicle becoming straight .....5. Arabidopsidinae.

6. Radical or basal leaves sessile; glands separated; funicle not becoming straight ..... 6. Camelininae.

I. Leaves bipinnatifid; plants usually glandular... 7. Descurainiinae.

Subtribe i. Alliariinae O.E.Schulz in Pflanzenreich (86) 19 (1924); S.E. P. 584.

80.(I) Alliaria Scop.

Subtribe ii. Sisymbriinae O.E.Schulz l.c. 45; S.E.P. 590.

81.(2) Sisymbrium L. 82.(3) Microsisymbrium O.E.Schulz.

Subtribe iii. Pachycladinae O.E.Schulz l.c. 181; S.E.P. 614.

83.(4) Arcyosperma O.E.Schulz. 84.(5) Aphragmus Andr.

Subtribe iv. Brayinae O.E.Schulz l.c. 204; S.E.P. 625.

85.(6) Streptoloma Bunge 86.(7) Torularia (Coss.) Schulz

87.(8) Braya Sternb. et Hoppe.

Subtribe v. Arabidopsidinae O.E.Schulz l.c. 256; S.E.P. 636.

88.(9) Arabidopsis Heyn. 89.(10) Cymatocarpus O.E.Schulz.

Subtribe vi. Camelininae O.E.Schulz in Pflanzenfam. (17 b) 647 (1936).

90.(II) Camelina Crantz.

Subtribe vii. Descurainiinae O.E.Schulz in Pflanzenreich (86) 304 (1924); S.E.P. 649.

91.(12) Descurainia Webb et Berth. 92.(13) Sophiopsis Schulz

93.(14) Smelowskia C.A.M. 94.(15) Robeschia Hochst.

#### Key to the 15 genera of the tribe Sisymbrieae

I. Leaves simple or lyrate-pinnatifid:

2. Seeds not mucous when wet:

3. Seeds large, longitudinally striated; basal leaves cordate

.....80. Alliaria

3. Seeds small, not striated; basal leaves not cordate:

4. Lateral nectariferous glands + annular; median usually joining the laterals; hairs mostly simple or forked, often ciliate; siliquae glabrous or not conspicuously hairy:

5. Fruits large (siliquae); flowering axis usually long, many flowered, + erect; basal leaves usually lyrate-stalked; seeds 1-seriate:

6. Plants usually robust; flowers mostly yellow; lateral nectariferous glands quadrat<sup>e</sup> or hexagonal; valves + 3 - veined  
 .....81. Sisymbrium
6. Plants usually small; flowers mostly white; lateral nectariferous glands simply annular; valves I - veined ...  
 .....82. Microsisymbrium
5. Fruits small (siliculae); flowering axis short, usually few-flowered, suberect or ascending; basal leaves obovate, subsessile or sessile; seeds 2 - seriate:
7. Racemes bracteate (rarely ebracteate above); ovary 6 - 12 - ovuled .....84. Aphragmus
7. Racemes ebracteate; ovary about 36 - ovuled .....  
 .....83. Arcyosperma
4. Lateral nectariferous glands + in pairs, small; median not joining the laterals; hairs usually short, rigid, simple or branched; fruits usually hairy (scabrous):
8. Hairs bi-partite appressed .....85. Streptoloma
8. Hairs simple or branched, often rigid, not appressed:
9. Plants annual or biennial, very rarely perennial, never caespitose, usually densely hairy (scabrous); siliquae + torulose; valves often scabrous; seeds uniseriate .....86. Torularia
9. Plants perennial, caespitose, hairy to glabrous; fruits (mostly siliculae) slightly or not torulose; valves glabrous; seeds + biseriate .....87. Braya
2. Seeds mucous when wet:
- IO. Siliquae linear, subcylindrical, rarely compressed; radical leaves + stalked:
- II. Flowers small, usually white or lilac; pedicels suberect or ascending; hairs short; cauline leaves sessile, auricled or cuneate at the base .....88. Arabidopsis
- II. Flowers mediocre, yellow; pedicels spreading or deflex<sup>e</sup>; hairs long (ciliate); cauline leaves + stalked .....  
 .....89. Cymatocarpus

10. Siliculae ellipsoid or pyriform; radical leaves sessile ...

..... 90. Camelina

1. Leaves mostly bipinnatifid with narrowly oblong or linear lobes:

12. Annuals or biennials, erect:

13. Pedicels very short, thick; siliquae + tetragonal ..

..... 94. Robeschia

13. Pedicels long, filiform, spreading or ascending:

14. Fruits(siliquae) linear, subcylindrical, often

curved ..... 91. Descurainia

14. Fruits(siliculae) short, ellipsoid or oblanceolate

..... 92. Sophiopsis

12. Perennials, caespitose, suberect or ascending .....

..... 93. Smelowskia.

80. \*ALLIARIA Scop., Fl. Carniol. 515 (1760); DC., Prodr. i 196 (1824);  
B.F.O. 212; S.F.20; S.E.P. 584; K.F.U. 31.

Syn: Sisymbrium sect. Alliaria Koch, Syn. 49 (1835); Pallavi-  
-cinia Cocconi, Fl. Bol. 94 ex Caruel in Parlat. Fl.  
Ital. ix 934 (1893).

Annual or biennial, rarely perennating with a slender tap root having an odour of garlic, erect, branched, sparsely hairy below with simple hairs, + glabrous above. Leaves simple, petiolate, ovate-cordate, dentate. Racemes ebracteate, corymbose above, lax and flexuose in fruit. Flowers small, white; pedicels spreading, thickened in fruit. Sepals erect, subequal, not saccate. Petals about twice as long as the sepals, obovate-oblong, cuneate at the base. Stamens 6, not appendaged; anthers obtuse or subapiculate. Lateral nectariferous glands annular, subangular; median broadly conical, hardly joining the laterals. Ovary cylindrical-tetrate, 4 - 18 - ovuled; style short with depressed-capitate hardly bilobed stigma. Siliquae broadly linear, + tetragonal, bilocular dehiscent; valves + 3 - vined; seeds uniseriate, large, oblong, longitudinally striated, non mucous when wet; placenta thickened; septum membranous, white, not veined.

Two species, one widespread in Europe and Asia, also in

N.Africa and the other is confined to Caucasus.

Alliaria petiolata (Bieb.) Cav.& Grande in Bull. Or.Bot.Napoli iii  
418 (1913); Clapham et al., Fl. Brit. Isles 228 (1952).

Syn: Arabis petiolata Bieb., Fl. Taur. Cauc. ii 126 (1808-1819);  
Erysimum Alliaria L., Sp. Pl. 660 (1753); Sisymbrium  
Alliaria (L.) Scop., Fl. Carniol. ii 26 (1772); F.B.I.151;  
Alliaria officinalis Andrzej. ex M.B., Fl. Taur. Cauc. iii  
445 (1819).

Type: Iberia, Steven (L- not seen).

Annual or biennial, rarely perennating, 20 - 120 cm. tall,  
erect, sparsely branched or simple, glabrous above, sparsely hairy below.  
Basal leaves loosely rosulate, often large, long petioled with reniform  
to cordate, toothed lamina; cauline leaves 2 - 12 x 1 - 6 cm., lamina  
ovate to triangular, often + cordate, petiolate; all leaves membranous,  
pale green, and smelling of garlic when crushed. Racemes 12 - 30- flowered,  
corymbose above, bracteate, increasing upto 30 cm. in fruit. Flowers 3 -  
5 mm. across, white; pedicels 3 - 4 mm. long, increasing upto 8 mm. in  
fruit, strong, thickened, spreading. Sepals 2 - 2.5 x 0.8 - 1.2 mm.  
Petals 5 - 6 x 1.8 - 2 mm., obovate-oblong, cuneate at the base, apex  
rounded. Stamens 2.5 - 3 : 3.5 - 4 mm.; anthers about 1 mm. long. Siliquae  
~~broadly~~ linear, + quadrangular, 3.5 - 6 x 0.2 cm.; seeds many, about  
3 x 1 mm., Oblong, almost black, longitudinally striated; septum not veined.

W. Pakistan:

Chitral: Drosh, 1350 m., Toppin no. 105(K!); Ziarat, 2250 m.,  
Harriss no. 15890(BM!).

N.W.F.P: Nathiagali, H.Deane(K!); Kaghan valley, 2400 m., Inayat  
nos. 19195(K!) and 19196(K!).

Punjab: Between Rohoulah and Mehabad, Jacquemont(K!).

Baluchistan: Ziarat, 2400 m., on limestone soils on hillside,  
H.Crookshank no. 214(K!).

Afghanistan:

Shalizan to Habibkalla, Aitchison no. 91(K!); (without locality),  
Griffith(K!);

N.W.Himalayas:

Bashahr state, Ralli forest, 2400 m., Lace no. 189(E!); Simla,  
Nagkunda, 2700 m., Watt nos. 8360(E!) and 13521(E!); Buspa, 1800  
m., Watt no. 4858(E!); Pangri, 2700 m., Watt nos. 2921(E!) and



2937(E!) and 818(E!); Chamba, R. Ellis no. 124(K!); Simla, above Matiyana, 2850 m., Gamble no. 6068 A(K!); Simla, Matiyana, Collett no. 10(K!); (without locality), Royle(K!); Thomson(E!, K!); Under Shioli, Edgeworth no. 104(K!); Chenab valley, Purti, 2250 m., R. Ellis no. 1024(K!); Kumaon, Strachey & Winterbottom (K!); Jaunsar, Gamble no. 24147(K!); Tihri-Grahal, Nila valley, Duthie no. 910(BM!);  
 Kashmir: Aliabad, 2700 m., Clarke no. 28637 B (BM!); Duli, R. Stewart no. 23781(R-E!); Sonmarg, 2700 - 3000 m., R. Stewart no. 6288(K!); Haripur, 2400 m., Clarke no. 28664 A(K!); Sonmarg, 2820 m., H. Rich no. 1105(K!).

Geog. Dist: Europe, N. Africa & Orient, C. and N. Asia.

81. SISYMBRIUM L., Sp. Pl. ii 657 (1753); S.P.46; S.E.P. 590; K.F.U. 38.

Syn: Norta Adans., Fam. Pl. ii 417 (1763); Leptocarpaea DC., Syst. ii 201 (1821); Klukia Andr. ex DC., Syst. ii 460 (1821); Chamaeplium Wallr., Sched. Crit. i 376 (1822); Cheirinia Link, Enum. Pl. Hort. Berol. ii 171 (1822); Valerum Reichenb., Mossl. Handb. 2. Aufl. ii. 1103 (1828); Tonguea Endl., Gen. suppl. 1419 (1840); Irio Fourr. in Ann. Soc. Linn. Lyon. N.S. xvi 331 (1868); Schoenocrambe Greene in Pittonia iii 124 (1896).

Annual to perennial, often robust, erect, rarely suberect, branched, glabrous or hairy with simple, rarely furcate hairs, very rarely clothed with branched hairs. Leaves mostly lyrate-pinnatifid, rarely runcinate or simple, petiolate, sometimes amplexicaule. Racemes ebracteate, rarely bracteate. Flowers often small or mediocre, rarely large, usually yellow rarely white or lilac. Sepals erect, rarely suberect, outer two oblong, obtuse, inner two broad, hardly or not saccate at the base, obtuse and often slightly hooded at the apex. Petals obovate-oblong or narrowly spatulate, apex rounded or subtruncate. Stamens six, erect or the outer two sometimes suberect or curved at the base; filaments often broad at the base; anthers oblong, obtuse or subobtuse. Lateral nectariferous glands annular, quadrate or hexangular, median joining the laterals, often stipitate in between the stamen bases or torose. Ovary cylindrical, sessile, 6 - many ovuled; style short, thickened, often about as thick as the apex of the siliquae; stigma depressed-capitate, often bilobed rarely peltate. Siliquae linear, subcylindrical or cylindrical, often elongated, tapering

erect or curved, bilocular, dehiscent; valves mostly glabrous, usually 3 - veined; septum hyaline rarely subfungosous, rigid or soft, not veined rarely 1 or 2 veined; seeds uniseriate rarely sub-biseriate, oblong or ellipsoid, 0.7 - 2.5 mm. long, brown, never mucilaginous when wet.

About 80 species mostly in the temperate zone of both hemispheres.

Only 9 species occur in the present area. Of these one is new to science, and 6 are new records for the present area.

O.E.Schulz's treatment of the genus Sisymbrium is followed here. Therefore, The 18 species of Sisymbrium recorded in the Fl. Brit. India (1872) have been split into 7 genera, Alliaria, Arabidopsis, Torularia, Microsisymbrium, Descurainia, Eutrema, and, of course, Sisymbrium. Two other genera, Sophiopsis and Cymatocarpus, recorded for the first time for the present area here, were also described by Schulz (S.P.1924, and S.E.P. 1936) and based on species known under Sisymbrium. Eutrema does not occur in the present area (see discussion under Arcyosperma and Thlaspi). These genera are fairly distinct. Their distinguishing characters are underlined in their generic descriptions and also discussed to some extent under each genus.

Even after splitting the genus Sisymbrium into several other genera it still has about 80 species. It is primarily distinguished by its robust habit, glabrous or hairy with usually simple hairs; leaves mostly lyrate-pinnatipartite; flowers usually yellow, mediocre; sepals subequal, laterals hardly or not saccate, often somewhat hooded at the apex; filaments often broad at the base; lateral nectariferous glands annular, quadrate or hexagonal, medians connecting the laterals; style thickened, about as thick as the apex of the pods; siliquae linear, subcylindrical or cylindrical with 3-veined valves; seeds never mucilaginous when wet.

Sisymbrium septulatum DC., S. rigidulum Decaisne and the present new species, S. pakistanicum Jafri need a word. Boissier (Fl.Or. 1867) misidentified the specimens of S. septulatum from the Orient as S. pannonicum Jacq. This was clarified by Schulz in Pflanzenreich(1924). Hooker f. and Thomson confused specimens from W.India (W.Pakistan) by forcing them into S.rigidulum - a species confined to Sinai. Later on

Schulz (S.P.1924) recognized S. rigidulum as a 'proles' of S. septulatum, and also included specimens from the present area under it.

S. septulatum is quite distinct from S. rigidulum except for the resemblance in flower size and septulate septum. The leaf character in the two species is very distinct. In S. septulatum the plants are tall and robust with + lyrate and runcinate leaves and many-flowered long racemes with much larger fruits (plate no. LVII), while in S. rigidulum the plants are short, leaves are not runcinate, and racemes are few-flowered. The ~~XXXX~~ former is common throughout <sup>the</sup> Orient while the latter is confined to Sinai (Map no. 4).

The present new species, S. Pakistanicum, is closely allied to S. rigidulum but is very distinct in certain characters as discussed in the synopsis of the new species. It is distinguished primarily by its pale lilac flowers; long pedicels, slightly ~~erect~~ thickened, but never as thick as in the above two species, often spreading; short, somewhat recurved fruits; ~~that are~~ acute with a minute stigma and very short style; and above all, septum not septulate. (Plate no. LVIII). This new species is confined to W. Pakistan extending into the borders of Afghanistan (Map no. 4). Thus, it is separated from S. rigidulum of Sinai by a wide gap.

Sisymbrium is divided into about 14 sections, and out of these the present 9 species fall into only 4 sections:

Key to the 4 sections:

I. Siliquae linear:

2. Stigma depressed-capitate; siliquae spreading or hanging on + deflexed pedicels ..... sect. I. Grypolobus
2. Stigma + bilobed, erect; siliquae + erect or ascending on upcurved or suberect pedicels :
  3. Pedicels in fruit filiform or slightly thickened at the apex only ..... sect. 2. Irio
  3. Pedicels in fruit thickened, often about as thick as the pods ..... sect. 3. Pachypodium

I. Siliquae conical . ..... sect. 4. Oxycarpus.

The section Grypolobus is central Asian and consists of only two species, S. heteromallum C.A.M. and S. brassiciforme C.A.M., both occurring in the present area. Schulz (S.P.1924) included 3 species under it,

but the third, S. decipiens Bunge, is nothing but a state of S. loeselii L., of the section Irio, with its erect or ascending pedicels and erect siliquae. (see full discussion under S. loeselii).

The section Irio is divided into two subsections and consists of about 20 species. The subsectio Leptocarpaea has about 12 species, which also includes S. irio L. and S. loeselii L., of the present area.

The section Pachypodium now consists of 5 species (including the present new species), and all of these except S. rigidulum occur in the present area. Schulz (S.P. 1924) gives the petal character for the section as, 'petala flava'. I find petals mostly pale yellow or white for S. septulatum, pale lilac or lilac for S. pakistanicum. The other two species of this section are S. altissimum L. and S. orientale L.

The section Oxycarpus, consisting of only two species, is represented by one species, S. erysimoides Desf. in the present area.

"S. salsugineum" Hooker f. et Thomson [Journ. Linn. Soc. Bot. V. 159 (1861)] is a misidentification of Conringia persica Boiss.

Sect. I. Grypolobus O.E. Schulz in Pflanzenreich (86) 84 (1924); S.E.P. 597.

I. S. heteromallum C.A.M.      2. S. Brassiciforme C.A.M.

Sect. II. Irio DC., Syst. ii 463 (1821); S.E.P. 597

subsect. Leptocarpaea (DC.) Thellung in Hegi, Ill. Fl. Mitteleurope iv 157 (1916); S.P. 87; S.E.P. 597.

3. S. irio L.      4. S. loeselii L.

Sect. III. Pachypodium (Webb et Berth.) Fourn., Recherch Crucif. 86 (1865); S.P. 116; S.E.P. 598.

5. S. altissimum L.      6. S. orientale L.

7. S. septulatum DC.      8. S. pakistanicum Jafri.

Sect. IV. Oxycarpus Paoletti in Fl. Anal. Ital. i 431 (1865); S. erysimoides Desf  
Key to the species:

I. Pedicels thickened in fruit, often about as thick as the pods:

2. Pods linear oblong:

3. Cauline leaves pinnatisect:

4. Pedicels 4 - 6 mm. long in fruit, about as thick as the pods;  
flowers yellow or white:

5. Petals 1.5 - 1.7 mm. broad ..... 5. S. altissimum

5. Petals 3 - 5 mm. broad ..... 7. S. septulatum

4. Pedicels (6-) 10 - 15 mm. long, slightly thickened in fruit,

never as thick as the pods; flowers pale lilac.....

..... 8. S. pakistanicum

3. Cauline leaves hastate .....6. S. orientale

2. Pods conical oblong .....9. S. erysimoides

I. Pedicels not thickened in fruit:

6. Siliquae erect; stigma + bilobed:

7. Flowers minute; petals 2-3 mm. long .....3. S. irio

7. Flowers mediocre; petals 5-6 mm. long ...4. S. loeselii

6. Siliquae + spreading, recurved; stigma depressed-capitate:

8. Flowers small; petals 3-4.5 mm. long ...1. S. heteromallum

8. Flowers mediocre; petals 7-9 mm. long ...2. S. brassiciforme.

1\*S. heteromallum C.A.M. in Ledeb., Fl. Alt. iii 132 (1831) et Ic. Fl.

Ross. iii 20 t. 263 (1831); S.P.84; S.E.P. 597; R.F.U. 43.

Syn: S. dahuricum Turcz. in Fourn., Recherch Crucif. 97 (1865);

Hesperis heteromalla (C.A.M.) O.Ktze., Rev. Gen. ii 934

(1891); H. dahurica O.K., l.c 934.

Type: Altai, Tschrysch, Ledebour (L- not seen).

Annual or biennial, 30 - 90 cm. tall, erect, branched above, + hairy below with simple rarely forked hairs (hairs long ciliate, rigid), rarely glabrous. Lower leaves shortly petioled, lyrate-pinnatifid, 3 - jugate; terminal lobe oblong-ovate, acute, irregularly toothed; lateral lobes oblong, confluent, shortly toothed. Upper leaves shortly petioled, pinnatifid; terminal lobes oblong-lanceolate or broadly linear, acute; lateral lobes oblong, entire or subentire; basal lobes often recurved. All leaves sparsely hispid to glabrous. Racemes 30 - 45 -flowered, ebracteate, corymbose, increasing upto 25 cm. in fruit and becoming lax. Young fruits characteristically overtopping the flowers. Flowers minute, 3 - 3.5 mm. across, pale yellow, pedicellate; pedicels 5 - 10 mm. long, filiform, increasing upto 15 mm. in fruits and becoming + recurved. Sepals 3 - 3.5 x 1 mm., linear, subobtuse. Petals 3 - 4.5 x 1 - 1.2 mm., oblanceolate, apex rounded. Stamens 3-3.5 : 3.5-4 mm.; anthers about 1 mm. long, linear, obtuse. Siliquae linear-oblong, subcylindrical, 6-8x0.7-1 mm.; valves membranous, 3-veined, glabrous; style short (about 0.5 mm. long), with depressed-capitate stigma; septum membranous, not veined; seeds 25 -

30 in each loculus, 0.7 - 1 x 0.5 mm. , oblong-ellipsoid, brown, finely granulated.

Afghanistan:

North of Hindukush, Giles(E!).

N.W.Himalayas :

Chamba, Pangi valley, R.Ellis(K!); Kunawar, 2700-3300 m., Thomson(K!);

Kashmir; Baltistan, 1800 m., F.Ludlow no. 270(BM!).

Geog. Dist:

C.Asia:

Tibet: Nangartse, c. 4500 m., Walton(K!); Gyangtse, Walton no.91(K!).

Selengam, Turczavinow(K!).

China: Peking, Cowdry(K!).

2.\*S. brassiciforme C.A.M. in Ledeb., Fl. Alt. iii 129 (1831) et Ic. Pl. Ross. iii t. 204 (1824); S.E.P. 597; S.P. 85; K.F.U. 43.

Syn: "S. Columnae"Hooker f. et Thomson in Journ. Linn. Soc. v 157 (1861) et F.B.I. 150 (non Jacq.); Hesperis brassiciformis O.K. l.c. 934; S. iscandericum Komarov in Trav. Soc. Nat. St. Petersb. Bot. xxvi 95 (1898); S. ferganense Korsh. in Bull. Acad. Sc. St. Petersb. ser.V, ix(5) 412 (1898).

Type: Altai, Mt. Arkaul, Ledebour(L- not seen).

Biennial, 40 - 80 cm. tall, subglabrous, glaucescent, erect, branched. Lower leaves shortly petioled, lyrate-pinnatifid, 1-2-jugate; terminal lobe elongated, ovate-oblong, obtuse, distantly toothed; lateral lobes small, ovate-oblong, toothed or subentire. Middle cauline leaves with broadly lanceolate terminal lobes, acute, slightly hastate. Upper leaves usually narrowly linear, entire or sinuate-toothed, sessile or cuneate at the base, acute. All leaves subfleshy. Racemes 20-60-flowered, ebracteate, corymbose, increasing upto 25 cm. in fruit. Flowers mediocre, about 5 mm. across, yellow; pedicels 3-5 mm. long, filiform, increasing upto 10 mm. in fruit, spreading, often deflexed, not thickened. Sepals 5-6x1.5 mm., Petals 7-9x1.5-1.8 mm., oblong-cuneate, apex rounded. Stamens about 6 : 7 mm. ; anthers 1.5-1.8 mm. long. Siliquae oblong-linear, elongated, subcylindrical, often recurved, 6-10x0.1 cm.; valves glabrous, sub-

-membranous, 3-veined; style 0.5-1.5 mm. long, thickened with coronate depressed-capitate stigma; septum membranous, not veined; seeds 40-50 in each loculus, oblong-ellipsoid, about 1 x 0.5 mm., brown, finely granulated.

W. Pakistan:

Chitral: Yarkhun, 2550 m., Toppin no. 371(K!).

Baluchistan: Ziarat, 2550 m., Lace no. 3952(E!,K!); Urak, Zarghoun, 2100 m., H. Crookshank no. 381(K!).

Afghanistan:

Kaloo-youurt, Griffith nos. 1536(K!), and 1537(K!); Kurrum valley, Shalizan, Aitchison no. 135(K!); Alikhel, Aitchison no. 547(K!); North of Hindukush, Urgan Wakhan, 2640 m., Giles no. 127(K!).

N.W. Himalayas:

(Without locality), Edgeworth(K!); Jaeschke (K!); Kunawar, 2700-4200 m., Thomson(K!); Spiti, 3900 m., Gill no. 1979(K!); Keylang, water course, 4200 m., Drummond no. 20236(K!).

Kasmir: Sonmarg, 2700 m., R. Stewart(K!); Gilgit, Taner no. 96(K!); Gilgit, Shah Salim, 2910 m., Giles no. 180(K!); Gilgit, 3000 m., river banks, dry sheltered spot, Thornley no. 29(BM!); Ladak, 3900 m., Ludlow & Sherriff no. 8432(BM!); Baltistan, Hunter-Weston no. 10169(K!); Shagarth, valley, 2700-3000 m., Duthie(no. 12119(K!); Jamu, Badri pass to Bhadrar, Schlagintweit no. 3110(BM!); Charwan, Kishenganga valley, R. Stewart no. 22626(R-E!).

Karakorum: 3600 m., Clarke no. 30152(K!); and no. 30152 C(BM!); Hispar glacier, 3300-4500 m., Russell no. 1225(BM!).

W. Tibet: Chango piti, 3000-3900 m., Thomson(K!); Zaskar, Schlagintweit(BM!).

Geog. Dist: C. Asia.

3. S. irio L., Sp. Fl. 659 (1753); F. BI. 150; S. P. 89: S. E. P. 597; K. F. U. 44.

Syn: Descurainia Irio Webb et Berth., Phyt. Canar. i 73 (1840);

S. irioides Boiss. in Ann. Sc. Nat. ser. II xvii 76 (1842) et

B. F. O. 218; Hooker f. et Thomson in Journ. Linn. Soc. Bot.

v 157 (1861); "S. subhastatum" Edgeworth ex H. f. et T. l. c.

(non Hrnem., Enum. Fl. Hort. Hafn. 37 (1807)); Erysimum

Irio Rupr., Fl. Cauc. in Mem. Acad. St. Petersb. ser. VII

xv (2) 89 (1869); Crucifera Irio Krause, Sturm. Fl. Deut.

2 Aufl. vi 81 (1902); Norta Irio Britt. in Ill. Fl. North

U. S. ii 174 (1913); S. Irio var. irioides (Boiss.) O. E. Schulz

in Pflanzenreich (86) 93 (1924).

Type: Europe (not precisely designated) no. 14(LS!).

Annual or biennial, 10 - 60 cm. tall, erect, branched, glabrous or hairy with simple hairs. Lower leaves deeply pinnately lobed, 2-6-jugate, very variable in size; terminal lobe ovate, obtuse, irregularly and distantly toothed or sublobulate; lateral lobes ± alternate. Upper leaves 1-4-jugate; terminal lobe elongated, lanceolate, acute with ± hastate bases; lateral lobes oblong, acute, often recurved. Racemes 40-100-flowered, ebracteate, corymbose above, increasing upto 30 cm. in fruit. Flowers small, 2-3 mm. across, yellow; pedicels 3-5 mm. long, increasing upto 15 mm. in fruit, filiform, upcurved or spreading. Sepals 2-2.5x0.5-0.8 mm. Petals 2-5x0.4-0.7 mm., usually slightly longer than the sepals, oblong-obovate. Stamens about 2.5 : 3 mm.; anthers about 0.5 mm. long Siliquae 2.5-8x0.1 cm., linear-oblong, usually upcurved; valves submembranous, obscurely torulose, ± 3-veined, glabrous; style short, about 1 mm. long, thickened; stigma ± bilobed, about as broad as the style; seeds 20-40 in each loculus, about 1 x 0.5 mm., oblong-ellipsoid, yellowish-brown; septum rigid, not veined.

W. Pakistan:

Chitral: Ayun, 1410 m., Toppin no. 46(K!); Dir valley, Harriss no. 15885(BM!).

N.W.F.P.: Peshawar H. Deane(K!); near Peshawar, Schlagintweit Catl. no. 10425(BM!).

Punjab: Lahore, L.S. Das(E!); Rawalpindi, R. Stewart(K!); Aitchison no. 317(K!); Topi park, Pinfold no. 41(BM!); Karnal, Drummond nos. 20310(K!), 20312(K!), and 20311(K!); (without locality), Punjab plains, J.L. Stewart(K!); Sirhind, Thomson (K!); (without locality), Aitchison no. 99(K!); Salt range, Aitchison no. 22(K!); Sandalbar, Edgeworth no. 1015(K!); Kohat, Drummond no. 3018 C(K!); Gurgeon, Drummond no. 20313 (E!,K!); Hissar, Drummond nos. 20315(E!,K!), and 20314(E!, K!); Ludhiana, Drummond nos. 20304(E!,K!), 20303(E!,K!), 20306(K!), 20305(K!), 20307(K!), and 20308(K!); Sirsa, Drummond no. 20320(E!,K!); Ferozepore, Edgeworth(K!); Fagwara, Jacquemont(K!); (without locality), Royle(K!).

Sind: (without locality), Stocks no. 604(K!).

Baluchistan: (without locality), Stocks no. 769(K!); Zahree, Stocks no. 871(K!); Quetta, 1650 m., on dry stony ground and far from irrigation canal, H. Crookshank no. 134(K!).

Afghanistan:

Khyber pass, Johnston no. 55(E!); Pushut, Griffith no. 1539 (K!) and no. 1540(K!); Bolan pass, Griffith no. 1480(K!); Kabul, Griffith(K!); Naoshera & Halion, Griffith(K!).



N.W.Himalayas:

Kishtawar, 2100-3000 m., Thomson(K!); Chamba, Pangi valley, R.Ellis(K!); Lahul, Schlagintweit(BM!);  
 Kashmir: Baltistan, Skardo, 2070-2250 m., Schlagintweit(BM!);  
 Ladak, Zdongpolas, 3750 m., Ludlow no. 387(BM!).

Geog. Dist: Europe, N.Africa and Orient, and C.Asia.

A very variable species. The var. irioides(Boiss.)Schulz, cannot be retained as <sup>a</sup> good variety due to the presence of intermediate forms

A number of irregularities have been noticed in some specimens; they appear mostly to be due to grazing etc. J.R.Drummond no.20320(E!,K!) shows an aphyllous flowering shoot, but is no doubt a form of S.irio.

4. S.loeselii L., Cent. Pl. 18 (1755) et Amoen. Acad. iv 279 (1760)-excl. s syn. Col. et Bauh; B.F.O. 218; F.B.I. 151; S.P. 94; S.E.P. 598; K.F.U. 44.

Syn: Turritis Loeselii R.Br. in Ait. Hort. Kew. 2 ed. iv 109 (1812); Leptocarpaea Loeselii DC., Syst. ii 202 (1821); Hesperis Loeselii O.K. l.c. 934; Nasturtium Loeselium Krause, in Bot. Centralb. Lxxxix (7) 231 (1900); Crucifera loeselii Krause in Sturm, Fl. Deutschl. 2 Aufl.vi 81 (1902).; S. decipiens Bunge, ~~ix~~ Del. Sem. Hort. Dorpat in Linnaea xviii 505 (1844).

Type: Not precisely designated.

Annual or biennial, 20 - 100 cm. tall, erect, branched, hispid, especially below, sometimes subglabrous or glabrous, rarely glaucous; hairs simple, ciliate. Basal leaves rarely forming a rosette, sublyrate-pinnatifid, 4-12x1.5-4.5 cm., stalked; terminal lobe large, + triangular or ovate, irregularly dentate, obtuse or acute; lateral lobes few, 3-5, much smaller, alternate, narrowly triangular. Upper and middle leaves shortly petioled or sessile, lower ones runcinate-pinnatifid, upper ones much smaller; terminal lobes sagittate-lanceolate; lateral lobes 1-3, linear. All leaves irregularly sinuate-toothed, + hairy, rarely subglabrous or glabrous, very rarely glaucous. Racemes about 100-flowered, ebracteate, corymbose above, increasing upto 25 cm. in fruit. Flowers 6-8 mm. across, pale yellow; pedicels 4-8 mm. long, increasing upto 15 mm. in fruit, filiform, spreading or slightly upcurved. Sepals 3-4x1-1.8 mm. Petals 5-7x1.8-2 mm., obovate, clawed, apex rounded. Stamens about 4 : 5.5 mm.; anthers

about 1.5 mm. long. Siliquae 2 - 5 x 0.1 cm., linear, glabrous, often slightly upcurved; valves + 3-veined, subtorulose; style about 0.6 mm. long, thickened; stigma bilobed, hardly broader than the style; seeds 25-30 in each loculus, about 1 x 0.5 mm., ellipsoid-oblong, brown; septum membranous, with or without 1 vein.

W. Pakistan:

N.W.F.P: Peshawer, H. Deane(K!).

Baluchistan: Ziarat, 2400 m., H. Crookshank no. 204(K!).

Afghanistan:

Shalizan, Aitchison nos. 135(K!) and 216(K!); (without locality), Aitchison no. 42(BM!); Kurrum valley, Harsukh no. 15282(K!); Kabul, gravelly slope, 1740 m., W.R. Hay no. 288(K!); Kabul, garden weed, W.R. Hay no. 460(K!); Kabul, cornfield, W.R. Hay no. 92(K!); (without locality), Griffith(K!).

N.W. Himalayas:

Lahul, Gondla, 3000 m., N.L. Bor no. 1244(E!); Pangi, Kilar, 2550 m. R. Ellis no. 167 E(E!); Bashahr state, 2850 m., Lace no. 519(E!); Chenab valley, 3000 m., R. Ellis no. 155(K!); Kashmir: Srinagar, Schlagintweit(BM!); Sind valley, near Baltal, 2700-3000m., Duthie no. 13658(BM!); Baltistan, Skardu, 2250 m., Duthie no. 12056(BM!); Kishtawar, 1500 m., Clarke no. 21413 B(BM!); Srinagar, 1650 m., Clarke no. 29073 B(BM!); and no. 29073 A(K!); (without locality), 1500 m., Winterbottom(K!); Thomson(K!); Ganderlail, 1650 m. Gammie(K!); Sonmarg, 2700m., R. Stewart no. 7305(K!); Gund, Sonmarg Rd., 2100 m., R. Stewart(K!); Shalimar, 1650 m., R. Stewart no. 3241(K!); Valley of Kashmir, J.L. Stewart(K!); Poonana, 2250 m., Clarke no. 28458 A(K!); Aliabad serai, Drummond no. 13925(K!); Srinagar, Drummond no. 14334(K!) and no. 14335(E!); Between Wangtu and Chegaon, Thomson(K!); Srinagar, H. Rich no. 1053(K!); (without locality), Falconer, Herb. East Ind. Co. no. 160(K!); Baltal to Sonmarg, 2760-2850 m., R. Stewart no. 21299(R-E!).

Geog. Dist: Europe, N. Africa and Orient, and C. Asia. Probably introduced in N. America.

This species <sup>is</sup> easily distinguishable in the present area by its characteristic fruiting habit, leaf character and flower size. In my opinion S. decipiens Bunge is nothing but a state of S. loeselii L. It was primarily distinguished <sup>s</sup> by its glaucous habit and shorter fruits. After examining large number of specimens these characters do not hold good. It resembles in every respect to S. loeselii. Schulz(S.P. 1924) quotes three specimens under S. decipiens, out of which two are from Kashmir. I have seen Falconer's <sup>n</sup> specimen [Herb. East Ind. Co. no. 160(K!)] from Kashmir

included under this species by Schulz , and I have not the least doubt that it is S. Loeselii. First of all it fails to fulfil the section Grypolobus character by having short ascending fruits.

5.\*S. altissimum L., Sp. Pl. 659 (1753) (partim); S.P. II6; S.E.P. 600; K.F.U. 49.

Syn: S. sinapistrum Crantz, Class. Crucif. 138 (1769);  
S. pannonicum Jacq., Ic. Pl. Rar. i 12 (1786); S. brachy-  
-petalum C.A.M., Enum. Pl. Nov. Schrenk ii 58 (1842);  
Hesperis altissima O.K. l.c. 936; Norta altissima Britt.  
 in Ill. Fl. North U.S. ii 116 (1897); Nasturtium altissim-  
-um Krause in Bot. Centralbl. Lxxxii (7). 231 (1900);  
Crucifera altissima Krause in Sturm., Fl. Deut. 2 Aufl.  
 vi 82 (1902)

Type: Europe (not precisely designated) no. 13 (LS!).

Annual or biennial, 20 - 80 cm. tall, erect, branched above, sparsely hairy with simple 2-3 mm. long hairs, subglabrous above. Basal leaves rosulate, shortly petiolate, obovate-oblong, distantly toothed to subentire; Lower cauline leaves sublyrate, 4-7-jugate, petiolate, 6-20x 3-8 cm. ; terminal lobe large, ovate, obtuse or subobtuse, distantly lobulate; lateral lobes narrowly ovate or lanceolate, toothed to entire. Middle cauline leaves 6-7-jugate, lobes narrowly oblong, shortly petiolate. Upper cauline leaves 5-7-jugate, lobes linear to filiform, entire. Racemes 15-25-flowered, ebracteate, increasing upto 30 cm in fruit. Flowers 5-7 mm. across yellowish; pedicels 4-9 mm. long, increasing upto 10 mm. in fruit and becoming thickened, ascending or spreading. Sepals 4-6x1.3-1.6 mm. Petals 6-8x 1.5-1.7 mm., oblong-cuneate, sometimes rudimentary, apex subtruncate. Stamen about 4 : 5 mm.; anthers 1.5-2 mm. long, oblong, obtuse. Siliquae 5-10x0.15 cm., linear-oblong, erect on equally thickened pedicels; valves glabrous, rigid, 3-veined; style 0.5-1.5 mm. long, thickened; stigma coronate, bi-lobed; seeds 40-60 in each loculus, about 1 x 0.6 mm., ellipsoid, brown; septum rigid, somewhat thickened inbetween the seeds.

W. Pakistan:

Chitral: Lutkhoo, 2100 m., Toppin no. 268(K!).

Afghanistan:

North of Hindukush, Badakhshan, 2610 m., Giles no. I40(K!);  
(without locality), Giles(E!).

N.W.Himalayas:

Kashm r: Rupal nullah, R.Stewart no. 22840(R-E!).

Geog. Dist: Europe, N.Africa and Orient, and C.& N. Asia. Introduced  
in N.America.

6.\*S. orientale L., Cent. ii 24 (1756) et Amoen. Acad. iv 322 (1759);  
S.P. 122; S.E.P. 601; K.F.U. 50.

Syn: S. columnae Jacq., Fl. Aust. iv 12 (1776)-non H.f. et T. in  
F&B.I. 150; B.F.O. 216; S.columnae Jacq. var orientale DC., Syst. ii 469  
(1821); Pachypodium columnae Webb., It. Hisp. 75 (1838); Hesperis columnae  
O.K. l.c. 33; H.orientalis O.K. l.c. 936; Phryne columnae Bub., Fl. Pyr.  
iii 172 (1901); Crucifera columnae Krause, Sturm. Fl. Deut. vi 82 (1902).

Type: Not precisely designated.

var. orientale Annual or biennial, 20 - 120 cm. tall, erect, + hairy with  
simple often recurved hairs. Lower leaves often subrosulate, usually with-  
ering before flowering, very variable in size, 6-20x1.5-10 cm., sometimes  
even larger, stalked, 4-5-jugate, lobes deep; terminal lobes triangular;  
obscurely 3-lobulate, obtuse, remotely dentate; lateral lobes confluent;  
alternate, + recurved. Upper cauline leaves 1-3-jugate to entire, ovate or  
triangular, acute, lateral lobes narrowly triangular; leaves as a whole +  
hastate. Racemes 20-30-flowered, ebracteate, corymbose above, increasing  
upto 40 cm. in fruit. Flowers 4-6 mm. across, yellow; pedicels 3-5 mm.  
long, increasing upto 8 mm. in fruit and becoming almost as thick as the  
pods, ascending. Sepals 3.5-5x1 mm. Petals 7-9x1.2-1.8 mm., obovate-oblong,  
clawed. Stamens about 4 :5 mm.; anthers about 1.5 mm. long, obtuse.  
Siliquae 4 - 10 x 0.15 cm., linear-oblong, subcylindrical or subterete,  
+ hairy, straight; valves 3-veined; style 1-2(-3) mm. long, thickened;  
stigma coronate, subbilobed; seeds 40-50 in each loculus, about 1 x 0.6  
mm., ellipsoid or subquadrate, brown; septum rigid, not veined.

Afghanistan:

(without locality), Griffith(K!).

Geog. Dist: Europe, N.Africa & Orient, C. and N.Asia.

var. leiocarpum (DC.)Hal., Consp. Fl. Graec. i 69 (1901); S.P. 125.

Syn: S. columnae var. leiocarpum DC., Syst. ii 469 (1821).

Type: Not precisely designated.

Plants as well as siliquae glabrous.

N.W.Himalayas:

Bashahr state, Chini, 2700 m., Lace no. 280(E!); Lahul, Pangi, Kilar, 2700 m., Watt no. 2220(E!); Salgram, 3000 m., Watt no. 2369(E!); Pangi, 2850 m., Watt no. 2775(E!).

Kashmir: Baltistan, Shingo valley, Duthie(E!).

Geog. Dist: Same as for the type race.

It appears from the records of the present area that the type race is present only in Afghanistan, while the variety leiocarpum in N.W. Himalayas, although both have the same wide range of distribution.

The status of the other varieties is taxonomically not clear.

7. \*S. septulatum DC., Syst. Nat. ii 471 (1821) et Prodr. i 193 (1824);

S.P. 120 (partim); S.E.P. 601.

Syn: "S. pannonicum" Boiss., Fl. Or. i 217 (1867)-pro parte (non Jacq.); S. grandiflorum Post, Pl. Post. i 3 (1890);

Hesperis septulata O.K. l.c. 935.

Type: Syria, Aleppo, Russel (BM!).

Annual or biennial, 20 - 60 cm. tall, erect, simple or branched, hairy below with simple hairs, + glabrous above; branches stout, straight, slender, many leaved. Lower leaves runcinate-pinnatipartite, 5-20x1-5 cm., 6-8-jugate, lobes lanceolate, laterals + recurved, acute, or slightly acuminate, unequally toothed, 3-6-lobulate. Upper leaves 3-5-jugate, shortly stalked. Racemes 20-45-flowered, lax, ebracteate, increasing upto 30 cm. in fruit. Flowers 7-10 mm. across, yellowish; pedicels 3-5 mm. long, hardly increasing upto 6 mm. in fruits, about as thick as the pods, ascending or spreading, never deflexed. Sepals 5-7x1.8-2.2 mm. Petals 10-12x3-5 mm., obovate, clawed, apex subtruncate. Stamens about 8 ; 9 mm.; anthers 2-2.5 mm. long, oblong, obtuse. Siliquae 4-6x0.12-0.2 cm. linear-oblong, terete, + straight, apex obtuse with broad, subbilobed stigma; valves 3-veined, rigid, glabrous; style about 2( )5 mm. long, thickened; seeds 30-40 in each loculus, about 1 x 0.6 mm., oblong, dark brown; septum rigid, septulate. (Plate no. LVI)

Afghanistan:

Harirud valley; common, flowers yellowish, Aitchison no. 222(K!), and no. 232(K!).

Geog. Dist:

Persia: East Hmedan, 2100 m., Cowan & Darlington no. 543(K!); Between Rescht and Kazwin, J. Bornmuller no. 6157(K!); near Tabriz, Gilliat-Smith no. 1421(K!); Kurdistan: J. Bornmuller(K!).

Iraq: Basra, J. B. Gillett no. 6635(K!); Arbil, Guest no. 1462(K!); Jazirah desert, Edmond no. 3805(K!); (without locality), P. Sintenis no. 557(K!); Erbil, J. Bornmuller no. 881(K!).

Arabia: Kuwait, Dickson no. 282(K!); Saudi Arabia, Wadi Badanah, Dickson no. 694(K!).

Syria: East of Aleppo, J. E. Dinsmore no. 13030(K!).

Palestine: - J. E. Dinsmore no. 11030(K!).

8. \*\*Sisymbrium pakistanicum Jafri, sp. nov.

[sect. Pachypodium (Webb et Berth.) Fourn.]. Affinis S. rigidulo

Decaisne sed habitu sparse hispido supra + glabro, foliis profunde pinnatifidis vel pinnatipartitis paucis lobatis, lobis obovatis 3-lobulatis, floribus majoribus pallide lilacinis, pedicellis in fructu saepe longis multo angustioribus valde patentibus, siliquis brevioribus acutioribus saepe recurvatis, stylo et stigmatibus brevibus, septo tenuiter membranaceo differt.

Herba annua, 5 - 20(-30) cm. alta. Caules ascendentes vel suberecti, ramosi, saepe tortuosi, sparse hispidi vel interdum superne + glabri, pilis simplicibus vel furcatis sparse obsiti. Rami filiformes 0.7 - 1.5 mm. crassi, paucifoliati, interdum basi florentes. Folia inferiora profunde pinnatifida vel pinnatipartita, 3 - 5 - jugata, 1.5 - 5 x 0.5 - 2 cm., sparse hispida, lamina petiolo 2-4 plo longiore, lobis obovatis vel oblongis 3-lobulatis obtusis vel rotundatis, lateralibus ascendentibus; folia superiora subglabra vel glabra. Racemus 10 - 20 - florus, ebracteatus, laxissimus, in fructu circa 10 cm. longus. Flores majusculi 8 - 15 mm. diam., pallide lilacini. Pedicelli 4 - 12 mm. longi, filiformes, glabri, saepe flexuosi, in fructu crassiusculi patentibus saepe recurvati. Sepala 5-8x2-2.4 mm. oblonga, inaequalia, interiora latiuscula subsaccata ad apicem vix cornuta. Petala 10-15x3-6 mm., late obovata, apice subtruncata, unguiculata. Stamina

8 - 9 : 9 - 10 mm. longa; antherae 2.5 mm. longae, lineares, subobtusae. Ovarium stipitiforme, glabrum, 40 - 60 - ovulatum. Siliquae 3 - 3.5(-5.5) x 0.1 - 0.12 cm., lineares, angustatae, acutae, saepe curvatae, glabrae; valvae + 3-~~nervatae~~; stylus brevis, circa 1 mm. longus, incrassatus; stigma tenue, retusum et depressum. Semina 40 - 60, circa 1 x 0.5 mm. oblonga brunnea, haud mucilaginoso; septum membranaceum non septulatum.

Syn: "S. rigidulum" H.f. et T. in Journ Linn. Soc. Bot. v. 158 (1861)[non Decaisne in Ann. Sc. Nat. ser. II iii 272(1835)]; S. septulatum prol. rigidulum O.E.Schulz in Pflanzenreich (86) 121 (1924)(partim).

Annual, 5-20(-30) cm. tall, ascending or suberect, branched mostly from the base, sparsely hispid with simple or furcate hairs, + glabrous above; branches spreading, often zigzag, 0.7-1.5 mm. thick, filiform, bearing a few distant leaves, sometimes flowering from the base to apex. Lower leaves deeply pinnatifid or pinnatipartite, 3-5-jugate, 1.5-5x0.5-2 cm., stalked; lobes short, obovate or oblong, 3-lobulate, apex obtuse or rounded; lateral lobes ascending, not runcinate, ± similar to the terminal lobe; upper leaves few, + similar to the lower leaves; all leaves sparsely hairy to glabrous. Racemes 10-20-flowered, lax, ebracteate, increasing upto 10cm. in fruits. Flowers 8-15 mm. in diam., pale lilac; pedicels 4-12 mm. long, increasing upto 15 mm. in fruits, thickened but much narrower than the pods, spreading, sometimes recurved in fruits. Sepals 5-8x2-2.4 mm., oblong, unequal, obtuse; inner two broad, subsaccate at the base, hardly hooded at the apex. Petals 10-15x3-6 mm., obovate, clawed, apex subtruncate. Stamens 8-9 : 9-10 mm. long; anthers 2.5 mm. long, linear, subobtusae. Ovary stipitiform, slender, glabrous, 40-60-ovuled. Siliquae 3-3.5(-5.5)x0.1-0.12 cm., linear, slender, narrow, often recurved, spreading, glabrous; valves + 3-veined; apex of the fruit acute; style short, about 1 mm. long; stigma narrow, short, retuse, depressed. Seeds 40-60, about 1 x 0.5 mm., oblong, brown, not mucilaginous when wet, septum membranous, not septulate. (Plate no. LVII).

W. Pakistan:

N.W.F.P: Peshawer, H. Deane(K!); Khyber hills, Vicary(K!); (without locality), J.L. Stewart(K!); Khyber pass, M. Nath no. 15454(R-E!); Hazara, Hassanud Din no. 153



Plate no. LVII.

*Sisymbrium septulatum* DC.

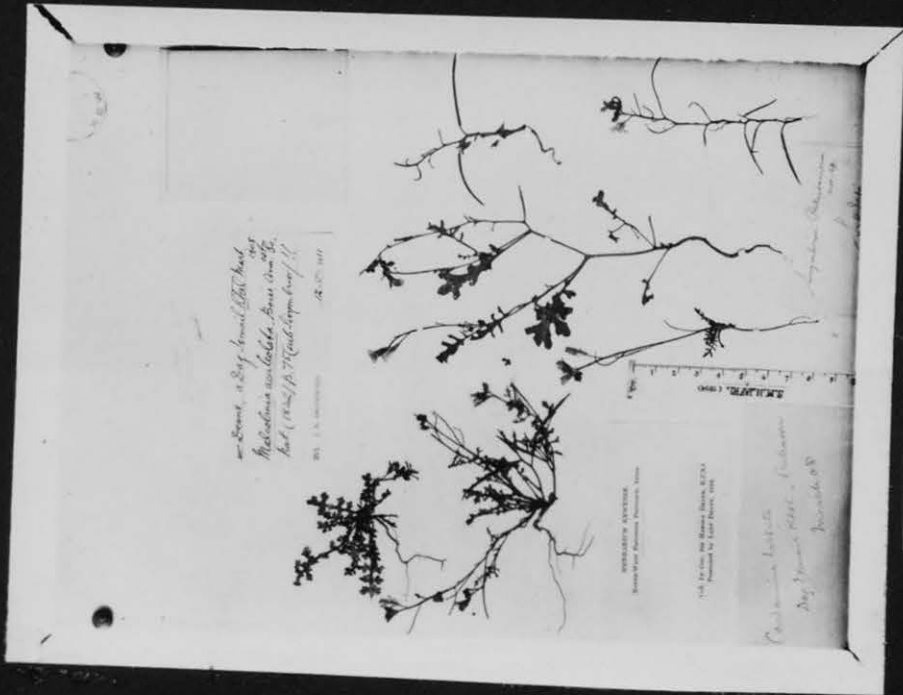


Plate no. LVIII.

*Sisymbrium pakistanicum* Jafri





Map no. 4

(R-E!); Peshawer, N.Ali no. 3(R-E!); Shagai, 750 m., flowers mauve, on stony hillsides, dwarf and spreading in open, D.Lowndes no. L 700(E!).

Afghanistan:

Kyber pass, 1440m., H.Johnston no. 79(E!,K!); Koonur river, Griffith(K!).

Geog. Dist: Endemic.

Distinguished from S. rigidulum Decaisne by its sparsely hispid, <sup>habit</sup> glabrous above ~~habit~~; deeply pinnatifid or pinnatipartite distantly lobed leaves with obovate, 3-lobulate lobes; large flowers of pale lilac colour; narrow, often elongated, spreading pedicels; short, acute, often recurved siliquae with short style and stigma, and membranous not septulate septum.

9. \*\*S. erysimoides Desf., Fl. Atl. ii 84 t. 158 (1799); DC., Syst. ii 482 (1821) et Prodr. i 195 (1824); B.F.O. 217; S.E.P. 601. Syn: S. Zeae Spreng, Syst. ii 904 (1825); Pachypodium erysimoides Webb et Berth., Phytogr. Canar. i 203 (1840); Hesperis erysimoides O.K. l.c. 33.3 (

Type: Tunis, Kerwan, Desfontaines(P- not seen).

Annual, hairy to glabrous, erect, simple or sparsely branched, 15-60 cm. tall; hairs simple or furcate. Lower leaves not rosulate, lyrate-pinnatipartite, 3-4-jugate, stalked, 3-8x1-3 cm.; terminal lobes ovate, obtuse, short; 3-5-lobulate, irregularly toothed; lateral lobes narrowly ovate, + confluent, alternate, toothed, often somewhat lobulate. Upper leaves few, distant, 2-4-jugate, somewhat small but + like the lower leaves. All leaves hairy or glabrous at least above. Racemes 30-70-flowered, ebracteate, increasing upto 30 cm. in fruits. Flowers minute, about 2 mm. across, pale yellow; pedicels very short, 1-1.5 mm. long, increasing upto 3 mm. in fruit (rarely upto 5 mm. long) and becoming about as thick as the pods. Sepals 2-2.6x0.6-0.8 mm. Petals about as long as the sepals, narrowly spathulate, apex rounded, hardly clawed. Stamens 2.8-3 : 3 -3.5 mm. long; anthers about 0.5 mm. long, obtuse. Siliquae 2-5x0.1 cm., oblong-conical, terete, rigid; valves 3-veined; style short, sometimes indistinct; stigma minute, depressed, subbilobed; seeds 15-25 in each loculus, about 0.8x0.5 mm., ellipsoid, brownish; septum membranous

with a faint midvein. (Plate no. LXXI.)

W. Pakistan:

N.W.F.P: Dera Ismail Khan, Herb. Bot. Dept. N. India (E!).

Punjab: Salt range, very abundant, Fleming (E!); Rawalpindi, Hasan Abdal, Aitchison no. 318 (K!); Musakhel, Schlagintweit (BM!); Jhalar, near Campbellpur, E. Nasir (R-E!).

Baluchistan: (without locality), Lace no. 3392 (E!, K!); Coast of Baluchistan, C. Pierce (K!).

N.W. Himalayas:

Kamshilman, Watt no. 4732 (E!).

Geog. Dist: S.E. Europe, N. Africa and Orient.

82. \*MICROSISYMBRIUM O.E. Schulz in Pflanzenreich (86) I59 (1924); S.E.P. 603.

Annual or biennial, branched mostly from the base, erect, short, suberect or prostrate, + hispid, rarely subglabrous or glabrous; hairs simple or furcate rarely branched and minute. Basal leaves + rosulate, lyrate-pinnatifid or pinnatisect, often petiolate; terminal lobe usually large, lateral lobes few and minute; upper leaves various, usually oblong and + stalked, sinuate-dentate to entire; all leaves membranous. Racemes bracteate or ebracteate, corymbose above, flexuose and becoming lax in fruit. Flowers small, white or pinkish rarely yellow; pedicels often elongated, filiform. Sepals erect, oblong, narrow, subequal, obtuse; lateral two sub-saccate or not. Petals spatulate or oblong-obovate, apex + rounded. Stamens 6, erect,; filaments simple, linear; anthers short, obtuse, oblong-ovate. Nectariferous glands minute, laterals subannular or annular, median torose, joining the laterals, often slightly conical in between the stamen bases. Ovary cylindrical, sessile, 10-many ovuled; style short with minute depressed stigma. Siliquae linear, usually subcylindrical, bilocular, dehiscent; valves glabrous or hairy, sometimes obscurely torulose, I-veined, apex acute; seeds uniseriate, oblong-ellipsoid, small, brown or orange-yellow, not mucilaginous when wet; septum membranous, rarely I-veined.

8 species mostly in Himalayas and C. Asia.

Of the 8 species 7 occur in the present area and two of them are new to science. Microsisymbrium is distinguished from Sisymbrium by its short habit with filiform branched; flowers small or minute, mostly white or pinkish; lateral nectariferous glands simply annular or subannular; minute, siliquae narrowly linear, subcylindrical with I-veined valves; and pedicels filiform, often flexuose and elongated.

This genus apparently looks ~~like~~ somewhat intermediate between Sisymbrium and Arabidopsis, but is no doubt very closely related to the former.

Microsisymbrium axillare (H.f. et T.) O.E. Schulz, is an east Himalayan species. Only ~~one~~ specimen [Watt's no. 2433(E!)- Plate no. LIX] from N.W. Himalayas was seen which closely resembled the plants of this species from E. Himalayas, but differed remarkably in having very short pedicels (plate no. LIX). It has been, therefore, described here as a subspecies of the above species. This subspecies is from Lahul (N.W. Himalayas) while the type race- subsp. axillare seems to be endemic in the Sikkim (E. Himalayas).

Key to the species:

- I. Flowers 4-5 mm. across:
2. Racemes bracteate ..... 5. M. bracteosum  
 2. Racemes ebracteate:
3. Plants hispid with short, branched hairs; cauline leaves narrowly oblong, 1.2-4x0.1-0.4 cm.; sepals 3-3.2 mm. long, hispid .....  
 ..... 6. M. angustifolium
3. Plants sparsely hairy with mostly simple hairs, often + glabrous above; cauline leaves broadly oblong, 1-2.5x0.5-1 cm.; sepals 2-2.5 mm. long, glabrous ..... 4. M. flaccidum
- I. Flowers 1.5-2 mm. across:
4. Racemes bracteate:
5. Plants often much branched from the base; branches prostrate or subspreading, 2-10 cm. long; pedicels 2-6 mm. long, increasing upto 10 mm. in fruit ..... 2. M. axillare  
 (upto 3 mm. long pedicels in subsp. brevipedicellatum)
5. Plants simple, erect, upto 100 cm. tall; pedicels 1-2 mm. long (not increasing more than this in fruit) ..... 1. M. duthiei
4. Racemes ebracteate:
6. Leaves pinnatisect, 1-2-jugate; racemes 5-12-flowered; siliquae 1-1.5 cm. long ..... M. minutiflorum
6. Leaves simple, distantly toothed; racemes 20-70-flowered; siliquae 2-4 cm. long ..... 7. M. griffithianum

I. \*M. duthiei (O.E. Schulz in Notizblatt, Berlin ix 1089 (1927); S.E.P. 604.

Type: Kumaon (N.W. Himalayas), Duthie no. 5331 (B- only photograph seen at Kew).

Annual, about 100 cm. tall, erect, simple, hairy with simple or furcate hairs. Lower leaves obovate, cuneate, shortly stalked, apex rounded, margin dentate, rarely sublobulate; upper leaves elliptic-obovate, acute, shortly toothed, cuneate, sessile; upper most forming bracts, + linear, entire; all leaves membranous. Racemes about 40-flowered, bracteate below, lax, flexuose, increasing upto 50 cm. in fruits. Flowers minute, about 1.6 mm. across, white; pedicels short, 1-2 mm. long, not increasing more than this in fruit. Sepals about 1.5 mm. long. Petals about 2 mm. long, spathulate. Stamens about 1.5 : 1.8 mm. ; anthers about 0.4 mm. long, oblong. Ovary about 132-ovuled. Siliquae 3-4x0.1 cm., subterete; style 1-1.5 mm. long; valves hairy with short, branched hairs; septum 1-veined; seeds numerous, minute, about 0.5 mm. long, oblong, brown.

Known from the type locality only.

2. M. axillare (H.f. et T.)Schulz in Pflanzenreich (86) 160 (1924); S.E.P 604.

Syn: Sisymbrium axillare H.f. et T. in Journ. Linn. Soc. Bot. v 162 (1861); F.B.I. 149; Hesperis axillare O.K. l.c. 934.

Type: Sikkim (E. Himalaya), J.D. Hooker (K!).

Subsp. I. axillare

Annual or biennial, prostrate or subspreading, often much branched from the base, 6-10 cm. long, hispid with simple or furcate hairs. Lower leaves rosulate, often congested, spathulate, sinuate-dentate or sublyrate-pinnatipartite, bijugate, petiolate; terminal lobe obovate, obtuse, remotely 2-denticulate; lateral lobes minute, triangular; upper leaves sessile, obovate or broadly oblong, obtuse, distantly toothed, cuneate at the base; all leaves membranous, + hispid (often densely so). Racemes 6-10-flowered, bracteate at least below, Flowers minute, about 2 mm. across, white; pedicels 2-3 mm. long, increasing upto 10 mm. in fruit, filiform. Sepals about 2 mm. long. Petals about 3 mm. long, spathulate, white. Stamens about 2 : 2.5 mm.; anthers about 0.4 mm. long. Ovary cylindrical, about 40-ovuled; style short with minute, depressed stigma. Siliquae 2.5-3x0.07-0.09 mm, narrowly linear, glabrous; valves 1-veined; seeds many, about 0.7 mm. long, ellipsoid, brown; septum membranous, not veined.

Geog. Dist:

E. Himalaya: Sikkim.

Subsp.2. brevipedicellatum Jafri, subsp. nov.

A typo racemis in parte superiora ebracteatis, pedicellis multo brevioribus divergit.

Rami inferne prostrati vel <sup>b</sup>suberecti, 2-10 cm. longi, dense hispidi. Racemus fere 10-florus, inferne bracteatus. Flores minuti vix 2 mm. diam.; pedicelli circa 1 mm. longi, in fructu circa 3 mm. longi.

Basal branches 2-10 cm. long, prostrate or suberect, densely hispid. Racemes about 10-flowered, bracteate below. Flowers minute, hardly 2 mm. in diam.; pedicels about 1 mm. long, increasing upto about 3 mm. in fruit. (Plate no. LIX).

N.W.Himalayas:

Lahul, Keylang, 3600 m., dated: 8. 6. 1889. G.Watt no. 2433(E!).

3. M. minutiflorum (H.f.et T.)Schulz in Pflanzenreich (86) I60 (1924);

S.E.P. 604.

Syn: Sisymbrium minutiflorum H.f.et T. in Journ. Linn. Soc. Bot. v I58 (1861); B.F.O. 215; F.B.I. 149; Hesperis minutiflora O.K. l.c. 934; Arabidopsis minutiflora (H.f.et T.)Busch, Fl. Caus. Crit. iii 457 (1909) in obs.  
Type: N.W.Himalayas: West Tibet, Zanskar, Thomson (K!).

Annual, 5-20 cm. tall, simple or sparsely branched; branches filiform, often zigzag, + hairy with minute branched hairs. Leaves pinnatisect, 1-2-jugate, stalked; lobes narrowly linear or oblong, 0.5-2 mm. broad, entire, apex rounded. Racemes 5-12-flowered, lax, ebracteate, flexuose, increasing upto 15 cm. in fruit. Flowers minute, 1.8-2 mm. across white; pedicels 2-5 mm. long, increasing upto 8 mm. in fruit, filiform, spreading or recurved. Sepals 1-1.2x0.6 mm. Petals 1.5-2x0.7-0.8 mm., oblong-cuneate, Stamens about 1.2 : 1.5 mm.; anthers about 0.25 mm. long. Siliquae 10-15x0.7-0.8 mm., linear, subcylindrical, subtorulose; valves glabrous or sparsely hairy, obscurely veined; seeds 5-7 in each loculus, about 0.8x0.4 mm., oblong, brown; septum not veined.

W.Pakistan:

Chitral: Barum gol, south Barum glacier, c. 4500 m., P.Wendelbo no. 4640(BM!).

Afghanistan:

Erak ravines, 2700-3300 m., Griffith no. I464(K!).

Geog. Dist:

N.Persia: Totschal, in alpine region, J.Bornmüller no.6159(K!).

4.\*M.flaccidum Schulz in Notizblatt, Berlin ix I090 (1927); S.E.P. 605.

Type: N.W.Himalayas: Kashmir, Duthie no. II055(B,K!).

Annual, 20-40 cm. tall, simple or sparsely branched mostly from the base, suberect or ascending, sparsely hairy with short furcate or simple hairs especially below, glabrous or subglabrous above. Basal leaves rosulate, lyrate-pinnatipartite or obovate, 1-2-jugate; terminal lobe large, obovate or suborbicular, 2-3-denticulate; lateral lobes minute, + triangular; leaves 2-5x1-2 cm. Cauline leaves oblanceolate or oblong-obovate, 1-2.5x0.4-1 cm., acute, distantly toothed, rarely entire. All leaves membranous, sparsely hairy to glabrous; lower long petioled, upper shortly petioled, cuneate. Racemes 10-20-flowered, ebracteate, lax, flexuose, increasing upto 25 cm. in fruit. Flowers 4-6 mm. across, white; pedicels 5-12 mm. long, increasing upto 25 mm. in fruit, filiform, glabrous, suberect, or ascending, usually upcurved. Sepals 2-2.5x0.8 mm. Petals 5-6x1.4-1.8 mm., obovate-oblong, apex subrounded. Stamens about 2.5 : 3 mm.; anthers about 1 mm. long, oblong, obtuse. Ovary cylindrical, 40-50-ovuled. Siliquae linear erect, 4-6x0.08 cm., glabrous; valves faintly 1-veined; style about 1 mm. long with minute depressed stigma; seeds 20-25 in each loculus, about 1x0.5 mm., oblong-ellipsoid, brown; septum not veined.

W.Pakistan:

N.W.F.P.: Hazara, Kaghan, 1500 m., Inayat no. 1917(B- only photograph seen at Kew)

N.W.Himalayas:

Kashmir: Kajnag range, Limbur nullah, 2700-3300 m., Duthie no. II055(K!); Kangan, Sind valley, 1800 m., Ludlow & Sherriff no. 7579(BM!); Bet Uri and Aliabad, 1800 m., R.Stewart no. I2365(R-E!).

Geog. Dist: Endemic.

5. \*\*Microsisymbrium bracteosum Jafri, sp. nov.

Species haec affinis M. axillard (H.f. et T.) Schulz et M. flaccido Schulz; ab hoc foliis majoribus grossius dentatis, racemis circa 15-floris, pedicellis longioribus, floribus majoribus differt; ab illo racemis bracteatis, indumento dense hispido, foliis basilibus spathulatis recedit.

Herba annua, pilis simplicibus et furcatis dense hispida. Rami inferne prostrati deinde adscendentes, 10-20 cm. longi, filiformes, teretes, flexuosi, remote foliati. Folia basalia et inferiora petiolata, spathulata, haud congesta, 2-4x0.8-1.5 cm., obtusa, ad marginem remote 3-5-denticulata; folia superiora sessilia vel subsessilia, obovata vel late elliptica, 1-3x0.5-1.5 cm., obtusa, cuneata, remote denticulata; omnia membranacea, dense hispida. Racemus bracteatus, circa 15-florus. Flores circa 5 mm. diam., albi, bracteati, pedicellati; pedicelli 5-10 mm. longi, filiformes, flexuosi. Sepala 3.5-4x1 mm., erecto-patentia, anguste oblonga, obtusa, hirsuta, subaequalia, lateralia subsaccata. Petala 5-6x1.7-2 mm., spathulata, alba. Stamina 3.5 : 4 mm.; antherae 0.6 mm. longae, ovoideae. Ovarium cylindricum, ovulis fere 30; stylus et stigma breves. Siliquae immaturae pedicellis aequilongae, lineares, glabrae.

Annual, densely hispid with simple or furcate hairs; basal branches 10-20 cm. long, <sup>b</sup>erect or prostrate, filiform, terete, flexuose, distantly leaved. Basal and lower leaves petiolate, spathulate, not congested, 2-4x0.8-1.5 cm., obtuse, distantly 3-5-toothed; upper leaves sessile or subsessile, obovate or broadly elliptic, 1-3x0.5-1.5 cm., obtuse, cuneate, distantly toothed; all leaves membranous, densely hispid. Racemes bracteate, about 15-flowered, flowers about 5 mm. in diam., white, bracteate, pedicellate; pedicels 5-10 mm. long, filiform, flexuose. Sepals 3.5-4x1 mm., erect, narrowly oblong, obtuse, hispid, subequal; lateral ones subsaccate. Petals 5-6x1.7-2 mm., spathulate, white. Stamens 3.5 : 4 mm.; anthers 0.6 mm. long, ovoid. Ovary cylindrical, about 30-ovuled; style and stigma short. Siliquae immature, about as long as the pedicels, linear, glabrous.

Distinguished from M. axillare (H.f. et T.) Schulz by its larger leaves, with coarse teeth, about 15-flowered racemes, larger flowers with long pedicels. Also distinguished from M. flaccidum Schulz by its bracteate racemes, densely hispid habit and spathulate basal leaves.



N.W.Himalays:

Kumaon, Byans, c. 2400 m., April 1881, J.R.Reid (E!). (Plate no.LXI).

Geog. Dist: Endemic.

6. \*\*Microsisymbrium angustifolium Jafri, sp. nov.

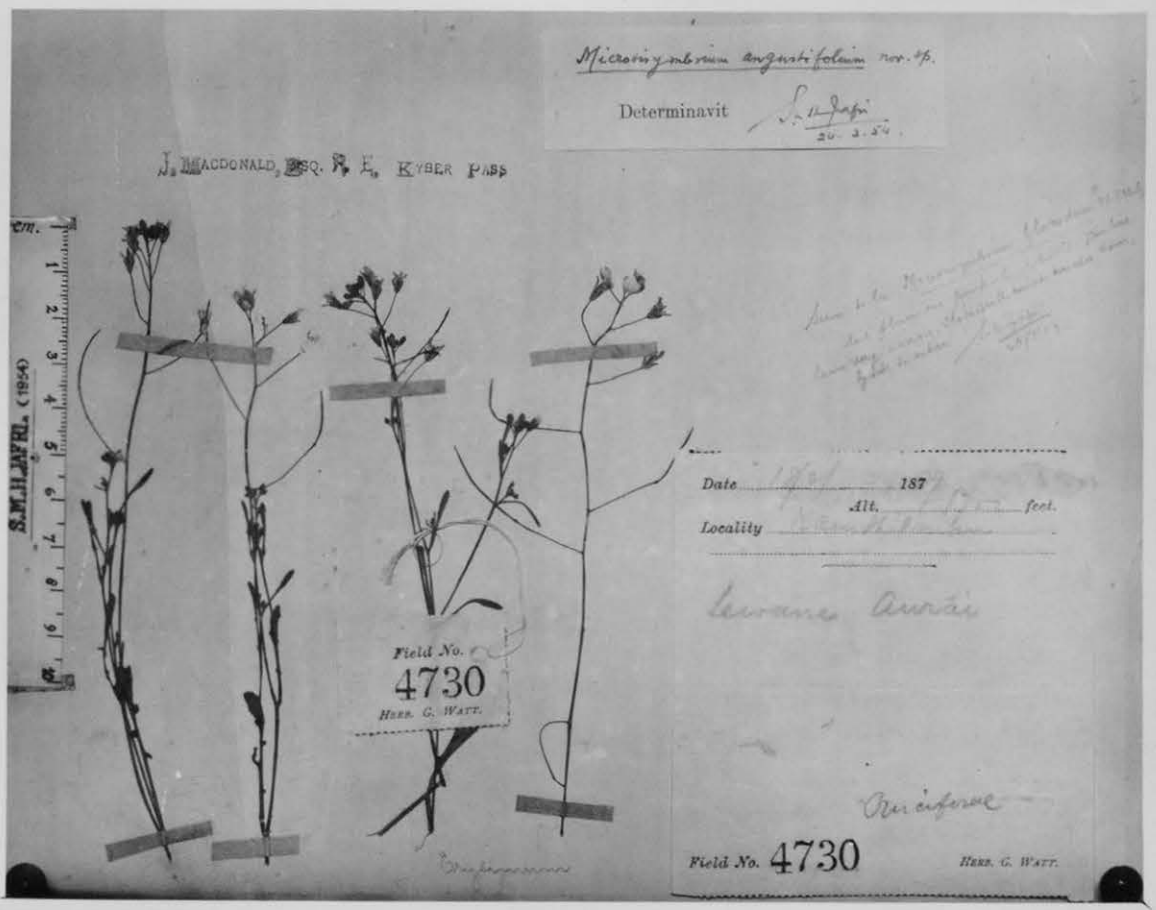
Affinis M. flaccido Schulz sed indumento densiore e pilis brevibus ramosis composito, foliis caulinis anguste oblongis, lyrato-pinnatipartitis, summis integris vel sinuato-dentatis, sepalis et pedicellis pubescentibus longioribus recedit.

Herba probabiliter annua (pars inferior abest), pilis brevibus ramosis + vestita. Rami filiformes, + erecti. Folia caulina petiolata, anguste oblonga, membranacea, inferiora lyrato-pinnatipartita, 2.5-4x 0.2-0.4 cm., lobo terminale circa 1cm. longo obovato-oblongo vel elliptico obtuso ad marginem remote 2-denticulato, lobis lateralibus oblongis integris vel subintegris, 2-5x1-2 mm.; summa 1-2-sinuato-dentata vel integra obtusa vel acuta, 1-2x0.1-0.2 cm. Racemus ebracteatus, circa 10-florus, laxissimus. Flores circa 4 mm. diam., roseo-lilacini vel albi, longe pedicellati; pedicelli 6-12 mm. longi, filiformes, flexuosi. Sepala 3-3.2x0.8-1 mm., erecto-patentia, anguste oblonga, obtusa, pubescentia, subaequalia, lateralia subsaccata. Petala 5-6x1.2-1.8 mm., oblongo-obovata, roseo-lilacina vel alba. Stamina 3 : 4 mm. longa; antherae 0.8 mm. longae, ovoid-ae. Ovarium cylindricum, ovulis circa 30; stylus et stigma breves. Siliquae (immaturae) circa 22 x 0.6 mm., lineares, glabrae, pedicellis 17-19 mm. longis suffultae; pedicelli et siliquae saepe curvati.

Probably annual (lower parts absent), clothed with minute, branched hairs. Branches + erect, filiform. Cauline leaves petiolate, narrowly oblong, membranous; lower ones lyrate-pinnatipartite, 2.5-4x0.2-0.4 cm., terminal lobe about 1 cm. long, obovate-oblong or elliptic, obtuse, distantly 2-denticulate, lateral lobes oblong, entire or subentire, 2-5x 1-2 mm.; upper leaves 1-2-sinuate-toothed or entire, obtuse or acute, 1-2x 0.1-0.2 cm. Racemes ebracteate, about 10-flowered, lax. Flowers about 4mm. in diam., pinkish or white, long-pedicellate; pedicels 6-12 mm. long, filiform, flexuose. Sepals 3-3.2x0.8-1 mm., erect, narrowly oblong, obtuse, pubescent, subequal; lateral ones subsaccate. Petals 5-6x1.2-1.8 mm., oblong-obovate, pinkish or white. Stamens 3 : 4 mm. long; anthers 0.8 mm.



Plate no. LXI. Microsisymbrium bracteosum Jafri



*Microsisymbrium angustifolium* nov. sp.

Determinavit *S. Jafri*  
20. 3. 54

J. MACDONALD, Esq. R. E. KYBER PASS

S.M.J. JAFRI, (1954)

Field No.  
**4730**  
HERB. G. WATT.

Date 1954 187  
alt. \_\_\_\_\_ feet.  
Locality \_\_\_\_\_

*Lewane Aurai*

*Microsisymbrium*  
Field No. **4730** Herb. G. Watt.

Plate no. LXII. Microsisymbrium angustifolium Jafri

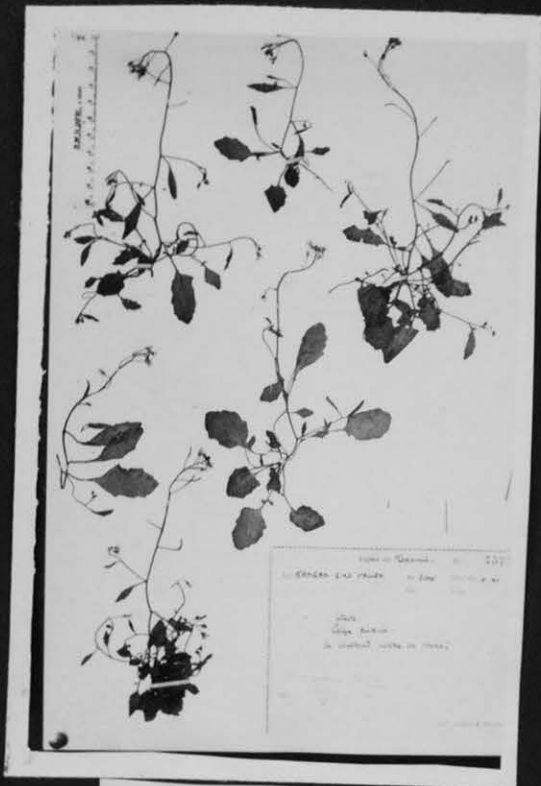


Plate no. LX.

*Microsisymbrium flaccidum* Schulz



Plate no. LIX.

*Microsisymbrium axillare* (H.f. et T.) Schulz  
Subsp. *brevipedicellatum* Jafri

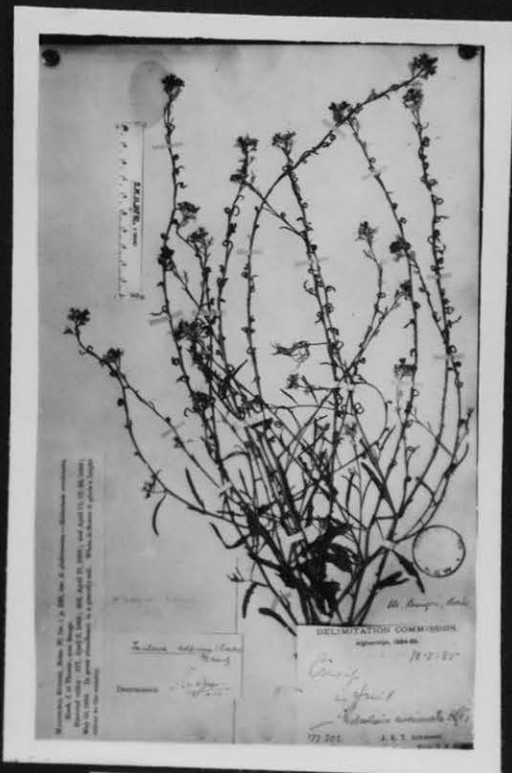


Plate no. LXIV.

*Torularia adpressa* (Trautv.) Schulz

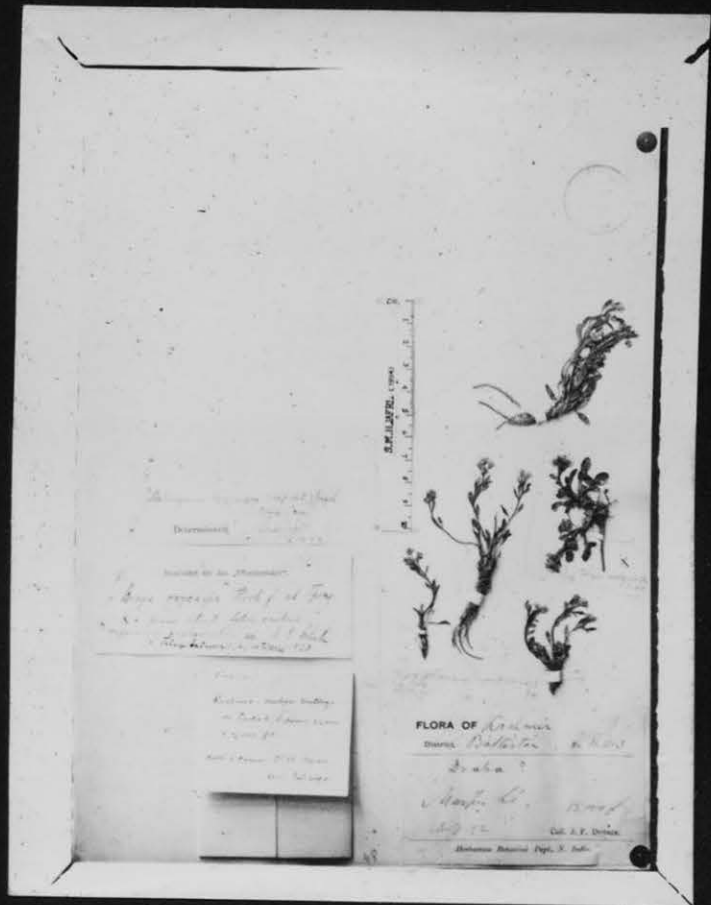


Plate no. LXIII.

*Aphragmus oxycarpus* (H.f. et T.) Jafri

long, ovoid. Ovary cylindrical, about 30-ovuled; style and stigma short. siliquae (immature) about 22 x 0.6 mm., linear, glabrous on 17 - 19 mm. long pedicels; pedicels and siliquae often curved.

Distinguished from M. flaccidum Schulz by its densely hairy habit with minute, branched hairs; cauline leaves narrowly oblong, lower lyrate-pinnatifid, upper entire or sinuate toothed, and sepals and pedicels long and pubescent.

W. Pakistan:

N.W.F.P: Kamshilman, 510 m., dated: 18. 2. 1889, G. Watt no. 4730 (E!).

7. M. griffithianum (Boiss.) Schulz in Pflanzenreich (86) 161 (1924); S.E.P. 605.

Syn: Sisymbrium Griffithianum Boiss., Diagn. ser. II i 23 (1853) et B.F.O. 214; H.f. et T. in Journ. Linn. Soc. Bot. v. 159 (1861); Hesperis Griffithiana O.K. l.c. 934; Arabidopsis Griffithiana (Boiss.) Busch, Fl. Cauc. Crit. iii 457 (1909) in obs.

Type: Afghanistan: Hydozy, Griffith no. 1483(K!).

Annual, 10-40 cm. tall, erect, simple or sparsely branched, + hairy with short, furcate hairs. Basal leaves spatulate, stalked, 1-2.5x0.4-0.9 cm., sinuate-dentate to entire; cauline leaves oblong, 0.5-1.2x0.2-0.6 cm., acute, distantly toothed, sessile, bases slightly auricled, semiamplexicaule; all leaves membranous. Racemes 20-70-flowered, ebracteate, corymbose above, flexuose, increasing upto about half the size of the entire plant in fruit. Flowers minute, 1.5-2 mm. across, white or pinkish; pedicels 1-2 mm. long, increasing upto 4 mm. in fruit, filiform, often deflexed. Sepals 1.2-1.5x0.6 mm., oblong, erect, obtuse, subequal, hairy. Petals 1.4-1.6x0.6 mm., narrowly spatulate. Stamens about 1.2 : 1.5 mm.; anthers about 0.26 mm. long, subquadrate. Siliquae 2-4x0.07 cm., linear, subtorulose, mostly hanging on recurved pedicels, apex acute or subobtuse, often slightly curved; valves + hairy, sub-scrabrous; stigma minute, subsessile; seeds about 10 in each loculus, about 0.9 x 0.5 mm., oblong-ellipsoid, brown; septum not veined.

Afghanistan:

Hydozy, under bushes in sands, Griffith no. I483(K!);

Serai Chashma, 2250 m., on rocky slopes, W.R.Hay no. I65(K!).

Geog. Dist:

Persia and Turkmania.

83. \*ARCYOSPERMA O.E.Schulz in Pflanzenreich (86) I82 (1924); S.E.P. 614.

Perennial, short, glabrous or sparsely hairy with simple hairs; rootstock thick, covered with leaf bases. Radical leaves rosulate, obovate-oblong, shortly stalked or subsessile, sometimes sessile, dentate or subentire, much larger than the cauline leaves. Branches short, sparsely leaved, about as long as the radical leaves, filiform. Cauline leaves small, ovate-oblong or elliptic-oblong, sessile. Racemes lax, ebracteate. Flowers mediocre, rose-white; pedicels filiform, long or short in fruit, ascending or spreading. Sepals suberect, equal, oblong, obtuse, not saccate. Petals about twice as long as the sepals, narrowly obovate-oblong, cuneate, apex subemarginate. Stamens 6, simple; anthers oblong, obtuse. Lateral nectari-ferous glands horse-shoe-shaped, open towards the inner side; median torose, joining the laterals. Ovary oblong, cylindrical, sessile, about 36-ovuled; stigma depressed-capitate, subsessile. Siliquae broadly linear, terete, apex obtuse, bilocular, dehiscent, often + curved; valves torulose, membranous, glabrous with a distinct midrib; seeds + biseriate, minute, ovoid, not mucous when wet; septum membranous, not veined.

One species in Himalayas.

Distinguished from Eutrema primarily by its short flowering branches, about as long as the radical leaves, filiform; curved siliquae with + biseriate ~~XXXXX~~ seeds; and different kind of leaves.

This monotypic genus was described by Schulz (1924) and was based on a single species, A. primulaefolium (Thomson) Schulz. Thomson's species, Sisymbrium Primulaefolium (1853), was transferred to Eutrema by Hooker f. and Thomson (1861), making a new combination, E. primulaefolium (Thom.) H.f. et T.. Schulz correctly separated this species of Thomson's under the above new genus, Arcyosperma.

The genus "Eutrema" as recorded by H.f. et T. (1861) and Schulz [Notizblatt ix I084 (1927)] needs a word. H.f. & T. (1861) recognize two

species of "Eutrema"- of which only one species, E. himalaicum H.f. et T. from Sikkim (E. Himalayas), remains as <sup>a</sup> true species, while the other has correctly been transferred to the new genus Arcyosperma. Another species, E. septigerum Bunge, recorded by Schulz from Kashmir (1927), has been transferred to Thlaspi in the present work (see discussion under Thlaspi)

Thus, the genus Eutrema does not occur in the present area.

Arcyosperma primulaefolium (Thomson) Schulz in Pflanzenreich (84) 182 (1924); S.E.P. 615.

Syn: Sisymbrium primulaefolium Thomson in Hooker's, Kew Journ. Bot. iv p. 10 et v 18 (1853); Eutrema primulaefolium (Thom.) H.f. et T. in Journ. Linn. Soc. Bot. v 164 (1861).

Type: N.W. Himalayas: Kumaon, Champwa, c. 3000 m., Strachey & Winterbottom no. 6 (K!).

Perennial, 6-20 cm. tall, glabrous or sparsely hairy with simple hairs especially below; rootstock covered with withered leaf bases or leaf scars, often thick. Flowering branches short, about as long as the radical leaves, sparsely leafy with much smaller cauline leaves. Rosette leaves many, spatulate or oblong-obovate, 5-18 x 1.5-5 cm. Cauline leaves oblong-ovate or oblong-elliptic, 1-4 x 0.5-1.5 cm., sessile, semiamplexicaule; all leaves subfleshy, dentate to entire. Racemes 7-10-flowered, ebracteate, corymbose, increasing upto 5 cm. in fruit. Flowers about 5 mm. across, white; pedicels 2-5 mm. long, increasing upto 12 mm. in fruit (rarely short - only upto 5 mm. long), filiform, spreading, glabrous. Sepals 3-4 x 1-1.2 mm. Petals 5-7 x 1.5-2 mm., obovate-oblong, apex subemarginate or truncate. Stamens 3-4 : 4-5 mm.; anthers about 1 mm. Siliquae 1.5-2.2 x 0.17-0.2 cm, terete-oblong, often + curved; stigma subsessile, depressed-capitate; seeds + biseriate rarely sub-biseriate, about 1 x 0.6 mm.; septum not veined.

W. Pakistan:

Chitral: Dir, 3300 m., Harriss no. 15908 (BM!).

N.W.F.P.: Hazara, Saran valley, 3210 m., Inayat (K!).

N.W. Himalayas:

Simla, Mattiyana to Nagkunda, 2700-3000 m., Watt (E!); Tihri-Garhwal, Kidarkanta, W. Gollan (BM!); (without locality), Thomson (K!); Nagkunda, 2700 m., H. Collett no. 926 (K!); Tihri-Garhwal, W. Gollan no. 1369 (K!); Kidarkanta, 3600 m., Drummond nos. 20282

(K!); and 2028I(K!); Hatugarh, 3150 m., Gamble no. 6114 A(K!); Tihri-Garhwal, Kidarkanta, Gamble nos. 24365(K!), and 1038(K!); Byans, 3600 m., Reid(E!); Bashahr state, Murali hills, 3150 m., Watt no. 10112(E!); Kashmir: Below Beđori, damp cliffs, 2700-3000 m., R. Stewart no. 23968(R-E!); (without locality), Falconer's collector no. 2939(K!).

Geog. Dist: Himalayas(Sikkim and Nepal).

84. \*APHRAGMUS Andrz. ex DC., Prodr., i 209 (1824); S.P. 197; S.E.P. 620.

Syn: Oreas Cham. et Schlecht. in Linnaea i 29 t. I (1826);

Orobium Reichenb., Consp. 185 (1828).

Annual to perennial, short, simple or branched mostly from the base; branches erect to prostrate, distantly few leaved, glabrous or hairy with simple or furcate hairs. Leaves simple, often spatulate, lower stalked, upper sessile or sessile often bearing flower in the axils; all leaves entire, ± glabrous and thick. Racemes short or long, often lax in fruit, bracteate, especially below. Flowers minute or small, white or pale lilac; pedicels short, increasing twice or more in length in fruit, filiform. Sepals erect, oblong, equal, not saccate, often caducous. Petals spatulate or ovate-oblong, apex subtruncate or subemarginate. Stamens 6; filaments linear; anthers shortly ovoid or subreniform. Lateral nectariferous glands semicircular, open towards the inner side; median present, narrow, torose, joining the laterals. Ovary oblong-ovoid, 6-12-ovuled; style short with depressed-capitate stigma. Siliquae oblong or ellipsoid, rarely lanceolate, subcompressed, acute; valves ± convex, submembranous with a distinct mid-vein and obscure reticulate venation; seeds + baseriate, large, pendulous, ovoid or subglobose, not mucous when wet; septum membranous, often incomplete, sometimes absent, not veined.

5 species chiefly in Tibet(C.Asia).

It was first described on a single species, A. Escholtzianus Andrz. [DC., Prodr. i 209 (1824)] from central and north Asia. It is closely allied to Braya, and is distinguished from it primarily by its sparsely leaved, erect to prostrate branches, often lax and bracteate racemes, increasing considerably in length in fruit; leaves ± thick, glabrous and spatulate; median nectariferous glands present, joining the laterals; septum often incomplete or absent, very thin.

Schulz(S.P.1924) added two more species to this genus. In 1927 [Notizblatt ix I058] he described a new species, A. himalaicus, apparently not knowing that it was the same plant recognized as Draba obscura Dunn by Dunn in Kew Bull.(p. 383, 1924). Dunn was no doubt mistaken in describing his new species in Draba; Schulz therefore transferred it to Aphragmus [Fedde Rep. xxxi 330 (1933)], making a new combination, A. obscurus(Dunn) Schulz, and quoting his own A. himalaicus as its synonym. In the same paper he described another new species, A. Stewartii from Kashmir, which, after a point by point comparison with "Braya ? oxycarpa"H.f.et T. , now appears to be conspecific. Schulz recognizes this species of Hooker f. and Thomson as a distinct species of Braya, while it was dissolved in "B. alpina" by H.f.and T.Anderson in Fl. Brit. India(i 155, 1872). H.f.and Thomson were perfectly right in doubting this species to belong to Braya. The presence of leafy branches, ± lax, bracteate racemes, and the presence of the median nectariferous glands have compelled me to transfer it to Aphragmus, making a new combination, A. oxycarpus(H.f.etT.)Jafri, of which A. Stewartii Schulz must be cited as a synonym.

Thus there are only two species of Aphragmus, A. Obscurus(Dunn) Schulz, and A. oxycarpus (H.f.et T.) Jafri in the present area. Figure no.25 shows a close similarity between the two species.

Key to the species:

- I(a). Annual; flowers 2 mm. in diam.; siliquae 1-1.2 mm. broad; seeds sub-biseriate .....1. A. obscurus
- I(b). Perennial; flowers 2.5-3.5 mm. in diam.; siliquae 1.4-2 mm. broad; seeds biseriate .....2. A. oxycarpus.

I. A. obscurus (Dunn) Schulz in Fedde,Rep. xxxi 330 (1933); S.E.P.621.

Syn: Draba obscura Dunn in Kew Bull. 383 (1924); A. himalaicus Schulz in Notizblatt, Berlin ix I058 (1927).

Type: Kashmir: Sonmarg, 3600-3900 m., R.R. & I.D.Stewart no. 3547(K!).

Annual or rarely biennial, ± prostrate, 3-12 cm. long, simple or branched mostly from the base, glabrous, filiform stems, distantly leaved. Leaves spatulate or obovate-cuneate, 5-20x2-8 mm., ± stalked, thick, entire or slightly 1-toothed, apex rounded; lower leaves with stalks



about as long as the lamina; upper leaves subsessile or sessile-cuneate; upper-most usually bearing flowers in their axils. Racemes 4-12-flowered, lax, bracteate, especially below, increasing upto 5 cm. in fruits. Flowers minute, 2 mm. across, white; pedicels 2-6 mm. long, increasing upto 12 mm. in fruit, filiform. Sepals 1.5 x 0.8 mm., Petals 2.5 x 1.4 mm., spatulate, apex subemarginate. Stamens 2 : 2.2 mm; anthers about 0.3 mm. Siliquae linear, short, 10-17x1-1.2 mm., subtorulose, or torulose, often slightly curved above, glabrous; valves submembranous, finely striated; style about 1 mm. long with minute stigma; seeds 6-10, large, sub-biseriate, about 1.2x 0.6 mm., oblong-ellipsoid, brown; septum incomplete or absent, rarely complete, very thin.

W. Pakistan:

N.W.F.P: Kaghan, Sarul, Inayat no. 21124(K!).

N.W. Himalayas:

Kashmir: Sonmarg, 3600-3900 m., inconspicuous in grass, flowers

white, R. Stewart & I.D. Stewart no. 3547(K!); Arniun to Harnag, 3600 m., R. Stewart no. 9411(K!); Mt. Apharwat, above Gulmarg, 3900 m., R. Stewart no. 8844 (K!); Sonmarg, 3600 m., R. Stewart no. 9796(K!); Above Lidderwart, 3900-4200 m., Duthie no. 14133(K!); Zoji Matayan, Ladak Rd., 3600 m., R. Stewart no. 7557(K!); Lidder valley, Badzulkod nullah, 3900 m., Duthie no. 13430(K!); Masjid valley, above Aro, 3600-3900 m., Duthie no. 13219(K!); Sonmarg, 3600-3900 m., damp places, R. Stewart no. 6880(K!); Astan marg, Drummond no. 14291 (K!); Zoji pass, 3600 m., R. Stewart (R-E!).

Geog. Dist: Endemic.

2. Aphragmus oxycarpus (H.f. et T.) Jafri, comb. nov.

Syn: Braya ? oxycarpa H.f. et T. in Journ. Linn. Soc. Bot. v 169 (1861); S.P. 236; S.E.P. 630; "B. alpina" H.f. et T. And. in Fl. Brit. India i 155 (1872)-ex parte [non Sternb. et Hoppe in Denkschr. Bot. Gesellsch. i 66 (1815)]; A. Stewartii Schulz in Fedde, Rep. xxxi 330 (1933); S.E. P. 621.

Type: W. Tibet : Piti valley, 3600-3900 m., Thomson(K!).

Perennial, 2-8 cm. tall, branched mostly from the base, sub-erect or subspreading, + hairy with minute simple or furcate hairs, glabrous above; branches slender, distantly few leaved. Radical leaves spatula-



Fig. no. 25 (x1)

A and B - Aphragmus spp. [A - A. obscurus (Dunn)Schulz;  
B - A. oxycarpus(H.f.et T.)Jafri.]

C,D and E - Braya spp. [C - B. thomsonii Hooker f.;  
D - B.rosea(Turcz.)Bunge; E - B.tibetica  
Hooker f. et Thomsen]

[a - flower; b - fruit; c - leaves]

-late, rosulate, 10-25x2-5 mm., ; stalk about as long or longer than the lamina; lamina oblong-ovate with rounded apex, entire. Cauline leaves oblong-elliptic, 6-12x2-5 mm., subsessile or sessile, entire, apex acute or obtuse; uppermost usually bearing flower in the axils. All leaves glabrous, subfleshy. Racemes 5-12-flowered, lax, bracteate especially below, increasing upto 5 cm. in fruit. Flowers small, 2.5-3.5 mm. across, white, often with pale lilac bases; pedicels 2-5 mm. long, increasing upto 6 mm. in fruit. Sepals 1.7-2x1 mm., oblong, obtuse. Petals 2.5-4.5x1-1.5 mm., spatulate, apex subrounded. Stamens 2-2.5 : 2.5-3 mm.; anthers about 0.5 mm. Siliquae lanceolate, short, 6-12x1.4-2 mm., acute, glabrous; valves submembranous, subconvex, + 1-veined; style about 1 mm. long with minute stigma; seeds 8-12, biseriate, large, about 1 x 0.7 mm., ellipsoid, brown; septum membranous, complete. (Plate no. LXIII).

N.W.Himalayas:

Tihri-Garhwal , Damdar valley, 3900-4200 m., Duthie no.923(BM!); Dudugadh, 4500-4800 m., Duthie no.897(K!); Kunawar, Jacquem-ont(K!); Lahul, 4500 m., Jaeschke no. 27 a(K!); Lahul, Serchu to Keylang, 4200 m., N.L.Bor no.15122(R-E!);  
Kashmir: My. Kolahoi, 4800 m., R.Stewart no.9393(K!); Baltistan, Marpa La, 4500 m., Duthie no. 11813(K!); Lidder valley, Badzul-kad nala, 3900 m., Duthie no. 13427(K!); Pig-dong-la, 4500 m., Osmaston no. 199(K!); Baltistan, Birik above pass, 3000 m., Winterbottom(K!){with Draba lanceolata Royle}; Ladak, J.L.stewart (K!); Ladak, Khardong La, 4500 m., Ludlow & Sherriff no. 8430 (BM!)[with Pegaeophyton scapiflorum(H.f.et T.)Marq,et Shaw]; Ladak, Skyangpoche, 4650 m., Ludlow no. 561(BM!); Khardong La, 4500 m., Ludlow no. 505(BM!); Gogra, 4650 m., Ludlow no. 827 (BM!); Kashmir state, 4500 m., R.Stewart(R-E!).

Geog. Dist:

Tibet and Sikkim.

85.\*STREPTOLOMA Bunge in Arb. Naturf. Ges. Riga i 155 (1847); B.H.G.P. 77; B.F.O.238; S.E.P.626; K.F.U.305.

Annual, erect or subspreading, branched mostly from the base, sparsely hairy with bipartite appressed hairs. Basal leaves rosulate, ob-lanceolate, slightly toothed to entire, stalked; upper leaves + similar to the basal leaves. Racemes corymbose above, ebracteate. Flowers small, white or pinkish; pedicels filiform, rigid. Sepals almost equal, not saccate. Petals about twice as long as the sepals, obovate-cuneate, apex retuse. Stamens 6; filaments with broad rounded base; anthers short, ovate, obtuse. Lateral nectariferous glands in pairs, small, pyramidate; median absent.

Ovary subcylindrical, 8-16-ovuled; stigma depressed-capitate, subretuse, subsessile. Siliquae linear, subterete, torulose, + hairy with bipartite appressed hairs, bilocular, dehiscens; seeds uniseriate, ellipsoid; septum membranous, not veined.

One species in central and west Asia.

\*Streptoloma desertorum Bunge in Arb. Naturf. Ges. Riga i 155 (1847); B.F.O. 238; Schulz in Notizblatt, Berlin ix 1094 (1927); S.E.P. 626; K.F.U. 305.

Type: Turkestan, Lehmann Rel. Bot. no. 113(K!).

Annual, 5-18 cm. tall, erect or suberect, branched mostly from the base, sparsely hairy with bipartite appressed hairs. Basal leaves rosulate, oblanceolate, 2-7x0.3-1 cm., stalked, slightly and distantly toothed to subentire or entire, acute or obtuse; upper leaves narrowly linear to lanceolate, 1-4x0.15-0.6 cm., shortly stalked or subsessile, slightly toothed to entire. Racemes 10-25-flowered, ebracteate, corymbose above, increasing upto 10 cm. in fruit. Flowers 3-4 mm. across, white or pinkish; pedicels 1-3.5 mm. long, increasing upto 7 mm. in fruit. Sepals 1.2-2x0.8-1 mm. Petals 2.8-3.8x1-1.8 mm., obovate, clawed, apex + emarginate. Stamens about 1; 1.5 mm.; anthers about 0.5 mm. Siliquae about 20x1 mm., linear, subterete, subtorulose, covered with bipartite appressed hairs; stigma depressed-capitate, subretuse, subsessile; seeds about 1 x 0.6 mm., ellipsoid; septum not veined.

Afghanistan:

Harirud valley, frequent near shrubs, Aitchison no. 161(K!).

Geog. Dist:

Turkistan: Tschardara, Fedtsch(K!); (without locality), Lehmann no. 113(K!).

TransCaspicum region: Aschabad, P.Sintenis no. 56(K!)(with Torularia torulosa.)

86.\*TORULARIA (Coss.)Schulz in Pflanzenreich (86) 213 (1924); S.E.P. 626; K.F.U. 59.

Syn: Sisymbrium Sect. Torularia Coss., Comp. Fl. Atl. ii 136 (1885).

Annual or biennial, rarely perennial, branched, erect or spread-  
-ing, + clothed with simple or branched hairs, often rough. Leaves oblong,  
 often runcinate-pinnatifid, sometimes dentate or entire. Racemes bracteate,  
 or ebracteate, corymbose above, lax in fruit. Flowers small, white, rose  
 of violet; pedicels short, often thickened. Sepals erect or suberect, oblong,  
 obtuse, often caducous, subequal, not saccate. Petals spatulate, slightly to  
 about twice as long as the sepals, rarely suppressed. Stamens 6, not append-  
 -aged; anthers oblong, obtuse. Lateral nectariferous glands in pairs, semi-  
-globose or sub-ovoid, free or connate at the base; median absent. Ovary  
 cylindrical, sessile, 5-34-ovuled; style short or absent; stigma depressed,  
subbilobed. Siliquae linear, + terete, rarely compressed, bilocular, dehis-  
-cent, straight or curved, sometimes circinate, often torulose; valves  
rigid, often hairy with rough, simple or branched, short hairs, often  
distinctly I-veined; seeds uniseriate, small, not mucilaginous when wet;  
 septum membranous or submembranous, not veined.

About 12 species in central and western Asia.

It is represented by 5 species in the present area. It is disting-  
 -uished from Malcolmia primarily by its depressed, subbilobed stigma (not  
 conical bilobed with decurrent lobes), siliquae often very torulose and  
 flowers usually minute. Also distinguished from Sisymbrium by its oblong,  
 often oblanceolate, entire to pinnatifid leaves; short, simple, or branched  
 rough hairs; small, white or pinkish flowers; short or absent style; differ-  
 -ent nectariferous glands; siliquae torulose with I-veined and roughly  
 hairy valves. It includes mostly those species which were formerly tossed  
 between Malcolmia and Sisymbrium by the previous authors (see the synonyms  
 given under the species).

Key to the species:

- I. Perennial ..... 5. T. humilis
- I. Annuals:
2. Branches many-leaved; racemes corymbose, usually more than 10-flowered  
 (8-50-flowered):
3. Flowers minute; petals 3.5 - 4.5 mm. long ..... I. T. torulosa
3. Flowers mediocre or small; petals 5-7 mm. long... 2. T. adpressa
2. Branches 0-4-leaved; racemes lax, usually less than 10-flowered  
 (2-10-flowered):

4. Basal leaves + entire .....3. T. brevipes  
 4. Basal leaves lyrate-pinnatifid .....4. T. aculeolata

I. T. torulosa (Desf.) Schulz in Pflanzenreich (86) 214 (1924); S.E.P.628;  
 K.F.U. 61.

Syn: Sisymbrium torulosum Desf., Fl. Atl. ii 84 (1798); Boiss. in Ann. Sc. Nat. Bot. ser. II xvii 74 (1842); S. scorpiuroides Boiss., l.c.; S. rigidum M.B., Fl. Taur.-Cauc. iii 439 (1819); Malcolmia Torulosa (Desf.) Boiss., Fl. Or. i 225 (1869); F.B.I. 146; M. scorpiuroides Freyn. in Bull. Herb. Boiss. ser. II iii 688 (1903).

Type: Tunis, Shibam, Desfontaines (P- not seen).

Annual, 10-30 cm. long, spreading or ascending branched mostly from the base, + clothed with simple or branched, rough, short hairs; branches many leaved. Leaves oblong-linear or lanceolate, shortly stalked or sessile, 1-2x0.4-1.5 cm., pinnatifid to simply dentate. Racemes 10-50-flowered, corymbose above, lax, increasing upto 15 cm. in fruits. Flowers 2-3 mm. across, white, subsessile; pedicels upto 1.5 mm. long in fruit, thick. Sepals 1.5-2x0.8-1 mm. Petals 3.5-4x1 mm., obovate-oblong, cuneate at the base. Stamens 1.2-1.5 : 2-2.2 mm.; anthers about 0.4 mm. Siliquae 15-22x1-1.2 mm., linear, subcylindrical, torulose, often curved at the apex, + scabrous; seeds about 1 x 0.5 mm.; septum rigid.

W. Pakistan:

N.W.F.P.: Peshawer, J.L. Stewart (E!, K!); Kohat, J.L. Stewart (K!).

Sind: (without locality), Stocks (K!).

Baluchistan: Quetta, 1680 m., Lace no. 3640 (E!); Tatti village near Loralai, M. Nath no. 6040 (R-E!); Shelabagh, 1800 m., Lace no. 3532 (E!), Chahel, Tun, Stocks no. 1037 (K!); Quetta, Duthie no. 9573 (K!, BM!); (without locality), Stocks no. 755 (K!); Killa Abdulla, Duthie no. 8581 (K!).

Afghanistan:

(without locality), Griffith nos. 1466 (K!) and 1528 (K!); Hari-rud valley, a very common plant, growing in dense clusters among stones and gravels on hillside, Aitchison nos. 185 (K!), and 260 (K!); Khyber pass, 1080 m., H. Johnston no. 51 (E!, K!); On the Helmand and in Seistan, McMahon no. 25/74 (K!).

Geog. Dist: N. Africa and Orient, and C. Asia.

2. \*T. adpressa (Trautv.)Schulz in Pflanzenreich (86) 22I (1924) et Notizbl. ix I095 (1927); S.E.P. 628; K.F.U. 64.

Syn: Sisymbrium adpressum Trautv. in A.H.P. ix 367 (1884);

"Malcolmia Bungei var. glabrescens" Aitchison in Trans. Linn. Soc. iii 34 (1888)(non Boiss.); Cryptospora dentata Freyn et Sint. in Bull. Herb. Boiss. ser.II iii 693 (1903); S. Trautvetteri Lipsky in A.H.P. xxvi 119 (1910).

Type: Not precisely designated?

Annual, 15-40 cm. tall, erect, branched, + clothed with short, branched hairs; branched many-leaved especially below. Lower leaves oblong-obovate, oblong-elliptic, 3-7x0.6-1.5 cm., lyrate-pinnatifid to simply toothed, stalked; upper leaves oblong or linear, 1-2x0.3-0.5 cm., sparsely toothed to entire. Racemes 20-45-flowered, ebracteate, corymbose above, increasing upto 30 cm. in fruit. Flowers 7-8 mm. across, white or pale pink; pedicels 1.5-4 mm. long, increasing upto 5 mm. in fruit, + appressed, slightly thickened. Sepals 2.2-2.8x1 mm. Petals 5-7x2.5-3 mm., obovate-cuneate, apex truncate or subemarginate. Stamens about 2.5 : 3 mm.; anthers about 0.5 mm. Siliquae 10-25x1-1.2 mm., linear, contorted, torulose, + scabrous with short branched hairs; style 0.5-1 mm. long with retuse stigma; seeds 5-8 in each loculus, about 1.5x1 mm.; septum membranous.

Afghanistan:

Harirud valley, in great abundance in a gravelly soil, Aitchison nos. 177(K!), and 302(K!), and 240(K!).

Geog. Dist:

C.Asia.

Aitchison (1888) wrongly regarded the above plants from Afghanistan as "Malcolmia Bungei"(plate no. LXIV).

3. T. brevipes(Kar.et Kir.)Schulz in Pflanzenreich (86) 222(1924) et Notizblatt ix I095 (1927); S.E.P. 628; K.E.U.65.

Syn: Sisymbrium brevipes Kar.et Kir. in Bull. Soc. Nat. Mosc. xv 154(1842); Malcolmia brevipes (Kar.et Kir.)Boiss. in Fl. Or. i 226 (1867).

Type: C.Asia, Soongaria, Kar.et Kir.no. 1234(L,K!).

Annual, 2-15 cm. tall, sparsely branched from the base, erect; branches filiform, 0-3-leaved. Basal leaves rosulate, obovate-oblong, cuneate, sessile, 1-3.5x0.5-1 cm., + entire; cauline leaves minute, oblong-linear, cuneate, sessile, entire; all leaves 6 hairy with branched hairs. Racemes 5-10-flowered, lax, ebracteate, increasing upto 5 cm. in fruit. Flowers about 2 mm. across, white; pedicels about 0.5 mm. long, increasing upto 1.5 mm. in fruit (rarely upto 2 mm.), thickened. Sepals about 1.5 x 0.7 mm. Petals 2-2.5x1 mm., oblong-cuneate. Stamens about 2 : 2.5 mm.; anthers about 0.25 mm. Siliquae 10-20x0.8-1 mm., linear, subterete, straight or curved at the apex, subtorulose or torulose, + scabrous with short, branched hairs; stigma depressed, retuse, subsessile; seeds 8-12 in each loculus, about 1 x 0.5 mm.; septum membranous.

W. Pakistan:

Chitral: Chitral, Harriss (B- not seen).

Baluchistan: Khojak pass, Duthie no. 8585(K!) (with Drabopsis nuda).

Geog. Dist:

C. Asia:

Soongaria, Kar. et Kir no. 1234(K!); Sassyk-pastau, Kar. et Kir. no. 1240(K!).

4. T. aculeolata (Boiss.) Schulz in Pflanzenreich (86) 223 (1924); S.E.P. 628.

Syn: Sisymbrium aculeolatum Boiss. in Ann. Sc. Nat. ser. II xvii 75 (1842); Malcolmia aculeolata (Boiss.) Boiss., Fl. Or. i 226 (1867); Hesperis aculeolata O.K. l.c. 934.

Type: Arabia petraea, Mt. St. Catharine, W. Schimper no. 124(G, K!)

Annual, 5-20 cm. tall, erect, sparsely branched from the base, glabrous except the siliquae. Leaves lyrate-pinnatipartite, 2-4-jugate, fleshy, + stalked; basal leaves rosulate, 1-4x0.4-0.8 cm.; upper leaves few, distant, small and few lobed. Racemes 2-8-flowered, lax, ebracteate, increasing upto 10 cm. in fruits. Flowers 3-4 mm. across, lilac or pale pink; pedicels 1.5-2.5 mm. long, increasing upto 5 mm. in fruit, slightly thickened, spreading. Sepals 1.5-2x0.7-0.9 mm. Petals 4-5x1 mm., oblong-cuneate. Stamens 1.5-2 : 2-2.5 mm.; anthers about 0.5 mm. Siliquae linear, subsylindrical, 3-5x0.1 cm., often subcurved, roughly hairy with



simple or forked, rigid, + decurved hairs; style about 0.5 mm. long with subretuse stigma; seeds many, about 1 x 0.5 mm.; septum rigid.

W. Pakistan:

Baluchistan: Quetta, Duthie no. 8609(E!,K!); Nichara, Stocks no. 907(K!); Shelabagh, Khojak pass, Duthie no. 8612 (K!,E!); Lace no. 3531(E!,K!); Loralai, M.Nath no. 6039(R-E!).

Geog. Dist:

Persia : Terayschah, Bunge (K!).

Sinai: W.Schimper no. 124(K!).

5. T. humilis(C.A.M.)Schulz in Pflanzenreich (86) 223 (1924); S.E.P. 628; K.F.U. 65.

Syn: Sisymbrium humile C.A.M.in Ledeb., Ic. Pl. Ross. ii 16 t.147 (1830); F.B.I. 148.

Type: Altai, Ledebour (L,K!).

Var. I. humilis

Perennial, 5-20 cm. long, spreading or ascending, branched mostly from the base, + clothed with simple and branched hairs, rarely subglabrous or glabrous; branches few leaved. Basal leaves narrowly oblong-ovate, sinuate-toothed, 2-3.5x0.5-0.8 cm., stalked; upper leaves narrowly spatulate or obovate-oblong, sinuate toothed to simply toothed, shortly stalked to subsessile; upper-most obscurely toothed to entire. Racemes 10-15-flowered, often bracteaete below, increasing upto 10 cm. in fruits. Flowers 2-3 mm. across, white or pale pink; pedicels 1-2 mm. long, increasing upto 8 mm. in fruit, suberect or spreading. Sepals 1.8-2x0.7 mm. Petals 2.7-3x1 mm. , oblong-cuneate. Stamens about 2 : 2.5 mm.; anthers about 0.3 mm. Siliquae 10-25x1 mm., linear, subcylindrical, often slightly curved, torulose, minutely hairy to subglabrous; style abot 1 mm.(rarely 1.5 mm. ) long with depressed, slightly retuse stigma; seeds 10-16 in each loculus, about 1x0.5 mm.; septum membranous.

Afghanistan:

Wakhan, 2850 m., Giles no. 79(K!).

N.W.Himalayas:

Lahul, 2700 m., H.Jaeschke(K!); Kumaon, Pelang gadh, 3300-3600 m., Duthie no. 5349(K!);

Kashmir: Ladak, Saleti, 3900 m., Koelz no. 2512(K!); Gilgit, Giles(E!); Rupshu, 4500 m., along stream, Koelz no. 2289(K!); Ladak, Thomson(K!); J.L.Stewart(K!);

Geog. Dist: C. and N. Asia, N. America and China.

var. 2. piasezkii (Maxim.) Jafri, comb. nov.

Syn: Arabis Piasezkii maxim., Melang. Biol. x 567 (1880);  
Sisymbrium humile C.A.M. var. Piasezkii (Maxim.) Maxim.  
Enum. Pl. Mongol. 62 (1889); T. humilis prol. Piasezkii  
(Maxim.) Schulz l.c. 226.

Type: Mongolia, Piasezk(L- not seen)

Plants very densely branched from the base. Leaves minute, 3-12x1-2.5 mm., linear, entire or dentate. Siliquae short, 8-13x1 mm., slightly curved towards the apex.

W. Pakistan:

N.W.F.P.: Hazara, Kaghan valley, Inayat no. 19198(B- not seen).

N.W. Himalayas:

Kashmir: Baltistan, Winterbottom no. 874(K!); Rupshu, 4650 m.,  
Koelz no. 2185(R-E!).

Geog. Dist: Tibet:

N.W. Tibet: about 4800 m., Pike no. 855(K!); Tibet: c. 5100 m.,  
Thorold no. 16(K!); 3600-4200 m., Thomson(K!); near Tuna,  
4200 m., S. Chapman no. 969(K!); Gyangtse, J.H. Walton no. 8(K!);  
Khamba jung, Younghusband no. 52(K!);

China: W. China, Prezwalksi(K!); S.E. Kansu, J.F. Rock n. 12269(K!)

87. BRAYA Sternb. et Hoppe in Denkschr. Kgl. Bot. Gesellsch. Regensb. i 65  
(1815); S.P. 226: S.E.P. 628.

Syn: Platypetalum R.Br. in Parry's Voy. app. 266 (1824); Beketo-  
-wia Krassnow in Script Bot. Hort. Univ. Petropol. ii 12  
(1888).

Perennial, caespitose, small herbs, branched from the base,  
+ clothed with simple or branched short hairs. Branches erect, subscapose  
or scapose. Radical leaves densely rosulate, linear oblong, entire to sub-  
dentate, sessile or shortly stalked, + hairy. Cauline leaves present or  
absent, few, often restricted at the bases of racemes. Racemes corymbose,  
many flowered, often ebracteate, rarely 1-3-bracteate. Flowers small or

minute, yellowish or white, rarely pale purple or lilac; pedicels short, sub-thickened in fruit. Sepals erect, persistent, oblong, subequal, apex obtuse or slightly toothed. Petals short, obovate-cuneate, apex + truncate. Stamens 6; filaments simple; anthers short, ovoid, obtuse. Lateral nectariferous glands semiannular, often + in pairs, or incomplete only towards the innerside; median absent. Ovary subcylindrical or oblong, rarely narrowly ovate, 4-26-ovuled; style short; stigma depressed-capitate, subbilobed. Fruits short (siliculae), oblong or ovate, sometimes torulose, often subcompressed, bilocular, dehiscent, glabrous; valves I-veined with obscure reticulate venation; seeds ovoid, + biseriata, rarely subbiseriata, large, finely granulated or striated, not mucous when wet; septum membranous, complete, sometimes I-veined.

About 15 species mostly in alpine regions.

Of the 15 species only three, B. rosea (Turcz.) Bunge, B. thomsoni Hooker f. and B. tibetica H.f. et T. occur in the present area. (Fig. no. 25).

Hooker f. and Thomson, in Journ. Linn. Soc. v 168-169 (1861), record 5 species of Braya. Of these four were newly described except B. ? oxycarpa which was doubtful. When writing the Fl. Brit. India, H.f. and T. Anderson (1872), merged together, two species of the above four under their "B. alpina" (non Sternb. and Hoppe). Thus the number of species in Fl. Brit. India was reduced to four after the addition of one more species, B. rosea. Of these, B. uniflora H.f. et T. must be transferred to the newly described genus, Pycnoplithus of O.E. Schulz (1924), and B. ? oxycarpa under

Schulz, in Pflanzenreich (86) 1924, recognize B. thomsoni H.f. et T. and B. oxycarpa H.f. et T. as distinct species from B. alpina Sternb. et Hoppe which does not occur in the present area. I do not agree with Schulz in recognizing B. ? oxycarpa H.f. et T. as a species of Braya, though it was originally doubtfully included under Braya by Hooker f. and Thomson (1861). I have transferred it to Aphragmus Andrzej. for the reasons discussed under the latter genus. Thus, there occur only three species in the present area.

Key to the species:

- I. Racemes capitate in fruit; leaves narrowly linear, 1-2 mm. broad;  
petals 2.8-3.2 mm. long ..... 3. B. tibetica

1. Racemes increasing 1-2 cm. in length in fruits; leaves (2) 3-5 mm. broad  
petals 3-4.5 mm. long:

2. Fruits 1 mm. broad; seeds 0.7 X 0.4 mm. .... 1. B. thomsoni

2. Fruits 1.5 mm. broad; seeds 1 X 0.5 mm. .... 2. B. rosea

1. B. thomsoni Hooker f. in Journ Linn. Soc. Bot. v 168 (1861); S.P. 230;  
S.E.P. 630.

Syn: "B. alpina" H.f. et T. Anderson in Fl. Brit. Ind. i 155  
(1872) (non Sternb. et Hoppe); B. thomsoni var. pilosa  
Schulz in Notizblatt ix 1068 (1927).

Type: W. Tibet, Piti, 3600-3900 m., Thomson(K!).

Perennial, 5-8 cm. tall, with glabrous leaves and + pilose  
stems, branched mostly from the base; branches slender, mostly scapose;  
hairs simple. Radical leaves rosulate, many, linear-oblong, 1.5-3.5x0.2-  
0.3 cm., cuneate, fleshy. Cauline leaves usually absent, sometimes one,  
about 1 x 0.1 cm., linear. Racemes 10-20-flowered, ebracteate, corymbose,  
increasing upto 2.5 cm. in fruit. Flowers about 2.5 mm. across, white;  
pedicels 2-4 mm. long, increasing upto 7 mm. in fruit, and becoming slight-  
ly thickened, erect, subapressed, often outcurved towards the apex. Sepals  
2-2.5x1 mm. Petals 3.5-4.5x1-1.2 mm., obovate-cuneate, apex subemarginate.  
Stamens about 2 : 2.5 mm.; anthers about 0.26 mm. Fruits 5-8x1 mm., linear,  
subcompressed, obscurely torulose, often outcurved towards the apex, glab-  
rous; valves 1-veined; style 0.5-0.7 mm. long, slightly thickened with  
subretuse stigma; seeds 8-12, biseriate, about 0.7x0.4 mm., ovoid, pale  
brown; septum not veined.

N.W. Himalayas:

Kumaon, Jolinka, Byans, 4200-4500 m., Duthie no. 5343(K!);

W. Tibet, Piti, 3600-3900 m., Thomson(K!).

Geog. Dist: Endemic.

2. B. rosea (Turcz.) Bunge in Hort. Dorpat. 7 (1839); F.B.I. 155; S.P. 231;  
S.E.P. 630.

Syn: Draba rosea Turcz. in Bull. Soc Nat. Mosc. 87 (1838); —  
B. aena Bunge in Del. Sem. Hort. Dorpat. 8 (1841); Hesperis  
rosea O.K. l.c. 935.

Type: N.asia, Nuchudaban, Turcz. (L,K!).

Perennial, 2-6 cm. (rarely upto 12 cm. ) tall, suerect or ercet, sparsely hairy with simple and furcate, unequal hairs. Radical leaves rosulate, oblong-lanceolate or linear, 1.5-4x0.2-0.5 cm., stalked, entire to 2-3-subdentate, acute or obtuse, + fleshy, subglabrous or glabrous. Cauline leaves usually absent, rarely 1-2, short, linear, sessile. Racemes 10-20-flowered, corymbose, + capitate, increasing upto 1 cm. in fruit. Flowers about 2.5 mm. across, white or pale lilac; pedicels 1-2 mm. long, increasing upto 4 mm. in fruit. Sepals 2-2.5x1 mm. Petals 3-3.5x1-1.2 mm., obovate-cuneate, apex subemarginate. Stamens about 2 : 2.2 mm.; anthers about 0.3 mm. Fruits 4-6.5x1.5 mm., oblong or ellipsoid, subtorulose, glabrous; valves 1-veined; style 0.5-1 mm. long, thickened with depressed, subretuse, capitate stigma; seeds 8-14, biseriate, about 1 x 0.5 mm., ovoid, yellowish-brown; septum not veined.

N.W.Himalayas:

Kashmir: Ladak, 3900-4800 m., Strachey & Thomson(K!); W.Tibet, Zanskar, 3600-4200 m., Strachey & Thomson(K!); Nubra, Brash, 5100-5400 m., Strachey & Thomson (K!).

Geog. Dist:

Himalayas: Sikkim, J.D.Hooker(K!).

C.Asia: Altai, P.Krylow no.II05(K!);

3. B. tibetica H.f.et T. in Journ. Linn. Soc. Bot. v 168 (1861); F.B.I. 155; S.P. 236; S.E.P.630.

Syn: Sisymbrium tibeticum Fourn., Recherch. Crucif. 128 (1865); Hesperis tibetica O.K. l.c.935.

Type: W.Tibet: 3900-5400 m., Thomson(K!).

Perennial, 3-8 cm. tall, erect, very branched from the base, hairy, often pilose with furcate or simple hairs; rootstock densely covered with withered leaf bases. Radical leaves densely rosulate, linear-oblong, 2-4x0.1-0.2 cm., entire to irregularly sinuate-dentate especially near the middle, often purplish in colour; apex rounded or obtuse. Scapes aphyllous, rarely 1-2-leaved; All leaves fleshy, Racemes 15-25-flowered, capitate, ebracteate,, not increasing in length in fruit. Flowers minute, about 2 mm. across, white or pinkish; pedicels 2-4 mm. long, increasing very slightly

or not in fruit. Sepals 2-2.5x 0.8-1 mm. Petals 2.8-3.2x1-1.2 mm., obovate-oblong, cuneate, apex obscurely emarginate. Stamens about 1.7 : 2 mm.; anthers about 0.3 mm. Fruits short, 3.5-4.5x1-1.2 mm., ellipsoid, subinflated, hairy or glabrous, Valves ± 1-veined; style hardly 0.5 mm. long; stigma subretuse, depressed-capitate; seeds 4-10, biseriate, about 1 x 0.5 mm., ovoid, brownish; septum not veined.

N.W.Himalayas:

Lahul, Serchu, 4200 m., Koelz no. 2083(R-E!);

Kashmir: Ladak, J.L.Stewart(K!).

W.Tibet: Nubra, 4500-4800 m., Thomson(K!); Zaskar, Thomson(K!)

Karakorum: 5100-5400 m., Thomson(K!).

Geog. Dist:

Tibet: Karola pass, c. 4950 m., J.Walton(K!); Jaglang, c. 4800 m., Heyde(K!); Rama to Dumpa Gumpa, 4800 m., Gould no. 2264(K!); Phari to Tremo La, 4500 m., Gould no. 2165(K!).

88. \*ARABIDOPSIS Heynhold in Fl. Sachsen. i 538 (1842); S.P. 268; S.E.P. 640; K.F.U. 76.

Syn: Pilosella Kostel., Ind. Pl. Hort. Prag. 104 (1844);

Stenophragma Celakovsky, Kvet. Ok. Prazs. 75 (1870).

Annual, biennial or perennial, ± erect, rarely procumbent, branched, often densely so, hairy with simple and branched, often intermixed, short, rigid hairs, rarely subglabrous. Leaves oblong, basal/petiolate cauline sessile, often sagittate-amplexicaule, rarely cuneate at the base, entire or toothed. Racemes ebracteate or bracteate, corymbose above, often lax in fruits. Flowers minute or small, white, lilac or yellow; pedicels filiform, often flexuose in fruit, ascending or spreading. Sepals subequal, oblong, obtuse, inner two not or hardly saccate. Petals slightly to about twice as long as the sepals, spatulate or ovate-cuneate, rarely suppressed. Stamens 6, not appendaged; anthers oblong or ovoid, obtuse. Lateral nectari-ferous glands semiannular or annular, rarely semiglobose; median present, often torose and bigibbous, sometimes joining the laterals. Ovary narrowly cylindrical, or linear, 20-90-ovuled; stigma depressed-capitate, rarely subbilobed on short style, often slightly thickened in fruit. Siliquae linear, subcylindrical or terete; valves membranous or sub-rigid, with a + distinct mid-vein, glabrous or hairy; seeds uniseriate rarely subbiseriate, ovate,

mucilaginous when wet; septum membranous, not veined or rarely I-veined.

About 17 species chiefly in Europe Asia and N.africa.

It is primarily distinguished from Sisymbrium by its canescent habit (at least at the base) with short, mostly branched, rigid, white hairs; oblanceolate or oblong-obovate basal leaves, usually sinuate-dentate to subentire, and often auricled-amplexicaule cauline leaves; minute or small, usually white or pink flowers; narrowly linear, often terete-compressed siliquae, with I-veined valves; and seeds mucilaginous when wet. From Arabis it is primarily distinguished by its minute or small flowers with equal, not saccate sepals; terete-compressed siliquae with obtuse apex; style short, thickened; valves + convex, usually membranous; and seeds mucilaginous when wet.

This, primarily Asian genus is represented by eleven species in the present area. Of these two are new to science. Out of the remaining nine, 8 were originally described as Sisymbrium species. The ninth species, A. campestris Sculz, was described from Baluchistan during 1927. Seven of these species are included under Sisymbrium set. Arabidopsis in Hooker's Fl. Brit. India (1872).

Key to the species:

- I. Cauline leaves shortly stalked, subsessile or sessile but always cuneate and entire at the base (rarely sub-auricled and semiamplexicaule):
  2. Plants apparently glabrous above; cauline leaves with cuneate bases:
    3. Siliquae 1-2 cm. long; all cauline leaves sessile, entire or obscurely toothed, sparsely hairy with simple or forked hairs (rarely glabrous):
      4. Flowers white; petals 3-3.5 mm. long ..... I. A. thaliana
      4. Flowers deep yellow; petals about 1.8 mm. long ... 2. A. stewartiana
    3. Siliquae 6-7 mm. long; lower cauline leaves runcinate, upper + linear and entire, hairy with minute stellate hairs .....
      - ..... 5. A. russelliana
  2. Plants + canescent, even above; cauline leaves stalked to sessile; uppermost leaves sessile, often with slightly broad bases (about as broad as the lamina):
    5. Annual or biennial:

6. Siliquae 4-6 cm. long, often + recurved and spreading; seeds 30-45 in each loculus; (cauline leaf-bases often subauricled)

.....II. A. campestris

6. Siliquae 2-4 cm. long, straight and erect; seeds 20-30 in each loculus; (cauline leaf-bases entire) .....8. A. stricta

5. Perennials:

7. Hairs 1-1.5 mm. long, often dense; petals 4-4.5 mm. long

.....3. A. wallichii

7. Hairs minute, about 0.5 mm. long; petals 3.2-3.5 mm. long

.....4. A. kneuckeri

I. Cauline leaves sessile, mostly with broad and sagittate-amplexicaule bases:

8. Annual or biennial; siliquae clothed with short, rigid and furcate hairs:

9. Flowers yellow; racemes ebracteate; pedicels 1.5-3 mm. long, increasing upto 10 mm. in fruit .....6. A. pumila

9. Flowers lilac; racemes bracteate below; pedicels 0.5-1 mm. long, increasing upto 3 mm. in fruit .....9. A. lasiocarpa

8. Perennial (rarely biennial); siliquae glabrous:

10. Racemes bracteate, often upto the apex; flowers 2-2.5 mm. in diam. ....10. A. himalaica

10. Racemes ebracteate (rarely bracteate at the base); flowers 3.5-5 mm. in diam. ....7. A. mollissima

I. A. thaliana (L.) Heynh. in Fl. Sachs. i 538 (1842); S.P. 270; S.E.P. 64I; K.F.U. 77.

Syn: Arabis Thaliana L., Sp. Pl. ii 665 (1753); Sisymbrium Thalianum (L.) J. Gay et Monnard in Ann. Sc. Nat. Bot. vii 399 (1826); B.F.O. 214; F.B.I. 148.

Type: Europe (not precisely designated) (LS!).

Annual rarely biennial, 5-40 cm. tall, erect, sometimes branched from the base, + hairy with ~~xxx~~ simple or furcate hairs below and glabrous above. Basal leaves rosulate, obovate-oblong, 1.5-5x0.5-1 cm., subsessile or shortly stalked, slightly and distantly toothed to subentire. Cauline leaves short, distant, oblong, obovate or linear, cuneate, sessile



entire or slightly toothed. Racemes 3-40-flowered, ebracteate, corymbose above, increasing upto 20 cm. in fruits. Flowers 2-3 mm. across, white; pedicels 3-5 mm. long, increasing upto 15 mm. in fruit, filiform, ascending. Sepals 1.2-2x0.5 mm. Petals 3-3.5x0.8-1 mm., spathulate, apex rounded. Stamens 4-6; about 2 : 2.5 mm.; anthers about 0.5 mm. Siliquae 12-18x0.8-1 mm., linear, subcylindrical, slightly upcurved; valves glabrous, 1-veined; stigma short, depressed, sessile or on very short style; seeds 20-30 in each loculus, minute, uniseriate, about 0.5 mm. long; septum not veined.

W. Pakistan:

Chitral: Dam gol, 1500 m., Toppin no. 22(K!).

N.W.F.P.: Kaghan valley, 2400 m., Inayat no. 19197(K!); Abbottabad, 1440 m., R. Stewart no. 16371(R-E!).

Punjab: near Rawalpindi, Aitchison no. 1142(K!); (without locality), J.L. Stewart(E!,K!); Pathankot, R. Stewart(K!).

Afghanistan:

(without locality), Griffith nos. 1468(K!), and 1476(K!).

N.W. Himalayas:

Lahul, 3090 m., N.L. Bor no. 14580(E!); Pangri, 2400 m., Watt no. 964(E!); Kilar, Watt no. 2202(E!); Pangri, 2550 m., Watt nos. 945(E!), and 987(E!); Simla, Suni, 900-1200 m., Minchin (E!); Keylang, Lahul, Drummond nos. 20272(E!,K!); and 20273(K!); Kunawar, Thomson(K!); Kishtwar, 2400-3000 m., Thomson(K!); Sadhaura, Edgeworth(K!); Chenab valley, R. Ellis(K!); Chamba state, Wazirat Churah, 2100 m., Parker(K!); Kunawar, Jacquemont(K!); Kumaon, Beninag, N. Gill no. 435(K!); Chenab valley, Chor, 2250 m., Ellis no. 1045(K!); Chamba, Alwas, 2100 m., R. Stewart no. 2395(K!); Kumaon, Almora, 1650 m., Strachey & Winterbottom(K!); Kumaon; Jolinka, Byans, 4200-4500 m., Duthie no. 5354(K!,BM!); DehraDun. Gamble no. 23412(K!);

Kashmir: Jhelum valley, 1500-1800 m., Duthie no. 10895(E!); Lidder valley, 3600-3900 m., Duthie no. 13345(E!); (without locality), Thomson(K!); Baltistan, Hassora, Winterbottom no. 757(K!); Lidder valley, Kalhoi, Inayat(K!); Palgam, Inayat no. 25489(K!); Matyana, 3300 m., R. Stewart no. 9952(K!); Nishat, Falconer's collector no, 2172(K!); Baltistan, Dras valley, 3000-3300 m., Duthienno, 13686(BM!); Marpu nullah, 3600-3900 m., Duthie(BM!); Dras, Schlagintweit(BM!); Mt. Haramosh, 2250 m., Ludlow no. 246 (BM!);

Karakorum: 3750 m., Clarke no. 30350(K!).

Geog. Dist:

Europe, Mediterranean region, Asia and N. America.

2. Arabidopsis stewartiana Jafri, sp. nov.

Affinis A. thalianae (L.) Heynh. sed floribus minoribus intense flavis, ramis filiformibus subarcuatis sparse foliatis divergit.

Herba annua, 15-20 cm. alta, sparse ramosa; caules filiformes, erecti vel ascendentes, sparse foliati, pilis simplicibus vel furcatis inferne + hispidi. Folia basalia rosulata, saepe congesta, oblanceolata, 1.2 - 3.5 x 0.4 - 0.8 cm., subintegra, breviter petiolata, ad apicem rotundata. Folia superiora lanceolata, sessilia, semimplexicaulia, integra vel subdentata. Racemus 20-30-florus, ebracteatus, corymbosus, in fructu laxus. Flores 1.5 - 2 mm. diam., intense flavi; pedicelli 3 - 6 mm., in fructu circa 12 mm. longi, filiformes, ascendentes. Sepala circa 1.1 x 0.7 mm., aequalia, non saccata, oblonga, obtusa. Petala spathulata circa 1.8 x 0.9 mm., ad apicem subtruncata. Stamina 6, circa 1.5 : 2 mm.; antherae circa 0.3 mm. longae ovatae obtusae. Glandulae nectariferae laterales semiannulares, medianae torosae. Ovarium lineare, subcylindricum, 34 - 40 - ovulatum; stylus brevis circa 0.3 mm. longus; stigma depresso-capitatum. Siliquae (fere maturae) circa 15 x 0.9 mm., teretes vel paulo compressae, obtusae; valvae subconvexae, glabrae, uninervatae; semina circa 0.6 x 0.3 mm. ellipsoidea brunnea, humida mucilaginoso; septum haud nervatum.

Annual, 15-20 cm. tall, sparsely branched; branches filiform; erect or ascending, sparsely leaved, hairy with simple or furcate hairs below. Basal leaves rosulate, often congested, oblanceolate, 1.2-3.5x0.4-0.8 cm., subentire, shortly petioled, apex rounded. Upper leaves lanceolate, sessile, semimplexicaule, entire or slightly dentate. Racemes 20-30-flowered, ebracteate, corymbose, lax in fruit. Flowers 1.5-2 mm. in diam., deeply yellow; pedicels 3-6 mm., increasing upto 12 mm. in fruits, filiform, ascending. Sepals about 1.1 x 0.7 mm., equal, not saccate, oblong, obtuse. Petals spathulate, about 1.8 x 0.9 mm., apex subtruncate. Stamens 6, about 1.5 : 2 mm.; anthers about 0.3 mm. long, ovate, obtuse. Lateral nectariferous glands semiannular, median torose. Ovary linear, subcylindrical, 34-40-ovuled; style short, about 0.3 mm. long; stigma depressed-capitate. Siliquae (almost mature) about 15 x 0.9 mm., terete-compressed, obtuse; valves subconvex, glabrous, 1-veined; seeds about 0.6 x 0.3 mm., ellipsoid, brown, mucilaginous when wet; septum not veined.

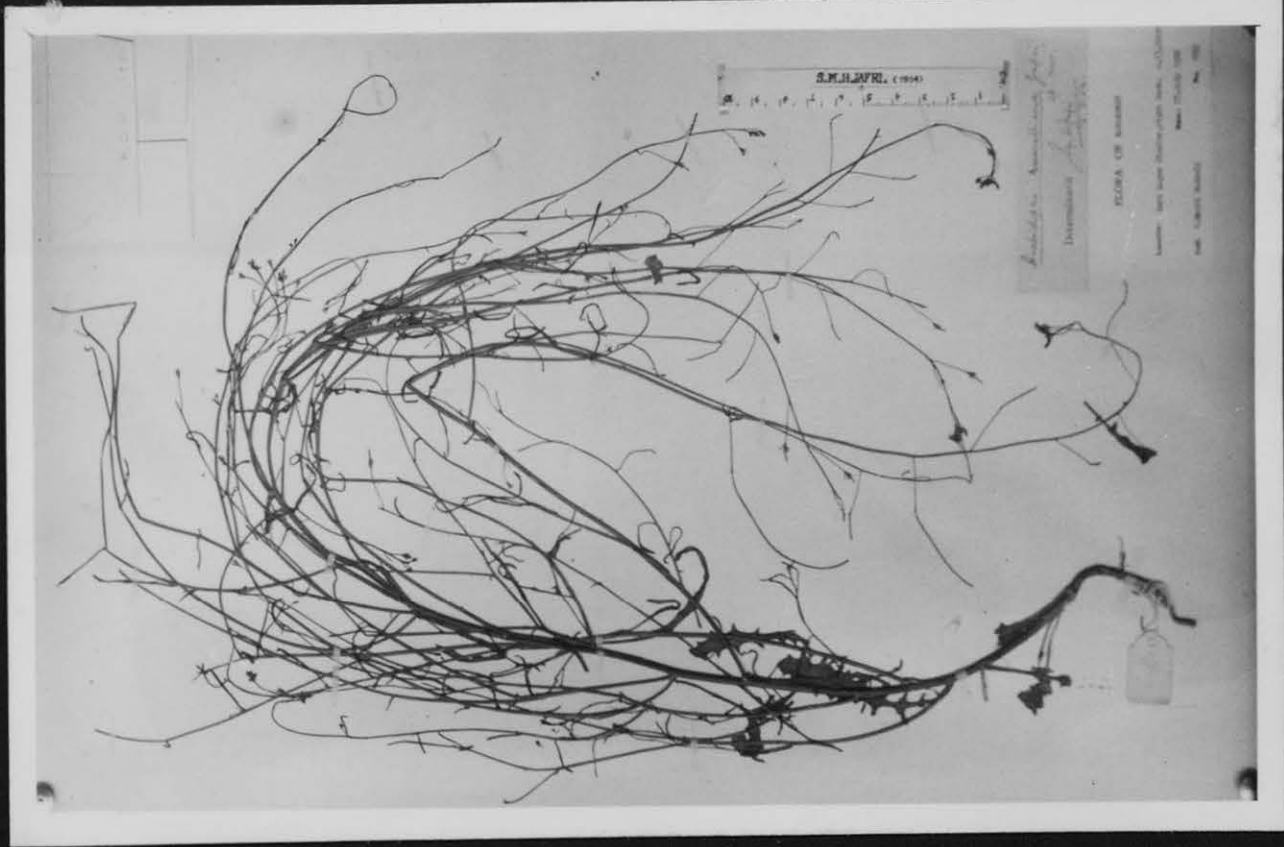


Plate no. LXVI. *Arabidopsis russelliiana* Jafri



Plate no. LXV. *Arabidopsis stewartiana* Jafri

*Arabidopsis stewartiana*

Herbarium of Gordon College  
Flora of HAZARA, Khyber

No. *Arabidopsis stewartiana*  
Date 17/3/87

annual  
leaves rounded to base

*Arabidopsis stewartiana* Jafri  
Determinavit *Abdullah*  
17/3/87

S.M.H. JAFRI. (1984)

S.M.H. JAFRI. (1984)

FLORA OF HAZARA

Location: Hazara District, Hazara, NWFP, Pakistan  
Date: 17/3/87  
No. 100

N.W.Himalayas:

Punjab Himalaya: Kulu, E.Nasir (R-E!). (Plate no. LXV).

Distinguished from A. thaliana (L.) Heynh. by its minute, deeply yellow flowers and filiform, subarcuate, sparsely leaved branches. The plants resemble very closely to these of A. thaliana, but the flowers are <sup>a</sup>remarkably deep yellow. I am therefore unable to include it in A. thaliana where the flowers are white. Yellow flowers <sup>are</sup> rare in Arabidopsis. A. pumila (Steph.) Busch, a species occurring in Baluchistan and extending northwards to C. Asia, has yellow flowers. But this species is very distinct from the present new taxon in its sagittate-amplexicaule cauline leaves, large flowers and hairy fruits.

3. A. wallichii (H.f. et T.) Busch, FL. Cauc. Crit. iii 657 (1909); S.P. 276; S.E.P. 64I.

Syn: Sisymbrium Wallichii H.f. et T. in Journ Linn. Soc. Bot. v 158 (1861).

Type: Kumaon, Wallich no. 4784 (K!).

Perennial, 20-60 cm. tall, usually sparsely branched, erect, densely pubescent with simple or furcate, 1-1.5 mm. long, white hairs. Rosette leaves lyrate-pinnatifid, 1.4-7x0.4-2 cm., stalked, 2-4(-6)-jugate; terminal lobe ovate or suborbicular, lateral lobes narrowly ovate or oblong, apex rounded or obtuse. Upper leaves few, distant, pinnatifid, shortly stalked or sessile. Uppermost leaves sessile, semiamplexicaule, sometimes subauricled at the base, oblong or linear, remotely dentate or ~~or~~ subentire. Racemes 10-20-flowered, ebracteate, subcorymbose, increasing upto 20 cm. in fruits. Flowers 2.5-3.5 mm. across, white or pale lilac; pedicels 5-8 mm. increasing upto 20 mm. in fruit, filiform, spreading. Sepals 2.5-3x0.7-0.9 mm. Petals 4-4.5x0.8-1 mm., narrowly spatulate, apex rounded. Stamens 2.5-3 : 4-4.5 mm.; anthers about 0.7 mm. long. Siliquae 4-8x0.08-0.1 cm., linear, terete-compressed, often + recurved, spreading; valves glabrous, 1-veined; style 0.5-1 mm. long, rarely suppressed with depressed-capitate stigma; seeds 20-30 in each loculus, about 0.8 x 0.5 mm.; septum not veined.

W. Pakistan:

Chitral: Harriss no. 15880 (B- not seen); Hamilton (B- not seen); Shokor Shal, c. 3500 m., P. Wendelbo (Herb. Oslo- not seen)

N.W.F.P.: Abbottabad, 1200 m., R.Stewart no. 9006(K!); and no. 1364I(R-E!).

Punjab: Hasan Abdal, 750 m., R.Stewart no. 9539(K!); Murree hills, Barian, 2100 m., R.Stewart no. 9585(K!).

Afghanistan:

Bharawal, Alipore, Griffith no. 147I(K!); Kurrum valley, Alizai, Aitchison nos. 12(K!), 200(K!), and 209(K!); Paghman, 2250 m., W.R.Hay no. 127(K!).

N.W.Himalayas:

Jaunsar, Konaan, 2190 m., Gamble no. 24106(K!); Kilar, 2400-2700 m., Watt no. 2900(E!); Kumaon, Almorah, 1650 m., Strachey & Winter-bottom(K!,BM!); Kumaon, Wallich, no. 4784(K!,BM!); Royle(K!); (without locality), J.L.Stewart(K!); Thomson(K!); Simla, Ushan valley 1200 m., A.M.Intire, Herb. Watt n. 4254(E!).

Kashmir: Falconer's collector no. 2043(K!); Srinagar, 1560 m., R.Stewart no. 11070(K!); Thomson(K!); Kishtwer, 2400-3000 m., Thomson(K!); Bern nala, 1800 m., Coventry no. 14561(K!); Pahlgam, 1950 m., Ludlow & Sherriff no. 7598(BM!).

Geog. Dist:

Persia and C.Asia.

This species seems to be very variable in the size of the style. Usually it has 0.5-1 mm. long style, but A.M.Intire's specimens [Herb Watt no. 4254(E!)] from Simla, have almost sessile, somewhat broad stigmas. There are three sheets with this very striking character, but in other characters the plants are remarkably identical with the true plants of this species. It has been included here for the time being till further information is available.

4. \* A. kneuckeri (Bornm.) Schulz in Pflanzenreich (86) 277 (1924); S.E.P. 641.

Syn: Sisymbrium Kneuckeri Bornm. in Allgem. Bot. Zeitschr. ix 45 (1904) et xii 71 (1906); Blatter, Fl. Arab. in Rec.Bot. Surv. India viii (1919).

Type: Sinai, A. Kneucker, Herb. Bornm. no. 108(B- not seen).

Perennial, 15-25 cm. tall, erect, sparsely branched, habit very much like A.wallichii(H.fet T.)Busch, but with filiform branches, hairy with short, substellate, about 0.5 mm. long hairs, sometimes sparsely hairy. Leaves lyrate-pinnatifid, shortly stalked, 3-5-jugate; terminal lobe narrowly obovate; lateral lobes distant, narrowly oblong. Racemes 8-20-flowered, corymbose above, increasing upto 15 cm. in fruits. Flowers 2-2.5

mm. across, white or pinkish; pedicels 4-12 mm., increasing upto 15 mm. in fruit, filiform, spreading. Sepals 2.2-2.5x0.8 mm. Petals 3.2-3.5x0.9 mm. Stamens about 2.5 : 3 mm.; anthers about 0.5 mm. Siliquae 3-6x0.08 cm., linear, often slightly curved.

Afghanistan:

Paghman, 2100 m., W.R.Hay no. 346(K!); Berg Babur, Bornmuller no. 186(B- not seen).

N.W.Himalayas:

Chenab valley, Purti, 2700 m., R.Ellis no. 1138(K!);  
Kashmir: Rampur, Jhelum valley Rd., 1200 m., R.Stewart no. 12151  
(B- not seen).

Geog. Dist:

Persia and Sinai.

5. \*\* Arabidopsis russelliana Jafri, sp. nov.

Affinis A. campestrae O.E.Schulz sed habitu robusto multi-ramoso, caulibus inferne sparse hispida superne glabris, foliis inferioribus runcinati-pinnatifidis superioribus lineari-oblongis elongatis, foliis pilis minutis substellatis vel stellatis praeditis, racemis paucifloris in fructu laxis, pedicellis valde flexuosis differt.

Herba annua vel biennis, circa 65 cm. alta, erecta, multi-ramosa, inferne sparse hispida, superne glabra. Folia basalia laxe rosulata, marcida, lyrato-pinnatifida, longe petiolata. Folia caulina inferiora pauca, runcinato-pinnatifida, 5-7-juagata, petiolata, 5-7x1-1.5 cm., ad apicem obtusa sparse pubescentia, pilis minutis sustellatis vel stellatis. Folia superiora lineari-oblonga, obscure denticulata vel integra, elongata, 1.5-6x0.15-0.5 cm., sessilia, semiamplexicaulia, sparse pubescentia vel glabra. Racemus 8-15-florus, laxis, ebracteatus, in fructu circa 20 cm. longus. Flores circa 3 mm. diam., albi; pedicelli 5-12(-15) mm., in fructu circa 20 mm. longi, filiformes, tortuosi vel ascendentes. Sepala circa 2.5x0.8 mm., aequalia, non saccata, oblonga, obtusa, pube minuta substellata. Petala ob-lanceolata, 3.5-4x0.8-1 mm., ad apicem rotundata. Stamina 6, circa 3 : 3.5 mm.; antherae circa 0.6 mm., oblongae, obtusae. Glandulae nectariferae laterales annulares, median torosae conjunctae. Ovarium oblongum, subcylindricum, circa 60-ovulatum; stigma depresso-capitatum, subsessile. Siliquae

(immaturae) lineari-subcylindrica, 6-7x0.08 cm., obtusae, saepe curvatae; valvae subconvexae, glabrae, uninervatae; semina immatura; septum membranaceum.

Annual or biennial, about 65 cm tall, erect, much branched, sparsely hairy with simple or forked hairs below and glabrous above. Basal leaves loosely rosulate, withering, runcinate-pinnatifid, long stalked. Lower cauline leaves few, runcinate, 5-7-jugate, stalked, 5-7x1-1.5 cm., apex obtuse, sparsely pubescent with minute, substellate or stellate hairs. Upper leaves linear-oblong, elongated, obscurely toothed to entire, 1.5-6x0.15-0.5 cm., sessile, semiamplexicaule, sparsely hairy to glabrous. Racemes 8-15-flowered, lax, ebracteate, increasing upto 20 cm. in fruits. Flowers about 3 mm. in diam., white; pedicels 5-12(-15) mm., increasing upto 20 mm. in fruit, filiform, spreading or ascending. Sepals about 2.5 x 0.8 mm., equal, not saccate, oblong, obtuse, minutely hairy with substellate hairs. Petals 3.5-4x0.8-1 mm., oblanceolate, apex rounded. Stamens 6, about 3 : 3.5 mm.; anthers about 0.6 mm., oblong, obtuse. Lateral nectariferous glands annular, median torose, joining the laterals. Ovary oblong, subcylindrical, about 60-ovuled; stigma depressed-capitate, subsessile. Siliquae (immature) linear, subcylindrical, 6-7x0.08 cm., apex obtuse, often curved; valves glabrous, subconvex, with a distinct mid-vein; seeds immature; septum membranous.

N.W.Himalayas:

Karakorum: Kero Lugma glacier, right bank, c. 3900 m., July 27th. 1939, R.S.Russell no. 1855(BM!).

Distinguished from A. campestris Schulz by its robust habit; much branched stem, sparsely hairy below and glabrous above; lower leaves runcinate-pinnatifid or simply runcinate, minutely pubescent with substellate or stellate hairs; upper leaves linear-oblong, elongated, entire or subdentate; racemes lax; pedicels long, flexuose. (Plate no. LXVI).

6. A. pumila (Steph.) Busch, Fl. Cauc. Crit. iii 457 (1909); S.P. 277; K.F.U. 78.

Syn: Sisymbrium pumilum Steph. in Willd., Sp. Pl. iii 507 (1800); B.F.O. 213; S. cabulicum H.f. et T. in Journ. Linn. Soc. Bot. v. 161 (1861); S. foliosum H.f. et T. l.c. 160; F.B.I. 148;

S. hirtulum et S. kokanicum Regel et Schmalh. in A.H.P., v 240 (1877) et Descr. Pl. Fedtsch. Turkest. 9 (1882).

Type: N. Persia, Willdenow ? (B- not seen).

Annual, (3)10-30(-50) cm. tall, erect, simple or sparsely branched from the base, ± hairy with branched, short and rigid hairs, rarely subglabrous. Basal leaves subrosulate, often congested, obovate-oblong or elliptic-oblong, 1.2-8x0.8-3.5 cm., coarsely toothed to subentire, apex rounded or obtuse, stalked. Upper leaves sessile, oblong or lanceolate, sagittate-amplexicaule, 1-5x0.3-1 cm., toothed or subentire, apex acute to rounded. Racemes 15-45(-75)-flowered, corymbose above, ebracteate, increasing upto 20 cm. in fruits. Flowers 2-2.5 mm. across, yellow; pedicels 1.5-3(-5) mm., increasing upto 10 mm. in fruit, filiform, ascending. Sepals 1.5(-2)x0.8-1 mm. Petals 2-2.5(-3)x1 mm., spatulate, apex rounded. Stamens 1.5-2 : 2-2.2 mm.; anthers about 0.3 mm. long. Siliquae 8-35x0.7-1.4 mm., oblong-linear, subcompressed, ± upcurved; valves ± scabrous with short branched hairs, rarely subglabrous, usually 1-veined; style about 0.5 mm. long, with depressed, subretuse stigma; seeds 16-35 in each loculus, about 0.75x0.4 mm.; septum membranous, not veined.

W. Pakistan:

Baluchistan: Chehel, Stocks no. II22(K!); Khojak pass, Duthie no. 8584(K!); Quetta, Griffith no. I481(K!); Peshin, Lace (E!); Kutchlak, Jafri(E!); Quetta, Lace no. 3634(E!).

Afghanistan:

Sinab, Griffith no. I482(K!); (without locality), Griffith no. I465(K!); Harirud valley, in shade of shrubs, very common, Aitchison nos. I63(K!) and I89(K!).

N.W. Himalayas:

(without locality), Royle(K!); Thomson(K!); Kashmir: Srinagar, 1500 m., Coventry no. I322(K!); R. Stewart no. III03(K!).

Geog. Dist: C. and W. Asia.

7. A. mollissima (C.A.M.) Busch, FL. Sib. I36 (1913); S.P. 280; K.F.U. 79.

Syn: Sisymbrium mollissimum C.A.M. in Ledeb., Fl. Alt. iii I40 (1831); F.B.I. I47; S. Thomsonii Hooker f. in Journ. Linn. Soc. Bot. v I61 (1861).

Type: C. Asia, Altai, Ledebour(L,K!).



Var. I. mollissima

Perennial, 10-30(-40) cm. tall, erect, branched mostly from the base, hairy or glabrous; hairs simple or branched, intermixed. Radical leaves spatulate or oblong-obovate, 2-6x0.5-1.5 cm., shortly stalked, obtuse, deeply toothed to entire. Cauline leaves lanceolate, sessile, auricled at the base, amplexicaule, much smaller than the radical leaves. Racemes 20-40-flowered, corymbose above, ebracteate (rarely bracteate at the base), increasing upto 15(-20) cm. in fruits, Flowers 3.5-5 mm. across, white or rose; pedicels 4-10(-15) mm., increasing upto 20 mm. in fruits, ± spreading, filiform. Sepals 2-2.8x1 mm. Petals 3-4x1-1.2 mm., spatulate, apex subtruncate. Stamens 2.2-2.5 : 2.5-2.8 mm.; anthers about 0.5 mm. long. Siliquae 1.5-4x0.1-0.15 cm., erect, straight, terete-compressed; valves with a prominent mid-vein, glabrous; style about 1 mm. long with a depressed-capitate stigma; seeds 20-40 in each loculus, about 1x0.5 mm.; septum not veined.

Afghanistan:

(without locality), Griffith no. 1470(K!); Kurrum valley, Shalizi-zan, Aitchison no. 141(K!).

N.W.Himalayas:

Chenab valley, Dunai, 3300 m., R.Ellis no. 299(K!); Upper Chenab, Drati pass, 3600 m., B.Powell no. 58(K!); Dartse, Drummond no. 20275(K!); (without locality), Drummond no. 20225(K!); Tihri-Garhwal, Jacquemont(K!); Lahul, Koksar, 3600 m., N.L.Bor no. 14555(E!,R-E!); Bashahr state, Lace no. 425(E!); Watt no. 2110(E!); Kumaon, Byans, J.R.Reid(E!); Chamba, Pangli, anuman nullah, 2850 m., R.Stewart no. 2779(K!); Lahul, Jaeschke(K!).

Kashmir: Sonmarg, R.Stewart(K!); Lidder valley, Zur nar, 3000 m., R.Stewart no. 21560(K!); Harnag pass, 3900 m., R.Stewart no. 12599(K!); Kishenganga valley, Deosai pass, 3900 m., R.Stewart no. 22185 a(K!); (without locality), J.L.Stewart(E!,K!); Pass to Darwar, 3000-3600 m., Winterbottom(K!); Sonmarg, 2700-3000 m., R.Stewart nos. 6319(K!) and 3530(K!); Jamu, Thomson(K!); Kistwer, Thomson(K!); (without locality), A.V.Munro no. 107(K!); Baltistan, Das Kirin, Winterbottom no. 756(K!); Musjid valley, Duthie no. 13205(E!,BM!); Sonmarg valley, 2400-2700 m., Duthie no. 11517(E!); Ladak, Thomson(K!); Marbul pass, 3150 m., Clarke nos. 31295(K!), and 31295 B(BM!); Ladak, Schlagintweit(BM!); Baltistan, Shinge valley, 3300 m., Duthie no. 1186(BM!); Gulmarg, 2400 m., Finfold no. 124(BM!); Ladak, 3150 m., Ludlow & Sherriff no. 8328(BM!); Baltistan; 3300 m., Duthie no. 11870(E!).

Karakorum: Zangia Harar, Hunza valley, 3900 m., Russell no. 1060 (BM!); Hispar valley, 3900 m., Russell no. 1556(BM!); Karakorum, 3750 m., Clarke nos. 30360(K!), and 30355(K!); Moraine, Conway no. 306(K!).

W.Tibet: Zanskar, 3600-4200 m., Thomson(K!); Deosoo, Falconer's collector nos. 3553(K!), and 4445(K!).

Geog. Dist: C. Asia.

Var. 2. griffithiana (Boiss.) Schulz in Pflanzenreich (86) 282 (1924).

Syn: Parlatoria Griffithiana Boiss., Diagn. ser. II (i)23(1853).

Type: Afghanistan: Bhorowal, Griffith no. 1472(G,K!).

Perennial, 30-40 cm. tall, erect, much branched from the base, subglabrous or glabrous. Cauline leaves few, distant, oblong-linear, sparsely toothed to subentire, bases hardly auricled, amplexicaule. Racemes subcorymbose above. Flowers 6-7 mm. across, white or yellowish; pedicels 2-6 mm. long, horizontal. Sepals about 3.5x1 mm. Petals 5.5-6x1.5 mm. Stamens about 4 : 5 mm.

Distinguished from the type race by its subcorymbose racemes, large flowers and horizontal pedicels.

Known from the type locality only.

8. A. stricta (Camb.) Busch, Fl. Cauc. Crit. iii 457 (1909); S.F. 282;

S.E.P. 641.

Syn: Malcolmia stricta Camb. in Jacquemont, Voy. Ind. Bot. iv 16 t. 16 (1844); Sisymbrium strictum (Camb.) H.f.et T. in Journ. Linn. Soc. Bot. v 161 (1861); F.B.I. 149.

Type: N.W.Himalayas: Simla, Jacquemont(P,K!).

Biennial, 30-50 cm. tall, erect, strict, branched, clothed with short, simple to substellate, intermixed hairs. Lower leaves spatulate, 1.5-6x0.6-1.8 cm., stalked, + toothed. Upper leaves lanceolate or oblong-linear, sessile, cuneate, entire to slightly toothed, 1-3x0.2-0.6 cm. racemes 30-60-flowered, corymbose above, + bracteate below, increasing upto 30 cm. in fruits. Flowers 2-2.5 mm. across, lilac; pedicels 1-5 mm., increasing upto 10 mm. in fruit, filiform, rigid, + spreading. Sepals 1.7-2.2x 0.7-0.8 mm. Petals 3-3.5x0.8-1 mm., spatulate. Stamens about 2 : 2.5 mm.; anthers about 0.25 mm., obtuse. Siliquae 20-40x0.6-0.8 mm., linear, subcompressed; valves glabrous, with a distinct mid-vein; style 0.5-1 mm. long with short, depressed stigma; seeds 20-30 in each loculus, about 0.7x0.4 mm.; septum membranous, not veined.

W. Pakistan:

N.W.F.P.: Hazara, Kaghan valley, Inayat(K!); Kaghan valley,

J.L.Stewart(K!).

Punjab: Murree hills, 2100 m., R.Stewart no. I2598(R-E!); Dharmsala, R.Stewart no. 2059(K!).

Afghanistan:

Kurram valley, Aitchison(K!); Shendtoi, Aitchison no. 25 (K!,BM!); Sikram, Harsukh no. I4837(K!).

N.W.Himalayas:

Kumaon, Byans, 3000-3300 m., Duthie no.5348(K!,BM!){with A. himalaica}; Gurhwal, Thomson(K!,BM!); Jaunsar, 2100 m., Gamble nos. 26945(K!)and 26827(K!); Mandali, 2550 m., Gamble no. 24346(K!); (without locality), Royle (K!); 2100-2700 m., Edgeworth(K!); Simla, Jacquemont(K!); Sutlej valley, J.L.Stewart(K!); Nagkunada, 2700 m., H.Collett no. 787(K!); Simla, 2100 m., Gamble no. 4561 A(K!); Jalanni pass, Drummond no. 20229(K!); Simla, Matyana, 2100 m., Gamble no. 4580 A(K!); Tihri-garhwal, Kanoor, Thomson(K!); Kumaon, Gori valley, 1800 m., Strachey & Winterbottom(K!);  
Kashmir: Rattan Panjal, Winterbottom(K!); Gurais, Winterbottom (K!); Rattanpir, Clarke no. 28314 A(K!); Tilail, 3150 m., Clarke no. 3068(K!); Sonmarg, 2700-3000 m., R.Stewart no. 7361(K!); Barungalli, 1950 m., Clarke no. 28397(K!); Drummond no. 13988(K!); Above Chorwan, Gilgit Rd., 2550-2700 m., R.Stewart no. 19688(R-E!); Rattanpir, 2400 m., Clarke no. 28286(BM!); W.tibet: Falconer's collector no. 3336(K!); Dunga gali, A.P.Young (BM!); Changla, A.P.Young (BM!).

Geog. Dist:

C.Asia.

9.\*A. lasiocarpa (H.f.et T.) Schulz in Pflanzenreich (86) 282 (1924)et Notiz-blatt ix 1060 (1927); S.E.P. 641.

Syn: Sisymbrium lasiocarpum H.f.et T. in Journ. Linn. Soc. Bot. v 162 (1861); F.B.I. 148.

Type: Himalayas, Bhutan, Griffith no. 1761(K!).

Annual or biennial, 12-35 cm. tall, erect, simple or sparse-ly branched, clothed with short, rigid, branched hairs. Basal leaves sub-rosulate, congested, spathulate, 1-2.5x0.5-0.8 cm., shortly stalked, sinuate-toothed to subentire. Upper leaves ovate-oblong or elliptic, 0.5-1.5x0.2-0.5 cm., sessile, toothed or entire. Racemes 15-35-flowered, often bracteate below, corymbose above, increasing upto 20 cm. in fruits. Flowers 2-2.5 mm. across, lilac; pedicels 0.5-1 mm., increasing upto 3 mm. in fruit, filiform, rigid, subspreading. Sepals 1.5-1.8x0.8 mm. Petals 2-2.5x0.8-1 mm., narrowly spathulate, apex rounded. Stamens about 1.5 : 2 mm.; anthers about 0.3 mm. long. Siliquae 10-18x1-1.2 mm., oblong, erect, straight; valves densely

hairy with shortly stellate hairs, I-veined; style hardly 0.5 mm. long with minute, depressed stigma; seeds 8-16 in each loculus, about 0.6x0.3 mm.; septum membranous, with a faint mid-vein.

W. Pakistan:

N.W.F.P.: Hazara, Kaghan valley, 3270 m., Inayat no. 19187(B- only photograph seen at Kew).

Geog. Dist:

E. Himalaya: Bhutan, Griffith no. 176(K!); R.E. Cooper no. 1491 (BM!); Nepal, Cooper(E!).

The short densely hairy siliquae are so characteristic with the very short pedicels that this species cannot be confused with any other of the present area. Inayat's specimen is the only record for W. Pakistan.

10. A. himalaica (Edgew.) Schulz in Pflanzenreich (86) 283 (1924); S.E.P.641.

Syn: Arabis himalaica Edgeworth in Trans. Linn. Soc. xx 31 (1846); Sisymbrium himalaicum (Edgew.) H.f. et T. in Journ. Linn. Soc. Bot. v 160 (1861); F.B.I. 147; S. rupestre Edgew. l.c. 33; H.f. et T. l.c. 162; F.B.I. 148.

Type: Himalaya, Mana, 3300-3600 m., Edgeworth(K!).

Biennial or perennial, 20-50 cm. tall, sparsely branched, erect, often densely hairy with simple and branched hairs. Basal leaves oblong-elliptic, 1-5x0.5-1.5 cm., stalked, coarsely toothed. Upper leaves ovate-oblong, or elliptic, sessile, subauricled at the base, 1-3x0.5-1 cm., acute, dentate. Racemes 20-50-flowered, bracteate, often upto the apex, corymbose, increasing upto 20 cm. in fruits. Flowers 2-2.5 mm. across, white or pink; pedicels 1.5-5(-8) mm., increasing upto 10(-15) mm. in fruit, filiform, rigid, ascending or spreading. Sepals 1.8-2.2x0.7-0.8 mm. Petals 2.5-3x1 mm., oblong-cuneate, apex subrounded. Stamens about 2 : 2.5 mm.; anthers about 0.3 mm. long. Siliquae linear, subtetragonal, 1.5-4x0.7-0.9 mm.; valves with a prominent mid-vein, glabrous rarely sparsely hairy; style about 0.5 mm. long with depressed, shortly subbilobed stigma; seeds 25-50 in each loculus, about 0.7x0.3 mm.; septum membranous, somewhat rigid, + I-veined.

W. Pakistan:

N.W.F.P.: Hazara, Kaghan, Chapri, Inayat(K!); Kaghan, Bhoja, 2820 m., Inayat no. 19190(K!); Hazara. Inayat no. 19186(R-E!).

Afghanistan:

Kurram valley, Aitchison(K!); (without locality), Aitchison no. 210(K!).

N.W.Himalayas:

Pangi valley, R.Ellis(K!); Lahul, Chandia valley, 3750 m., Graaff nos. I4(BM!) and IO(BM!); Kulu Dist., Dibibokri, E.Schelte no. 339I(BM!); Kumaon, Byans, Duthie no. 5348(BM!){with A.stricta}; Tihri-garhwal, Gangotri, 3600-3900 m., Duthie no. I36I(BM!); Summit Marala, c.3750 m., Watt no. 8646(E!); Byans, Reid(E!); Kulu valley, Dusheer lake, I350 m., M.Nath no. I775(R-E!); Sutlej valley, J.L.Stewart(K!); Mavali, 3600 m., H.Collett no. 948(K!); Chenab valley, 3300-3600 m., R.Ellis nos. I559(K!) and I569(K!); Ajoon valley, R.Ellis no. I4I8(K!){mixed}; Upper Chenab Sanch pass, 3000 m., B.Powell no. 6I(K!); Kunawar, Drummond no. 20267(K!); Thomson(K!){with A.stricta}; Tihri-garhwal, Dagsia Deo, 3300 m., Strachey & Winterbottom no. I4(K!); Kumaon, Milan glacier, 3900 m., Strachey & Winterbottom(K!); Palangadh, Byans, 3300-3600 m., Duthie nos. 5350(K!) and 535I(K!); Kumaon, Kali valley, 3600 m., Duthie no. 2727(K!); Harbi Dun, 3900 m., Gamble no. 24296(K!); Kumaon, 2700-3300 m., Thomson(K!); Barakanda, Drummond no. 20263(K!); (without locality), Royle (K!); J.L.Stewart(E!).

Kashmir: Pir Panjal, 3000 m., Drummond no. I3906(E!,K!); Tulion, above Palgam, 3600 m., R.Stewart no. 9I92(K!); Sonmarg, 2820 m., H.Rich no. II03(K!); Sonmarg, 3000 m., R.Stewart no. 7I83(K!); Tragbol pass, R.Stewart(K!); Tragbol, 3300 m., Clarke no. 29254 (K!); N.E. of Murgan pass, 2700-3300 m., Fuller no. 2I(K!); Punch, Barungalli, Drummond no. I3890(K!); (without locality), Falconer's collector no. 2255(K!); near Sutham pass, 3450 m., F.Ludlow no. I8I(BM!); Barungalli, 1950 m., Clarke no. 284I6 A (BM!); Dunga galli, A.P.Young(BM!); Poonana, 2550 m., Clarke no. 28803(BM!); Kishtwer, Bangar, 3450 m., Ludlow & Sherriff no. 9275(BM!);

Karakorum: Soha glacier, 3750-4200 m., Russell no. I7I3(BM!);

Kero Ligma glacier, 3900 m., Russell no. I374(BM!).

W.Tibet: Zanskar, Drummond no. 20276(K!).

Geog. Dist:

Himalayas.

Aitchison wrongly named a specimen [no. 5I9(K!)]

which he collected from Afghanistan as "Sisymbrium himalaicum" (I888). This is Cryptospora falcata Kar. et Kir. (Plate no. L.V).

II. \* A. campestris Schulz in Notizblatt ix I059 (I927) et Fedde, Rep. xxxi I63 (I933).

Type: Baluchistan(W.Pakistan), Ziarat, A.V.Munro (B- only photograph seen at Kew).

Annual, 15-40 cm. tall, erect, simple or branched mostly from the base, hairy with simple or branched, rigid hairs. Basal leaves subrosulate, oblanceolate, shortly stalked, sinuate-dentate to simply toothed, rarely sublyrate. Cauline leaves narrowly oblong, sessile with broad, subauricled bases, sparsely toothed to subentire. Racemes 15-30-flowered, ebracteate, corymbose above, increasing upto 18 cm. in fruits. Flowers about 3 mm. across white or violet; pedicels 2.5-5 mm., increasing upto 10 mm. in fruit, filiform, spreading. Sepals about 2x0.7 mm. Petals 3-3.5x0.8-1 mm., oblong-cuneate. Stamens about 2 : 2.5 mm.; anthers about 0.5 mm. Siliquae 4-6x0.08 cm., linear, ± curved; valves glabrous with a distinct mid-vein; style about 1 mm. long with short, depressed stigma; seeds 30-45 in each loculus, about 0.7x0.5 mm.; septum not veined.

W. Pakistan:

N.W.F.P.: Waziristan; Loargai Narai, 1980 m., Blatter & Fernandez nos. 1306 and 1314 (B- not seen); near Razmak camp, Blatter & Fernandez nos. 1778 and 1915 and 1958 and 3149 (B- not seen).

Baluchistan: Ziarat, 2400 m., on limestone hillside soils, H. Crookshank no. 245 (K!); Ziarat, growing on limestone soils in shaded and damp places, H. Crookshank no. 208 (K!)

Geog. Dist:

Endemic to W. Pakistan.

Distinguished from A. wallichii primarily by its annual habit and less dissected leaves.

I have not seen any specimen of this species from N.W.F.P and have cited only those specimens quoted by Schulz (1933). Blatter's specimens are mostly at St. Xavier's college, Bombay.

89\* CYMATOCARPUS O.E. Schulz in Pflanzenreich (86) 300 fig. 64 (1924);

S.E.P. 645; K.F.U. 80.

Annual, erect, branched mostly from the base, + pilose with simple rarely forked, long, white hairs. Leaves simple, petiolate, elliptic or ovate-oblong, toothed. Racemes ebracteate, corymbose above, lax in fruit. Flowers mediocre, yellow; pedicels filiform, rigid, spreading or deflexed. Sepals erect, subequal, inner pair subsaccate at the base. Petals about twice as long as the sepals, broadly obovate or suborbicular, cuneate at the base, apex rounded. Stamens 6, not appendaged; anthers oblong, obtuse.

Lateral nectariferous glands annular, hexagonal; median narrowly torose, joining the laterals. Ovary subcylindrical, 18-28-ovuled; style very short with capitate, bilobed, broad stigma. Siliquae linear, subcompressed, torulose, apex obtuse, bilocular, dehiscent; valves + convex, mid-vein distinct, glabrous; seeds uniseriate, large, ellipsoid, very mucilaginous when wet, not winged; septum membranous, white, not veined.

3 species in C. Asia and Transcaspicum region.

It is represented by only one species, C. pilosissimus (Trautv.) Schulz. This species can be easily mistaken for Brassica sp. (as done by Aitchison, 1888) (Plate no. LXVII) if the plants are only in flowers, due to its Brassica-like yellow flowers, and habit. But the siliquae and seeds are very distinct, being linear, subcompressed, without beak or articulation; the seeds are very mucilaginous when wet. The genus was based originally on one species transferred from Sisymbrium (S. pilosissimum Trautv.). It is distinguished from Sisymbrium primarily by its Brassica-like flowers with broad petals, pilose habit, different siliquae, and seeds very mucilaginous when wet.

\* Cymatocarpus pilosissimus (Trautv.) Schulz in Pflanzenreich (86) 300 fig. 64 (1924); S.E.P. 646; K.F.U. 81.

Syn: Sisymbrium pilosissimum Trautv. in A.H.P. ix 369 (1884);  
 "Brassica sp!" Aitchison in Trans. Linn. Soc. iii 36 (1888)  
 (no. 276).

Type: Not precisely designated ?

Annual, 20-90 cm. tall, branched mostly from the base, erect, pilose with 2-5 mm. long simple rarely forked hairs. Lower leaves ovate-oblong, stalked, toothed, obtuse; upper leaves comparatively small, shortly stalked, acute, sparsely toothed; upper-most sublinear, subentire. All leaves membranous, + hairy with prominently long hairs on the veins, lamina subglabrous rarely glabrous. Racemes 20-30-flowered, ebracteate, corymbose above, increasing upto 30 cm. in fruits. Flowers 5-7 mm. across, yellow; pedicels 6-12 mm., increasing upto 20 cm. in fruit, filiform, rigid, spreading or deflexed. Sepals 3-3.5x1.6-2 mm. Petals 5-6.5x3-4 mm., broadly obovate or suborbicular, cuneate at the base. Stamens 3-3.5 : 4-4.5 mm.; anthers about 1.5 mm. long. Siliquae 2.5-5x0.15-0.2 cm., linear, subcomp-

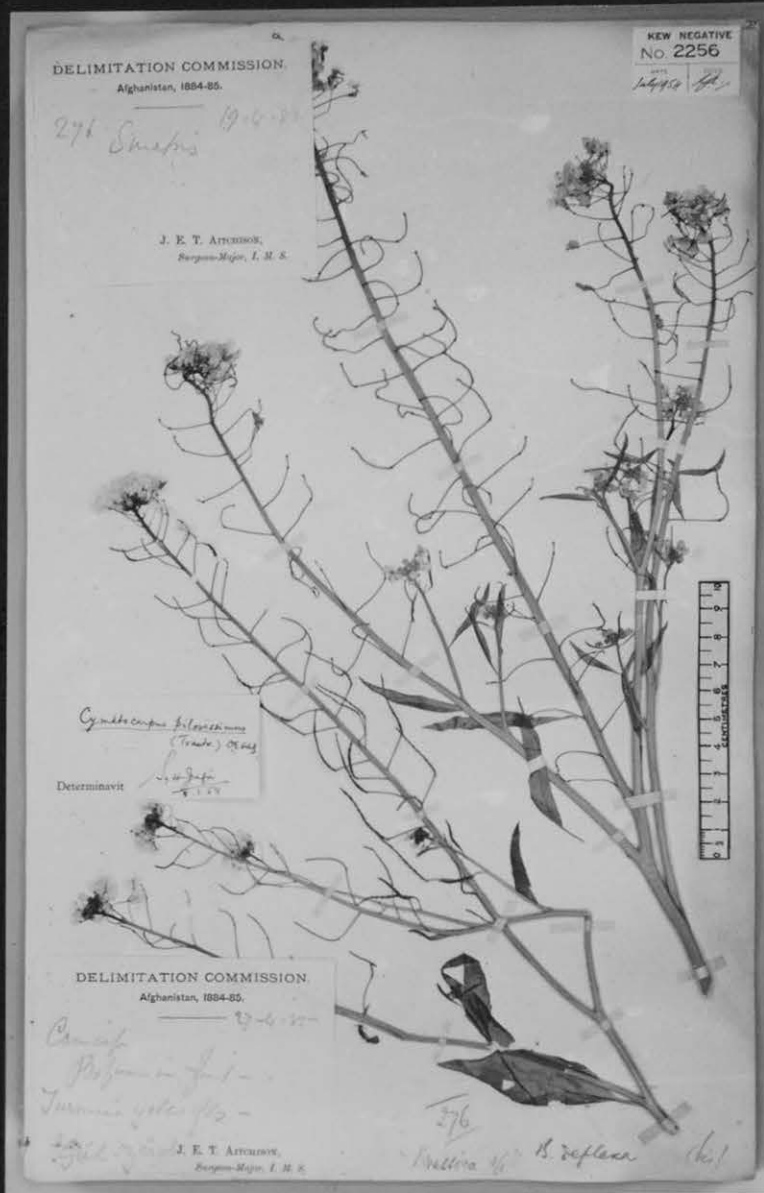


Plate no. LXVII. Cymatocarpus pilosissimus (Trautv.) Schulz



-ressed, torulose; valves subconvex, with a distinct mid-vein, glabrous; style short with capitate stigma; seeds 9-14 in each loculus, uniseriate, about 1.5x1 mm, olive-coloured, very mucilaginous when wet; septum membranous, not veined. (Plate no. LXVII).

Afghanistan:

Harirud valley, common throughout the valley on stoney soil but especially near sheepfolds, Aitchison no. 276(K!).

Geog. Dist:

C. Asia and TransCaspicum region.

90.\* CAMELINA Crantz, Stirp. Austr. 17 (1762); B.F.O. 311; S.E.P. 647.

Syn: Linostrophum Schrank, Prim. Fl. Salisburgh 163 (1792); Chamaelinum Host, Fl. Austr. ii 224 (1831); Sinistrophorum Schrank ex Endlicher, Gen. 882 (1840); Dorella Bubani, Fl. Pyren. iii 231 (1901).

Annual or overwintering, erect, branched mostly from the base, glabrous or hairy with simple and furcate hairs. Basal leaves oblong-lanceolate, sessile; cauline leaves sagittate-amplexicaule. Racemes ebracteate, corymbose above. Flowers small, yellow or whitish; pedicels filiform, rigid, subspreading. Sepals equal, not saccate. Petals oblong-cuneate, about twice as long as the sepals. Stamens 6, without appendages; anthers short, blunt. Lateral nectariferous glands in pairs, semiannular; median absent. Ovary elliptic, short, 8-24-ovuled; style distinct with capitate stigma. Fruits short (siliculae), ellipsoid, obovate or pyreiform, latisepate, bilocular, dehiscent; valves convex, rigid with a distinct mid-rib; seeds many, ovoid biseriate, mucous when wet; septum membranous, not veined.

10 species in C. Europe, Mediterranean region and C. Asia.

\* Camelina sativa (L.) Crantz, Stirp. Austr. 17 (1762); S.E.P. 647.

Syn: Myagrum sativum L., Sp. Pl. 641 (1753).

Type: Europe (not precisely designated) no. 6(LS!).

Annual or wintering, 30-80 cm. tall, erect, branched mostly above, leafy; glabrous or hairy with simple or forked hairs. Basal leaves oblong-lanceolate, 1.5-5x0.5-1(-1.5) cm., sessile, cuneate, entire or sinuate-toothed; middle and upper leaves lanceolate or linear, sessile,

amplexicaule, entire or sinuate-toothed. Racemes (30)40-70-flowered, ebracteate, increasing upto 30 cm. in fruit. Flowers about 3 mm. across, yellow; pedicels 5-12 mm. long, increasing upto 20(-25) mm. in fruit, filiform, rigid, strict, subspreading. Sepals about 2.5x1 mm. Petals about 5x1.5 mm.; oblong-cuneate. Stamens about 2.5 : 3.5 mm.; anthers about 0.7 mm. Siliculae 6-9x4-5 mm. (excluding about 1.5 mm. long style), ellipsoid or obovoid, rounded above; valves convex; seeds many, about 1-2 mm. long, ovoid, brown.

Afghanistan:

Badghis, on sandy downs, in abundance, Aitchison no. 392(K!).

Geogr. Dist:

Probably native of East, Europe and W.Asia, but widespread as weed through cultivation.

Aitchison remarks, "It is not cultivated, so far as I could find out, in Afghanistan."

91. \* DESCURAINIA Webb et Berthelot, Phytogr. Canar. i 72(1840); S.P. 305; S.E.P. 649; K.F.U. 82.

Syn: Sisymbrium L., Sp. Pl., 657 (1753) (partim).

Annual, or overwintering, branched, erect, hairy with simple or branched hairs, sometimes glandular or glabrous. Leaves mostly bipinnatipartite or pinnatisect with narrowly oblong or linear lobes; basal stalked; upper sessile. Racemes ebracteate, corymbose above. Flowers small, usually yellow; pedicels filiform, ascending. Sepals erect, almost equal, not saccate. Petals short, hardly exceeding or slightly exceeding the sepals, spathulate, rarely abortive. Stamens 6, often exceeding the petals, not appendaged; anthers short, obtuse. Lateral nectariferous glands semiannular or almost annular; median narrowly torose, joining the laterals. Ovary cylindrical, 6-85-ovuled; style short with depressed-capitate stigma. Fruits (siliquae) linear, subcylindrical, often upcurved, bilocular, dehiscent; valves subconvex, with a distinct mid-vein; seeds uniseriate or biseriate, small, oblong or ellipsoid, mucilaginous when wet; septum membranous, sometimes veined.

About 45 species chiefly in America and few in Europe and Asia.

Descurainia sophia (L.) Schur., Enum. Pl. Transsylv. 54 (1866); S.P. 309; S.E.P. 651; K.F.U. 83.

Syn: Sisymbrium Sophia L., Sp. Pl. 659 (1753); B.F.O. 216; F.B.I. 150.

Type: Europe (not precisely designated) no. II (LS!).

Annual or biennial, 30-90 cm. tall, erect, branched, hairy below, + glabrous above. Leaves 5-15 cm. long, 2-3-pinnatisect, stalked; uppermost subsessile or sessile; segments narrowly oblong or linear. Racemes 40-80-flowered, ebracteate, corymbose above, increasing upto 30 cm. in fruits. Flowers 2-3 mm. across, yellow; pedicels 5-8 mm., increasing upto 15 mm. in fruit, filiform, + ascending, glabrous. Sepals 1.8-2x0.5-0.7 mm. Petals 1.5-2x0.5-0.7 mm., narrowly spatulate, sometimes short or abortive. Stamens about 2 : 2.5 mm.; anthers about 0.4 mm. long. Siliquae linear, subcylindrical, 1.5-3x0.07-0.1 cm., + upcurved; valves glabrous, obscurely torulose with a distinct mid-vein; style short with a depressed-capitate, short stigma; seeds many, about 0.7x0.4 mm., reddish-brown; septum 2-3-veined.

W. Pakistan:

Chitral: Drosch, 1350 m., Toppin no. 36(K!).

N.W.F.P.: Peshawar, Vicary(K!); J.L. Stewart(E!,K!); H. Deane(K!); Hazara, Drummond no. 20309(E!,K!); Waziristan, Wana, 1350 m., Duthie no. 15656(K!).

Punjab: Campbellpur, H. Rich no. 127(K!); Salt range, common, Aitchison(K!); Shahpur, Drummond nos. 20316(K!), and 20317(K!).

Baluchistan: Quetta, 1650 m., fairly common by irrigation canals in shade, H. Crookshank no. 161(K!); Fort Sandeman, 2580 m., Harsukh no. 18776(K!); (without locality), Stocks no. 744(K!); Killa Abdullah, Duthie no. 8582(K!); Quetta, 1680 m., Lace no. 3637(E!).

Afghanistan:

Bameon valley, Erak ravine, in fields, Griffith (K!); Chokey, in ravines, Griffith no. 1477(K!); (without locality), Griffith no. 1538(K!); Very common, from Kurrum to Habibkella, Aitchison nos. 57(K!) and 149(K!); (without locality), Griffith no. 1460(K!); Siah Sung, Griffith no. 1459(K!); Kabul, edge of corn fields, Hay no. 10(K!); Tangi gharu, Hay no. 70(K!); Harirud valley, Aitchison no. 218(K!); Khyber pass, 1080 m., H. Johnston (E!).

N.W. Himalayas:

Pangi, Sanch, 2550-2850 m., Watt nos. 890(E!) and 2383 (E!); Lahul, N.L. Bor no. 14579(E!); Budhi, Byans, Reid (E!); (without locality), 2400-3000 m., Thomson(E!);

Kunawar, Drummond nos. 20269(W!,K!) and 20266(K!); Gurhwal, Thomson(K!); (without locality), Royle(K!); Cipol, 1800-2100 m., Edgeworth no. 108(K!); Chenab valley, above Purti, 2400 m., R.Ellis no. 1108(K!); near Kotgarh, 2250 m., Gamble no. 616 A(K!) Kunawar, Jacquemont(K!); Kumaon, Milam, 3450 m., Strachey & Winterbottom (K!); Almora, 1650 m., Strachey & Winterbottom (K!);

Kashmir: Ladak, 3000-4200 m., Thomson(K!); Parang valley, Thomson (K!); (without locality), Falconer no. 161(K!); Gilgit, Pilchi to Nomul, 1500 m., Giles no. 3(K!); (without locality), Giles (E!); Ladak, Dras, 3000 m., R.Stewart no. 7558(K!); Srinagar, 1560 m., Winterbottom(K!); Above Chorwan, 2550-2700 m., R.Stewart no. 19705(R-E!).

Geog. Dist:

Westward to Europe, N. Africa; C. and W. Asia; also in N. and S. America.

92.\*\* SOPHIOPSIS O.E.Schulz in Pflanzenreich (86) 346 (1924); S.E.P. 653; K.F.U. 86.

Biennial, simple or sparsely branched, erect, hairy with simple and branched, mixed hairs, rarely subglabrous. Leaves pinnatisect, petiolate. Racemes corymbose above, ebracteate. Flowers small or mediocre, yellow, or white; pedicels filiform, + spreading. Sepals almost erect, not saccate. Petals about twice as long as the sepals, spatulate or obovate-cuneate. Stamens 6, not appendaged; anthers oblong, obtuse. Lateral nectari-ferous glands semiannular, open towards the inner side; median narrowly torose, joining the laterals. Ovary narrowly pyriform, sessile, 4-12-ovuled, style short with depressed-capitate stigma. Fruits short (siliculae), ellipsoid or oblanceolate, bilocular, dehiscent; valves boat-shaped, obscurely veined, glabrous; seeds uniseriate, ovoid, brown, very mucous when wet; septum membranous, white, not or 1-veined.

3 species in central Asia.

Dr. Biswas, while revising the Cardamines of India thought S.M.Toppin's specimen no. 474(K!) from Chitral <sup>was a</sup> Cardamine sp. because of the superficial resemblance in leaf. He did not care to see the indumentum, flower and fruits. He remarked on the specimen sheet (dated 4. 3. 37), "This is a doubtful specimen. It is very close to Cardamine impatiens. There are auricle-like appendages at the base of the leaf. It is not C. hirsuta; no fruits available. (cf. C. pratensis) Kew." The leaf bases are not auricled in this specimen, although he presumably said that they were without carefully

examining them. The short fruits (although immature), yellow flowers, and densely pubescent habit are very distinct characters from Cardamine. There could be no doubt that this specimen belongs to the tribe Sisymbrieae and not to Arabideae- and therefore is not a Cardamine. This specimen exactly matches with Sisymbrium flavissimum Kar. et Kir., a central Asian species, which Schulz has correctly transferred to his new genus, Sophiopsis, making a new combination, Sophiopsis flavissima (Kar. et Kir.) Schulz (1924) (Plate no. LXVIII). This, this genus is for the first time recorded for the present area. It is primarily distinguished from Sisymbrium by its very short fruits, leaves pinnatisect, seeds very mucous when wet.

The mature fruits in Sophiopsis flavissima are only about 6 mm. long, and in the ~~present~~ Toppin's specimen the immature ones are about 4 mm. long. Dr. Biswas expected <sup>the</sup> long siliquae of Cardamine and therefore, <sup>he</sup> naturally ~~said above~~ that no fruits <sup>were</sup> available, apparently not realizing that there can be such small fruits ~~also~~ which would have at once warned him against mistaking it <sup>for</sup> a Cardamine sp.

\*\*Sophiopsis flavissima (Kar. et Kir.) Schulz in Pflanzenreich (86) 348 (1924); S.E.P. 654; K.F.U. 88.

Syn: Sisymbrium flavissimum Kar. et Kir. in Bull. Soc. Nat. Mosc. 382 (1841); Smelowskia flavissima Kar. et Kir. in Bull. Soc. Nat. Mosc. xv 156 (1842); Hutchinsia flavissima Ledeb., Fl. Ross. i 764 (1842).

Type: C. Asia, Turkestan, Tarbagtai, Kar. et Kir. no. 95 (L, K!).

Biennial or annual, 20-75 cm. tall, erect, branched above, villose to subglabrous with simple, unequal hairs. Lower leaves pinnatisect, 3-5-jugate, stalked; lobes narrow, usually 1-2-lobulate; upper leaves deeply pinnatifid, subsessile or sessile, bases not auricled. Racemes 30-50-flowered, corymbose above, ebracteate, increasing upto 20 cm. in fruits. Flowers 2.5-3 mm. across, yellow; pedicels 5-7 mm., increasing upto 10 mm. in fruits, spreading, filiform. Sepals 1.5-1.8 x 0.7-0.9 mm. Petals 2.5-3 x 1 mm., obovate-cuneate, apex rounded. Stamens about 2 : 2.5 mm.; anthers about 0.5 mm. long. Fruits about 6 x 1.2 mm., subterete; valves glabrous, somewhat boat-shaped, 1-veined; seeds 2-3 in each loculus; septum membranous, not veined. (Plate no. LXVIII)-



Plate no. LXX.

*Robeschia schimperi* (Boiss.) Schulz

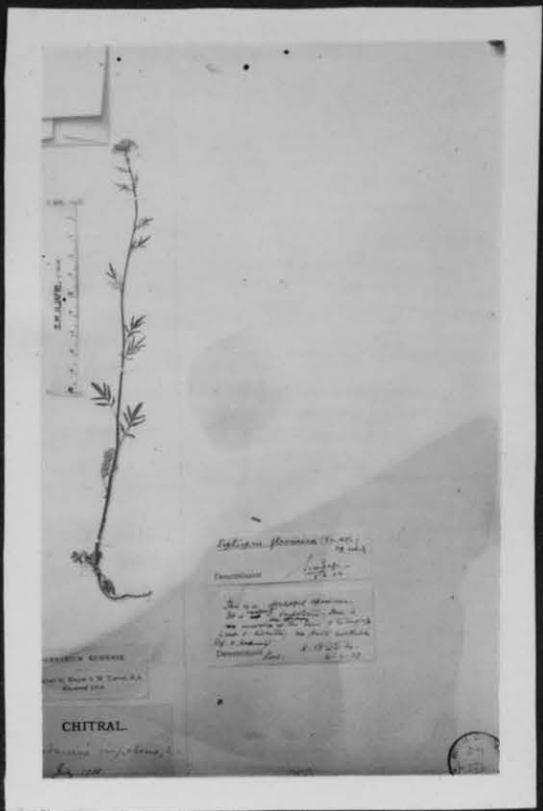


Plate no. LXVIII.

*Sophiopsis flavissima* (Kar. et Kir.) Schulz



Plate no. LXXI. *Sisymbrium erysimoides* Desf.

W. Pakistan:

Chitral: (without locality), S.M. Toppin no. 474(K!).

Geog. Dist:

C. Asia; Soongaria, Schrenk(K!); Turketan, Kar. et Kir. no. 95(K!).

93. \* SMELOWSKIA C.A.M. in Ledeb., Fl. Alt. iii 165 (1831); B.H.G.P. 79;  
S.P. 352; S.E.P. 655; K.F.U. 89.

Syn: Chrysanthemopsis Rech. f. in Phytion iii 51 (1951).

Perennial, subcaespitose, erect or ascending, branched mostly from the base, hairy with simple and branched hairs; rootstock thick, often woody and covered with withered leaf bases. Leaves pinnatisect, rarely subentire or entire; lower stalked, upper few, distant, shortly stalked or sessile; lobes narrowly oblong or linear, short. Racemes corymbose above, ebracteate or bracteate below. Flowers mediocre, yellowish rarely pinkish or whitish; pedicels filiform, ± spreading. Sepals subequal, not saccate. Petals about twice as long as the sepals, suborbicular-cuneate. Stamens 6, not appendaged; anthers oblong, obtuse. Lateral nectariferous glands annular or almost annular, emarginate or slightly open towards the inner side; median narrowly torose, often thickened in the middle, joining the laterals. Ovary subcylindrical, 6-36-ovuled; style very short with depressed-capitate subretuse stigma. Fruits short (siliculae), linear or ellipsoid, subtetragonate, bilocular, dehiscent; valves somewhat boat-shaped, glabrous, obscurely veined; seeds uniseriate, oblong or ellipsoid, not mucilaginous when wet; septum membranous, as broad as the siliculae, not veined.

5 species in C. Asia and N. America.

It is represented by one species, S. calycina(Steph.)C.A.M. Stephen (1800) regarded it as a species of Lepidium, and named it L. calycinum, while Desvaux (1814) recognized it as a species of Hutchinsia, calling it H. calycina.

Recently Rechinger fil. (1951) described a new genus, Chrysanthemopsis from Afghanistan with one species, C. Koelzii. (Plate no. LXIX). He included his new genus under the subtribe Capsellinae of the tribe Lepidieae in the system given by O.E. Schulz in Pflanzenfam. [(17 b) 1936]. It is interesting to note that Rechinger's new genus, Chrysanthemopsis, is congeneric with Smelowskia C.A.M., and his new species, C. Koelzii is

conspecific with S. calycina(Steph.)C.A.M.

Rechinger f., apparently relying on Schulz's classification(1936) only, and not finding any thing like his new genus and species under Lepidieae(and considering the immature siliculae like those in Hutchinsia),described it as a new genus under Lepidieae-Capsellinae. This is the same mistake ~~repeated again~~ as made by Desvaux(1814),who regarded the same plants as a species of Hutchinsia(see the synonyms given under the species, S. calycina). This is primarily due to the superficial resemblance of the siliculae of Smelowskia to those of Hutchinsia and several other genera of the Lepidieae. But a careful observation reveals that Smelowskia is closely allied to the genera like Sophiopsis etc. of the tribe Sisymbrieae, primarily in its <sup>yellow flowers and</sup> nectariferous glands character; and Schulz(1924) has correctly transferred it to Sisymbrieae.

\* Smelowskia calycina (Steph.) C.A.M. in Ledeb., Fl. Alt. iii 170 (1831); S.P. 355; S.E.P. 655; K.F.U. 90.

Syn: Lepidium calycinum Steph. in Willd., Sp. Pl. iii 433 (1800); Hutchinsia calycina (Steph.) Desv. in Journ. Bot. iii (4) 168 (1814); DC., Prodr. i 178 (1824); Hutchinsia pectinata Bunge in Ledeb., Fl. Ross. i 201 (1842); Chrysanthemopsis Koelzii Rechinger f. in Phytion iii 51 (1951).

Type: C.Asia, Altai, Willdenow ? (B- not seen).

Perennial, caespitose, 5-20(-30) cm. tall, erect or suberect, sometimes ascending, densely hairy with simple or forked, white hairs; rootstock 5-10 mm. thick, often densely covered with withered leaf bases. Radical leaves rosulate, pinnatisect, 3-6x0.5-1.2 cm., petiolate; lobes narrowly oblong. Cauline leaves few, distant, + similar to the basal leaves, shortly stalked to sessile. Racemes 15-30-flowered, ebracteate, rarely bracteate below, corymbose above, increasing upto 5(-8) mm. in fruits. Flowers about 5 mm. across, yellowish; pedicels 2-4 mm., increasing upto 6 mm. in fruit, filiform, rigid, subspreading. Sepals 3-3.5x1-1.2 mm. Petals 5-6x2.5-3 mm., spatulate, apex rounded. Stamens 2.2-2.8 : 2.8-3.2 mm.; anthers about 0.7 mm. Fruits(siliculae) 6-8x1.8-2 mm., elliptic, subtetragonal; valves with a distinct mid-rib, glabrous; style short with a depressed-capitate, subbilobed stigma; seeds 4-5 in each loculus, about 1.5x1





3377 Minjan Pass,  
Afghanistan, 13000 ft.  
July 27, 1937  
Walters

UNITED STATES NATIONAL MUSEUM



PLANTS OF AFGHANISTAN  
*Chrysanthemopsis koelzii* Koch. f.

Minjan Pass  
Hl. 13,000 ft. July 27, 1937  
Fls. cream

WALTER KOEHL No. 13767  
111 1030

Plate no. LXIX. Smelowskia calycina (Steph.) C.A.M.

mm., ellipsoid; septum membranous, I-veined. (Plate no. LXIX).

Afghanistan:

Minjan pass, 3900 m., W.Koelz no. I2767(U-E!).

N.W.Himalayas:

Gilgit, Dorah pass, 3900 m., Giles no. A 20i(K!); North of Chitral, Dorah pass, 4200-4500 m., Davidson(K!).

Geog. Dist:

C.Asia.

- 94.\* ROBESCHIA Hochstetter in Fournier, Recherch Crucif. I46 (I865); S.P. 359; S.E.P. 656.

Annual, erect, branched mostly from the base, hairy with stellate, short, somewhat rough hairs. Leaves pinnatisect, petiolate; lobes short, narrowly oblong to linear. Racemes ebracteate, corymbose above, lax in fruit. Flowers small, pale lilac; pedicels short and thick in fruit. Sepals equal, suberect, not saccate. Petals spatulate, apex subtruncate, about twice as long as the sepals. Stamens 6, not appendaged; anthers ovoid, obtuse. Lateral nectariferous glands annular, ± hexagonal; median narrowly torose, thickened in the middle, joining the laterals. Ovary, linear, subcylindrical, densely hairy, 22-28-ovuled; stigma minute, depressed-capitate, subsessile. Siliquae linear, tetragonal, acute, tapering towards the apex, straight, bilocular, dehiscient; valves hairy, I-veined; seeds uniseriate, many, oblong, submucous when wet; septum membranous, white, with a distinct mid-vein.

One species in Sinai, eastward to Baluchistan(W.Pakistan).

It is distinguished from Descurainia by its thick, short pedicel in fruit, straight and tetragonal siliquae. (Plate no. LXIX)

Robeschia schimperii (Boiss.)Schulz in Pflanzenreich (86) 360 (I924); S.E.P. 656.

Syn: Sisymbrium Schimperii Boiss. in Ann. Sc. Nat. 76 (I842); B.F.O. 2I5; S. Sophia var. Schimperii H.f.et T. in Journ. Linn. Soc. Bot. v I58(I86I); Robeschia Simaica Hoshst. in Fourn., Recherch Crucif. I46 (I865).

Type: Sinai, W.Schimper no. I70(G,K!,E!).

Annual, (♂)10-30 cm. tall, erect, branched, densely

hairy with short, branched hairs. Leaves bipinnatisect, 2-6 cm. long, petiolate; lobes short, narrowly oblong, sometimes slightly and irregularly lobulate. Racemes 10-25-flowered, ebracteate, increasing upto 25 cm. in fruits. Flowers about 3 mm. across, pale lilac; pedicels about 1 mm., increasing upto 2.5 mm. in fruit, thick. Sepals 2-2.5x0.6-0.8 mm. Petals 3.8-4x1 mm., spatulate. Stamens about 2.5 : 3 mm.; anthers about 0.4 mm. Siliquae 2.5-4x0.1-0.15 cm., linear, tetragonal, straight, tapering towards the apex; valves with a distinct mid-rib, hairy to glabrous; style very short with a depressed, subbilobed stigma; seeds 10-14 in each loculus, about 1x0.5 mm.; septum with a distinct mid-vein.

W. Pakistan:

Baluchisten: Kapota, Stocks no. 919(K!); Khojak pass, Duthie no. 86II(K!); Shelabagh, Khojak pass, 1800 m., Lace no. 3538(E!,K!); Shelabagh, Lace no. 3330 (E!).

Geog. Dist:

Persia: Shiraz, Kotschy no. 337(E!,K!).

Sinai: W.Schimper no. 170(E!,K!); Mt. Catharine, Shabetai no. 220(K!).

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\*The total number of Journals etc. consulted for the present work will run to several hundreds, and only a selection is given here. Other references are mostly in the text.

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TABLE NO. A.

World geographical distribution of the species of the genera of Capparidaceae &amp; Cruciferae of the present area:

(W. Pakistan, Afghanistan &amp; N. W. Himalayas).

Serial No.	GENERA	Total no. of species	Europe	N. Africa & Orient	C. & N. Asia	China & Japan	Present area	India	Malaya	Australia	New Zealand	Polynesia	Tropical Africa	Mascarine Isl.	South Africa	North America	Central America	West Indies	East Tropical S. America	West Tropical S. America	Temperate S. America	REMARKS	Present area		
																							W. Pakistan	Afghanistan	N.W. Himalayas
A	<u>CAPPARIDACEAE</u>						23															Chiefly Tropical	21	9	9
1	<u>Crataeva</u> L.	20	-	-	-	1	1	2	-	-	-	8	10	-	-	4	3	3	4	-	-	Tropical	1	-	1
2	<u>Capparis</u> L.	250	2	5	2	10	6	30	20	6	5	10	80	30	40	-	35	20	25	25	-	Chiefly Tropical	5	2	3
3	<u>Cadaba</u> Forsk.	30	-	5	-	1	2	2	2	1	-	-	15	8	2	-	-	-	-	-	-	Chiefly Trop. Africa	2	-	-
4	<u>Maerua</u> Forsk.	80	-	2	-	-	2	1	1	-	-	-	40	20	-	-	-	-	-	-	-	Do.	2	-	1
5	<u>Dipterygium</u> Decne	1	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	W. Asia & Africa	1	-	-
6	<u>Buhsea</u> Bunge*	1	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. & W. Asian	-	1	-
7	<u>Cleome</u> L.	200	5	40	10	5	9	12	5	5	-	5	40	20	10	2	5	5	30	20	5	Chiefly Tropical	9	5	3
8	<u>Gynandropsis</u> L.	20	-	1	-	-	1	1	1	1	1	-	1	-	-	-	6	5	8	7	-	Tropical S. America	1	1	1
B	<u>CRUCIFERAE</u>						254 (13)															Chiefly temperate	147 (9)	136 (8)	140 (11)
1	<u>Brassica</u> L.	25	15	10	3	3	2 (5)	-	-	-	-	-	4	-	-	4	3	-	-	3	2	Europe, N. Africa & Or.	2 (5)	1 (5)	(5)
2	<u>Sinapis</u> L.*	10	7	8	3	2	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	Do.	2	1	1
3	<u>Diplotaxis</u> D C.	20	8	15	3	-	1	-	-	1	-	-	4	-	1	-	2	-	-	-	-	Do.	1	1	-
4	<u>Eruca</u> Mill.	5	5	5	1	-	1	-	-	-	-	-	1	-	1	-	-	-	-	-	-	Do.	1	1	1
5	<u>Raphanus</u> L.	8	3	6	3	-	(1)	-	-	-	-	-	1	1	1	2	-	-	1	1	1	Do.	(1)	(1)	(1)
6	<u>Crambe</u> L.	20	10	12	9	-	1	-	-	-	-	-	3	-	-	-	-	-	-	-	-	Do.	1	1	1
7	<u>Erucaria</u> Gaet.*	6	3	6	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mediterranean region	1	-	-
8	<u>Physorrhynchus</u> Hook. f	2	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Orient	1	1	-
9	<u>Fortuynia</u> Shutt.	2	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	1	1	-
10	<u>Savignya</u> D C.*	2	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	-	1	-
11	<u>Moricandia</u> D C	7	3	7	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	1	-	-
12	<u>Douepia</u> Camb.*	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Endemic to W. Pakistan	1	-	-
13	<u>Conringia</u> Adans	6	2	6	5	-	4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	Orient	2	4	1
14	<u>Lepidium</u> L.	130	35	50	25	10	11	2	-	15	8	5	6	2	10	20	10	2	10	10	15	Cosmopolitan	6	10	5
15	<u>Coronopus</u> Zinn.*	8	2	4	2	2	1	1	-	2	1	2	3	1	4	2	1	-	-	-	-	Orient	1	-	1
16	<u>Winklera</u> Regel.*	2	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian	1	1	1
17	<u>Isatis</u> L.	30	10	25	12	3	7	-	-	-	-	-	1	-	1	1	-	-	-	-	-	Orient	6	6	1
18	<u>Pachypterygium</u> Bunge	5	-	5	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	1	1	-
19	<u>Sameraria</u> Desv.*	10	-	8	10	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. & W. Asian	-	2	-
20	<u>Didymophysa</u> Boiss.*	2	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian	1	-	-
21	<u>Iberis</u> L.	30	20	15	4	-	(1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mediterranean	(1)	(1)	(1)

TABLE NO. A - CONTINUED

Serial No.	GENERA	Total no. of species																	REMARKS	Present area										
		Europe	N. Africa & Orient	C. & N. Asia	China & Japan	Present area	India	Malaya	Australia	New Zealand	Polynesia	Tropical Africa	Mascarine Isl.	South Africa	North America	Central America	West Indies	East Tropical S. America.		West Tropical S. America.	Temperate S. America	W. Pakistan	Afghanistan	N.W. Himalayas						
22	<i>Megacarpaea</i> D C.	7	-	1	5	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian	-	-	2		
23	<i>Moriera</i> Boiss	4	-	3	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. & W. Asian	-	1	-	
24	<i>Aethionema</i> R. Br.	40	10	30	15	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mediterranean	1	1	-		
25	<i>Thlaspi</i> L.	60	25	35	15	2	7	3	-	3	-	-	1	-	-	10	-	-	-	-	3	-	-	-	Temperate Europe & Asia	5	4	6		
26	<i>Capsella</i> Medik	5	3	5	3	1	1	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Chiefly Mediterranean	1	1	1	
27	<i>Hedinia</i> Ost.*	1	-	-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Himalayan	-	-	1	
28	<i>Hymenolobus</i> Nutt.*	4	2	2	2	1	2	-	-	1	-	-	-	-	-	1	-	-	-	-	2	-	-	-	2	Chiefly in temp Europe Asia & America.	-	2	2	
29	<i>Dilophia</i> Thomson*	5	-	-	5	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	1	-	1	
30	<i>Cochleria</i> L.	20	10	10	7	5	3	3	-	-	-	-	-	-	5	-	-	-	-	-	1	-	-	-	1	Europe Asia & N. America.	1	-	3	
31	<i>Stroganowia</i> Kar et Kir.*	10	-	2	10	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	-	1	-	
32	<i>Octoceras</i> Bunge	1	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. & W. Asian.	1	1	-	
33	<i>Spirorrhynchus</i> Kar et Kir.*	1	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	1	-	-	
34	<i>Boreava</i> Jaub. et Spach.**	2	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Orient.	1	-	-	
35	<i>Tauscheria</i> Fisch.	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	1	1	1	
36	<i>Euclidium</i> R.Br.	2	1	2	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. & W. Asian	2	1	2	
37	<i>Hymenophysa</i> C.A.M.**	3	-	1	3	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	C. Asian.	1	-	1	
38	<i>Neslia</i> Desv.	2	2	2	2	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	Mediterranean & W Asian.	1	1	1	
39	<i>Lunaria</i> L.(**)	3	3	1	1	-	(1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	European	(1)	-	(1)	
40	<i>Farsetia</i> Turra.	8	-	7	1	-	2	2	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	N. Africa & Orient.	2	1	-	
41	<i>Fibigia</i> Medik.*	10	4	10	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	-	1	-	
42	<i>Alyssum</i> L.	100	60	75	25	1	8	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	Eurasian.	5	7	1	
43	<i>Ptilotrichum</i> C.A.M.*	13	8	9	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mediterranean.	-	-	1	
44	<i>Lobularia</i> Desv.	5	2	5	1	-	(1)	-	-	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	Mediterranean.	-	-	(1)	
45	<i>Buchingera</i> Boiss et Hohen**	1	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	1	-	-	
46	<i>Clypeola</i> L.	8	3	7	4	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mediterranean.	2	3	-	
47	<i>Draba</i> L.	250	50	70	100	25	24	10	-	1	-	-	-	-	50	6	-	-	30	15	-	-	-	-	-	Chiefly of Temp & Arctic regions.	10	5	22	
48	<i>Erophila</i> DC.	8	3	6	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Eurasia.	1	1	1	
49	<i>Graellsia</i> Boiss.*	2	-	1	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C & W Asian.	1	1	-	
50	<i>Cardamine</i> L.	120	35	30	30	25	5	10	8	7	5	3	10	3	3	30	3	3	1	10	20	-	-	-	-	Cosmopolitan Chiefly of temp. zones.	4	1	5	
51	<i>Pegaeophyton</i> Hayek et H.M.*	2	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Himalayan.	-	-	1	
52	<i>Phaeonychium</i> Schulz.*	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	-	-	1	
53	<i>Barbaraea</i> Beck.	15	10	7	4	3	3	2	-	1	1	-	-	-	1	4	-	-	-	-	-	-	-	-	-	-	Eurasian.	3	1	2

TABLE NO. A - CONTINUED

Serial No.	GENERA	Total no. of species	Present area																	REMARKS	W. Pakistan	Afghanistan	N.W. Himalayas					
			Europe	N. Africa & Orient	C. & N. Asia	China & Japan	Present area	India	Malaya	Australia	New Zealand	Polynesia	Tropical Africa	Mascarine Isl.	South Africa	North America	Central America	West Indies	East Tropical					S. America.	West Tropical	S. America	Temperate	S. America
54	<i>Arabis</i> L.	100	50	40	20	16	12	2	-	-	-	-	1	-	-	30	-	-	-	-	-	-	-	-	Chiefly of N. Temperate zone.	9	6	9
55	<i>Christolea</i> Camb.*	13	-	-	7	-	7	2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	Himalayan & C. Asian.	1	1	7
56	<i>Drabopsis</i> C. Koch.*	1	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. & W. Asian.	1	1	1
57	<i>Turritis</i> L.*	3	3	2	2	1	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	Eurasian.	1	-	-
58	<i>Nasturtium</i> R.Br.	2	2	2	2	1	2	1	-	1	1	-	-	-	2	2	1	1	1	1	1	1	1	1	Eurasia.	2	1	1
59	<i>Rorippa</i> Scop.*	90	20	20	10	15	3	5	8	2	3	-	4	2	5	10	4	3	3	4	5	5	5	5	Cosmopolitan chiefly Eurasian.	2	1	3
60	<i>Dontostemon</i> Andrz.*	8	-	-	7	6	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	-	-	2
61	<i>Notoceras</i> R. Br.	1	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N. Africa & Orient.	1	1	1
62	<i>Tetracme</i> Bunge.	5	-	4	3	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W. & C. Asian.	2	4	1
63	<i>Pyramidium</i> Boiss.	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Endemic to Afghanistan	-	1	-
64	<i>Matthiola</i> R. Br.	50	12	40	8	-	4 (2)	-	-	-	-	-	4	-	1	-	-	-	-	-	-	-	-	-	Chiefly Mediterranean.	1	4	1
65	<i>Chorispora</i> R.Br.	10	1	5	6	1	5	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	C. Asian.	4	3	3
66	<i>Diptychocarpus</i> Trautv.	1	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	1	1	-
67	<i>Parrya</i> R. Br.	18	-	3	15	1	6	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	Do.	2	4	3
68	<i>Cithareloma</i> Bunge.	2	-	1	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	1	-	-
69	<i>Leptaleum</i> DC.	2	2	1	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W. Asian.	2	1	-
70	<i>Malcolmia</i> R. Br.	25	8	20	10	1	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W. & C. Asian.	5	5	1
71	<i>Eremobium</i> Boiss.*	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N. Africa & Orient.	1	-	-
72	<i>Hesperis</i> L.(**)	24	5	20	10	-	(1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mediterranean & C. Asian	-	-	(1)
73	<i>Atelantha</i> H.f. et T.	2	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Himalayan.	-	-	2
74	<i>Cryptospora</i> Kar. et Kir.**	2	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	-	1	-
75	<i>Anchonium</i> DC.*	4	-	2	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. & W. Asian.	1	-	-
76	<i>Goldbachia</i> DC.	2	1	1	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	2	-	-
77	<i>Erysimum</i> L.	80	30	50	20	8	17	-	2	-	-	-	-	-	10	5	-	-	-	-	-	-	-	-	Europe, C & W Asia.	7	10	8
78	<i>Cheiranthus</i> L.	10	5	5	2	2	(1)	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	Europe & Asia.	(1)	(1)	(1)
79	<i>Pycnanoplinthus</i> Schulz.*	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Himalayan.	-	-	1
80	<i>Alliaria</i> Scop.*	2	1	2	2	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	Europe & W. Asia.	1	1	1
81	<i>Sisymbrium</i> L.	80	20	30	15	5	9	1	-	2	-	-	-	-	8	5	-	-	-	-	20	-	-	-	Chiefly in temp zones of both hemispheres.	6	8	7
82	<i>Microsisymbrium</i> O.E.S.*	8	-	2	-	-	7	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	Himalayan.	2	2	4
83	<i>Arcyosperma</i> O.E. Schulz.*	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Do.	1	-	1
84	<i>Aphragmus</i> Andrz.*	6	-	-	3	-	2	3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	C. Asian.	1	-	2

TABLE NO. A - CONTINUED.

Serial No.	GENERA	Total no. of species	Present area																	REMARKS	W. Pakistan	Afghanistan	N.W. Himalayas		
			Europe	N. Africa & Orient	C. & N. Asia	China & Japan	Present area	India	Malaya	Australia	New Zealand	Polynesia	Tropical Africa	Mascarine Isl.	South Africa	North America	Central America	West Indies	East Tropical S. America					West Tropical S. America	Temperate S. America
85	<u>Streptoloma</u> Bunge.*	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	-	1	-
86	<u>Torularia</u> (Coss.) Schulz.*	12	1	6	10	2	5	-	-	-	-	-	-	1	-	-	-	-	-	-	-	C. & W.Asian.	4	3	1
87	<u>Braya</u> Stern.	10	1	5	8	5	3	1	-	-	-	-	-	3	-	-	-	-	-	-	-	C. Asian.	-	-	3
88	<u>Arabidopsis</u> Heyn.*	15	3	7	5	3	11	4	-	-	-	-	-	1	-	-	-	-	-	-	-	Himalayan.	7	7	9
89	<u>Cymatocarpus</u> Schulz.*	3	-	1	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	-	1	-
90	<u>Camelina</u> Crantz.*	10	4	5	8	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	C. & W.Asia, Europe.	-	1	-
91	<u>Descurainia</u> W. et B.*	40	2	6	2	1	1	1	-	-	1	-	-	10	7	-	-	-	-	20	American.	1	1	1	
92	<u>Sophiopsis</u> Schulz.**	3	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. Asian.	1	-	-
93	<u>Smelowskia</u> C.A.M.*	5	-	-	4	1	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	Do.	-	1	-
94	<u>Robeschia</u> Hochst.*	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Orient.	1	-	-

## NOTE :

1. Figures given for outside the present area are in some cases approximate.
2. \* = addition to the present area.  
\*\* = added for the first time.  
( ) = known from cultivation only.



TABLE NO. B. - CONTINUED

Serial No.	SPECIES	Countries North and West of the present area.											Present area							Countries East & South of the present area							Distribution of a species in the 5 provinces of W. Pakistan				
		S. Africa	Tropical Africa	Europe (1)	Europe (2) (Mediterr. reg.)	Asia Minor	East Meditter. region.	Trans-Caspian region	N. Africa	Arabia	Iraq	Iran	N. Asia (Siberia)	C. Asia	Afghanistan	W. Pakistan	N.W. Himalayas	India	Malaya	China	Japan	Phillipines	Australia	New Zealand	North America	REMARKS	Chitral	N.W.F. Province	Punjab	Sind & Karachi	Baluchistan
3	<i>B. rapa</i> L.			+										(+)	(+)	(+)										Widely cultivated					cultivated
4	<i>B. juncea</i> (L.) Czern et Coss												+	(+)	(+)	(+)			+							Cultivated throughout Asia. Widely introduced			-Do.-		
5	<i>B. tournefortii</i> Gouan	+	+	+	+	+	+	+	+	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	W. Asia, Africa + Mediterranean region.	-	-	+	-	+
6	<i>B. deflexa</i> Boiss	-	-	-	-	-	+	-	+	+	+	-	-	+	+	-	-	-	-	-	-	-	-	-	-	West Asian	-	-	-	-	+
7	<i>B. nigra</i> (L.) Koch.			+										(+)	(+)	(+)										Widely cultivated. Probably native of Europe					cultivated
8	<i>Sinapsis arvensis</i> L.	-	-	+	+	+	+	+	+	+	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	Europe, Mediterranean region, eastward to W. Pakistan	-	-	-	-	+
9	<i>S. alba</i> L.	-	-	+	+	+	+	+	+	+	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	Native of Mediterranean region. Introduced elsewhere	-	-	+	-	-
10	<i>Diplotaxis griffithii</i> (H. f. et T.) Boiss	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	Endemic	-	+	+	-	+
11	<i>Brassica sativa</i> Mill	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	+	-	-	-	-	-	Widely introduced. Probably native of W. Asia	+	+	+	+	+
12	<i>Raphanus sativus</i> L.													(+)	(+)	(+)										Widely cultivated. Nowhere found wild except as an escape.					cultivated
13	<i>Crambe cordifolia</i> Stev.	-	-	-	-	-	+	-	-	-	+	-	-	+	+	+	-	-	-	-	-	-	-	-	-	W. Asian	-	-	-	-	+
14	<i>Erucaria hispanica</i> (L.) Druce	-	-	-	+	+	+	-	+	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	W. Pakistan, westward to Mediterranean region.	-	-	-	-	+
15	<i>Physorrhynchus</i> (L.) Hook. & G.	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	Endemic	-	-	+	+	+
16	<i>Fortuynia bungei</i> Boiss	-	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	W. Asian	-	-	-	-	+
17	<i>Savignya parviflora</i> (Del.) Webb	-	-	-	-	-	+	+	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	W. Asian + N. African	-	-	-	-	-
18	<i>Moricandia sinaica</i> Boiss	-	-	-	-	-	-	-	+	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	W. Asian	-	+	-	-	+
19	<i>Douepia tortuosa</i> Camb.	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Endemic to W. Pakistan	-	-	+	-	-
20	<i>Conringia orientalis</i> (L.) Andrz.	-	-	+	+	+	+	+	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Europe, Mediterranean region + W. Asia.	-	-	-	-	-
21	<i>C. persica</i> Boiss.	-	-	-	-	-	+	-	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	-	-	W. Asian	+	-	-	-	+
22	<i>C. clavata</i> Boiss	-	-	-	-	+	-	-	-	+	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-	Do	-	-	-	-	-
23	<i>C. planisigna</i> F. et M.	-	-	-	-	+	-	-	-	+	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	Do	-	-	-	-	+
24	<i>Lepidium repens</i> (Schrenk) Boiss	-	-	-	-	-	+	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	Do	-	+	+	-	+
25	<i>L. propinquum</i> F. et M.	-	-	-	-	-	+	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	Do	-	-	-	-	-
26	<i>L. aucheri</i> Boiss	-	-	-	-	-	+	-	-	+	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	+	+	+	+
27	<i>L. sativum</i> L.	-	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	+	+	Europe + Asia. Widely introduced + cultivated	+	+	+	+	+
28	<i>L. apetalum</i> Willd.	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	+	-	-	-	-	-	-	-	Asian	-	-	+	-	-
29	<i>L. capitatum</i> H. f. et T.	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	Himalayan	-	-	-	-	-
30	<i>L. perfoliatum</i> L.	-	-	-	+	+	+	+	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-	-	+	Mediterr. region, eastward to W. Pakistan; also in N. America	-	-	-	-	+
31	<i>L. crassifolium</i> Wald. et Kit.	-	-	-	+	+	+	+	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	Mediterr. region, Central + W. Asia.	-	-	-	-	+

TABLE NO. B - CONTINUED

Serial No.	SPECIES	Countries North and West of the present area.											Present area			Countries East & South of the present area.							REMARKS	Distribution of a species in the 5 provinces of W. Pakistan						
		S. Africa	Tropical Africa	Europe (1)	Europe (2) (Mediterr. reg.)	Asia Minor East Meditter. region.	Trans-Caspian region	N. Africa	Arabia	Iraq	Iran	N. Asia (Siberia)	C. Asia	Afghanistan	W. Pakistan	N.W. Himalayas	India	Malaya	China	Japan	Phillipines	Australia		New Zealand	North America	Chitral	N.W.F. Province	Punjab	Sind & Karachi	Baluchistan
32	<i>L. latifolium</i> L.	-	-	+	+	+	+	+	+	+	+	+	+	-	+	-	-	-	-	-	-	-	+	Europe, Asia + N. America	-	-	-	-	-	
33	<i>L. sibiricum</i> Schweigg.	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	-	+	-	-	-	-	-	Central Asian	-	-	-	-	-	
34	<i>L. persicum</i> Boiss	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	-	-	-	-	
35	<i>Coronopus didymus</i> (L.) Sm.	+	+	+	-	-	-	+	-	-	-	+	+	+	+	-	+	+	-	+	+	+	+	A common weed of cultivation, widely introduced. Probably native only in S. America	-	+	+	+	-	
36	<i>Winklera silaifolia</i> (H.f. et T.) Korsch.	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-	C. Asian	+	-	-	-	-	
37	<i>Isatis stocksii</i> Boiss	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	Endemic	-	-	-	-	+	
38	<i>I. emarginata</i> Kar. et Kir.	-	-	-	-	-	+	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	-	-	-	-	
39	<i>I. latisiliqua</i> Stev.	-	-	-	-	-	+	+	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	W. Asian	-	-	-	-	+	
40	<i>I. tinctoria</i> L.	-	-	+	+	+	+	+	-	-	+	+	+	+	-	-	-	-	-	-	-	-	-	Native of Central + S. Europe. Introduced elsewhere	+	+	-	-	-	
41	<i>I. costata</i> C.A.M.	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-	Central Asian	-	+	-	-	-	
42	<i>I. harsukhii</i> O.E. Schulz.	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	Endemic	-	-	-	-	+	
43	<i>I. minima</i> Bunge	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	-	-	-	+	
44	<i>Pachypterygium brevipes</i> Bunge	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	Do	-	-	-	-	+	
45	<i>Sameraria Bullata</i> (Aitch. et Hemsl.) B. Fedt.	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
46	<i>S. aitchisonii</i> (Korsch.) B. Fedt.	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	Do	-	-	-	-	-	
47	<i>Didymophysa fedtschenkoi</i> Regel	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	Do	+	-	-	-	-	
48	<i>Iberis amara</i> L.	-	-	+	+	+	+	-	-	-	-	-	-	(+)	(+)	(+)	-	-	-	-	-	-	-	Native of Europe + Mediterranean region. Widely cultivated.	-	-	-	-	-	cultivated
49	<i>Megacarpaea polvandra</i> Benth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	Endemic to N.W. Himalaya	-	-	-	-	-	
50	<i>M. bifida</i> Benth	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	Do	-	-	-	-	-	
51	<i>Moriera spinosa</i> Boiss	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	Iran + Central Asia	-	-	-	-	-	
	1. sub sp. <i>spinosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	
	2. sub sp. <i>cabulica</i> (Boiss) Jafri	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Endemic to Afghanistan	-	-	-	-	-	
52	<i>Aethionema carneum</i> (Soland) Fedtsch	-	-	-	-	-	+	+	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	-	-	-	+	
53	<i>Thlaspi septigerum</i> (Bunge) Jafri	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
54	<i>T. andersonii</i> (H.f. et T.) Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	Himalaya + W. Pakistan (Himalayan)	+	+	+	-	-	
55	<i>T. cochlearioides</i> H.f. et T.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	Do	+	-	-	-	-	

TABLE NO. B - CONTINUED

Serial No.	SPECIES	Countries North and West of the present area.											Present area		Countries East & South of the present area							REMARKS	Distribution of a species in the 5 provinces of W. Pakistan.									
		S. Africa	Tropical Africa	Europe (1)	Europe (2)	Meditter. reg.)	Asia Minor	East Meditter. region.	Trans-Caspian region	N. Africa	Arabia	Iraq	Iran	N. Asia (Siberia)	C. Asia	Afghanistan	W. Pakistan	N.W. Himalayas	India	Malaya	China		Japan	Phillipines	Australia	New Zealand	North America	Chitral	N.W.F. Province	Punjab	Sind & Karachi	Baluchistan
56	<i>T. cochleariforme</i> DC.	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-	-	Central Asian	+	+	+	-	-
	1. sub sp. <i>cochleariforme</i>																															
	2. sub sp. <i>griffithianum</i> (Boiss.) Jafri														+	-	-	-	-	-	-	-	-	-	-	-	Endemic to Afghanistan	-	-	-	-	-
57	<i>T. cardiocarpum</i> H.f. et T.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	Endemic	+	-	-	-	-
58	<i>T. perfoliatum</i> L.	-	-	+	+	+	+	+	+	-	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	Europe, Central and West Asia	-	-	-	-	-
59	<i>T. arvense</i> L.	-	-	+	+	+	+	+	-	-	+	+	+	+	+	+	+	-	-	+	-	-	-	-	+	Europe, Asia & N. America	+	+	+	-	-	
60	<i>Capsella bursa-pastoris</i> (L.) Medic.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	Cosmopolitan especially in cooler climates.	+	+	+	-	+
61	<i>Hedinia tibetica</i> (Thom.) Oestent.	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	Himalayan + C. Asian	-	-	-	-	-
62	<i>Hymenolobus procumbens</i> (L.) Nutt.	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	+	+	+	-	In most of the temperate regions.	-	+	-	-	+
63	<i>H. perpusillus</i> (Hemsl.) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	Endemic	-	-	-	-	-
64	<i>Dilophia salsa</i> Thoms.	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	-	Himalayan	-	-	-	-	-
65	<i>Cochlearia flava</i> Ham.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	Indo-Pak.	-	-	+	-	-
66	<i>C. minutissima</i> Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	Endemic to N.W. Himalaya	-	-	-	-	-
67	<i>C. conwayi</i> Hemsley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	Do	-	-	-	-	-
68	<i>Stroganovia affghana</i> (Boiss.) N. Pavl.	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-
69	<i>Octoceras lehmanianum</i> Bunge	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	-	-	-	+
70	<i>Spirorhynchus sabulosus</i> Kar. et Kir.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Do	-	-	-	-	+
71	<i>Boreava orientalis</i> J. et S.	-	-	-	-	+	+	+	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Mediter. region + W. Asia.	-	+	-	-	-
72	<i>Taucheria lasiocarpa</i> Fisch.	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	+
73	<i>Euclidium syriacum</i> (L.) Br.	-	-	-	+	+	+	+	-	-	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	W. Pakistan, westward to Asia minor + E. Europe	+	+	+	-	+
74	<i>E. tenuissimum</i> (Pallas) Fedtsch.	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	+	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	-	-	-	+
75	<i>Hymenophyza pubescens</i> C.A.M.	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	Central Asian + America	+	-	-	-	-
76	<i>Nestia paniculata</i> (L.) Desv.	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	+	Europe, Asia + N. America	+	+	+	-	+	
77	<i>Lunaria annua</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	Native of S.E. Europe	-	-	-	-	(+)
77	<i>Lunaria annua</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Indo-Pak.	-	-	+	-	+
78	<i>Farsetia hamiltonii</i> Royce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	Indo-Pak.	-	-	+	-	+



TABLE NO. B. - CONTINUED

Serial No.	SPECIES	Countries North and West of the present area.											Present area		Countries East & South of the present area.							REMARKS	Distribution of a species in the 5 provinces of W. Pakistan.								
		S. Africa	Tropical Africa	Europe (1) Europe (2) (Mediterr. reg.)		Asia Minor East Meditter. region.	Trans-Caspian region	N. Africa	Arabia	Iraq	Iran	N. Asia (Siberia)	C. Asia	Afghanistan	W. Pakistan	N.W. Himalayas	India	Malaya	China	Japan	Phillipines		Australia	New Zealand	North America	Chitral	N.W.F. Province	Punjab	Sind & Karachi	Baluchistan	
79	<i>F. incana</i> (Burm.) Jafri	-	-	-	-	-	-	-	-	+	-	-	+	+	-	+	-	-	-	-	-	-	-	-	India, W. Pakistan, Afghanistan + Iran	-	+	+	+	+	
	1. sub sp. <i>incana</i>																														
	2. sub sp. <i>edgeworthii</i> (H.F. et T.) Jafri												+	+	-	-	-	-	-	-	-	-	-	-	Endemic	-	+	+	-	-	
80	<i>Fibigia pendula</i> (Boiss) Boiss	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Persia + Afghanistan	-	-	-	-	-	
81	<i>Alyssum iran-icum</i> Hausskn.	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Do	-	-	-	-	-	
82	<i>A. desertorum</i> Stapf.	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Central + West Asia, Europe.	+	+	+	-	+	
83	<i>A. afghanicum</i> Rech. f.	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Endemic to Afghanistan	-	-	-	-	-	
84	<i>A. marginatum</i> Steud.	-	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	+	-	-	+	
85	<i>A. campestre</i> L.	-	-	-	+	+	+	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	Mediterranean region, Central + West Asia	-	-	-	-	-	
86	<i>A. dasycarpum</i> Steph.	-	-	-	-	+	+	+	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	Asia minor + W. Asia	-	-	-	-	+	
87	<i>A. homalocarpum</i> (F. et M.) Boiss	-	-	-	-	-	+	+	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	W. Asia + N. Africa	-	-	-	-	+	
88	<i>Alyssum lini-folium</i> Steph.	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Mediterr. region, Central + W. Asia	-	-	-	-	+	
89	<i>Ptilotrichum canescens</i> (DC.) C.A.M.	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	Himalaya + C. Asia	-	-	-	-	-	
90	<i>Lobularia mari-tima</i> (L.) Desv.	-	-	+	+	+	-	-	+	-	-	-	-	-	(+)	-	-	-	-	-	-	-	-	-	Native of Mediterra. region, widely introduced	-	-	-	-	-	
91	<i>Buchingera axi-llaris</i> Boiss et Hohen	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-	Central Asian	+	-	-	-	-	
92	<i>Clypeola jonth-laspi</i> L.	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Mediterr. region + W. Asian	-	-	-	-	+	
93	<i>C. aspera</i> (Grauer) Turrill	-	-	-	-	+	+	+	+	+	-	-	+	+	-	-	-	-	-	-	-	-	-	-	C. + W. Asia, N. Africa	-	-	-	-	+	
94	<i>C. dichotoma</i> Boiss	-	-	-	-	-	+	-	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-	C. + W. Asian	-	-	-	-	-	
95	<i>Draba hystrix</i> H.f. et T.	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	Endemic	-	-	-	-	+	
96	<i>D. setosa</i> Royle	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	Endemic to N.W. Himalaya	-	-	-	-	-	
97	<i>D. oreades</i> Schrenk	-	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	+	+	-	-	-	-	-	Temp. Asian	+	+	-	-	-	
98	<i>D. cachemirica</i> Gandoger	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Endemic	+	-	-	-	-	
99	<i>D. pamirica</i> (O. Fedt.) Pohle	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
100	<i>D. affghanica</i> Boiss.	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	Endemic	-	-	-	-	-	
101	<i>D. olgae</i> Regel et Schmal	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
	1. sub sp. <i>olgae</i>																														
	2. sub sp. <i>chit-ralensis</i> (C.E. Schultze) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Endemic to Chitral (W. Pakistan)	+	-	-	-	-	



TABLE NO. B - CONTINUED

Serial No.	SPECIES	Countries North and West of the present area.													Present area		Countries East & South of the present area.							REMARKS	Distribution of a species in the 5 provinces of W. Pakistan.						
		S. Africa	Tropical Africa		Europe (1)	Europe (2) (Mediterr. reg.)	Asia Minor	East Meditter. region.	Trans-Caspian region	N. Africa	Arabia	Iraq	Iran	N. Asia (Siberia)	C. Asia	Afghanistan	W. Pakistan	N. W. Himalayas	India	Malaya	China	Japan	Phillipines		Australia	New Zealand	North America	Chitral	N.W.F. Province	Punjab	Sind & Karachi
129	<i>Barbarea vulgaris</i> R.Br.	-	-	+	+	-	+	+	+	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	+	Native of N. Africa & W. Asia.	+	-	-	-	-
	1. var. <i>vulgaris</i>																									Do.					
	2. var. <i>arcuata</i> (Opiz.) Fries.			+	+	-	+	+	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	Do.	-	-	-	-	-
130	<i>B. intermedia</i> Boreau	-	-	+	+	-	-	-	+	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	Europe, N. Africa & C. Asia	-	+	-	-	-
131	<i>B. plantaginea</i> DC.	-	-	-	-	+	-	+	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	West Asia & Asia minor	-	-	-	-	+
132	<i>Arabis brevicaulis</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	Endemic to Karakorum (N. W. Himalaya)	-	-	-	-	-
133	<i>A. tibetica</i> H. f et T.	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-	-	Himalaya & C. Asia	+	-	-	-	-
134	<i>A. taraxacifolia</i> T. And.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	Endemic	-	+	+	-	-
135	<i>A. tenuirostris</i> Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	Endemic to N. W. Himalaya	-	-	-	-	-
136	<i>A. auriculata</i> Lam.	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	Europe, eastward to C. Asia	+	+	-	-	-
137	<i>A. bijuga</i> Watt.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	Endemic	+	+	+	-	-
138	<i>A. pangiensis</i> Watt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	Endemic	+	+	-	-	-
139	<i>A. amplexicaulis</i> Edgew.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	Endemic	+	+	+	-	-
140	<i>A. pterosperma</i> Edgew.	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-	Himalayan	-	+	+	-	-
141	<i>A. fruticulosa</i> C.A.M.	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	Central Asian	+	-	-	-	-
142	<i>A. saxicola</i> Edgew.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	Endemic	-	-	-	-	-
	1. var. <i>saxicola</i>																														
	2. var. <i>elatior</i> (Schulz) Jafri																+	+	-	-	-	-	-	-	-	Endemic	+	-	-	-	-
143	<i>A. griffithiana</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	Endemic to Afghanistan	-	-	-	-	-
144	<i>Christolea crassifolia</i> Camb.	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	Himalaya & C. Asia	-	-	-	-	-
145	<i>Christolea lanuginosa</i> (H. f et T.) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	Himalayan	-	-	-	-	-
146	<i>C. albiflora</i> (T. And.) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	Endemic to N. W. Himalaya	-	-	-	-	-
147	<i>C. parkeri</i> (Schulz) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	Do	-	-	-	-	-
148	<i>C. scapoza</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	Do	-	-	-	-	-
149	<i>C. stewartii</i> (T. Anders.) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	Himalaya & C. Asia	+	-	-	-	-
150	<i>C. himalayensis</i> (Camb.) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	Westward to Asia minor	+	-	-	-	+
151	<i>Drabopsis nuda</i> (Bel.) Stapf.	-	-	-	-	+	-	+	-	-	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-						

TABLE NO. B - CONTINUED

Serial No.	SPECIES	S. Africa	Countries North and West of the present area.										Present area							Countries East & South of the present area.					REMARKS	Distribution of a species in the 5 provinces of W. Pakistan.				
			Tropical Africa	Europe (1)	Europe (2) (Mediterr. reg.)	Asia Minor	East Meditter. region.	Trans-Caspian region	N. Africa	Arabia	Iraq	Iran	N. Asia (Siberia)	C. Asia	Afghanistan	W. Pakistan	N.W. Himalayas	India	Malaya	China	Japan	Phillipines	Australia	New Zealand		North America	Chitral	N.W.F. Province	Punjab	Sind & Karachi
152	<i>Turritis glabra</i> L.	+	-	+	+	-	-	-	-	-	+	+	-	+	+	-	+	+	-	-	-	+	+	Europe, Temperate Asia, N. America + S. Africa	-	+	-	-	-	
153	<i>Nasturtium officinale</i> R.Br.	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	-	+	+	-	+	+	+	Europe, C. + W. Asia; widely introduced	-	-	-	-	-	
154	<i>N. microphyllum</i> Boen	+	-	+	-	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-	+	Do.	-	-	-	-	+	
155	<i>Rorippa islandica</i> (Oed.) Borbas	+	-	+	-	-	+	-	-	-	+	+	+	+	+	+	-	+	+	-	+	+	+	Europe, C. + N. Asia; widely introduced	+	+	+	-	-	
156	<i>R. montana</i> (Wall) Small	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	-	-	-	W. Pakistan, eastward to Phillipines	-	+	+	-	-	
157	<i>R. sylvestris</i> (L.) Besser	-	-	+	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	European	-	-	-	-	-	
158	<i>Dontostemon glandulosus</i> (Kar et Kir) Schulz	-	-	-	-	-	-	-	-	-	-	+	-	-	+	+	-	-	-	-	-	-	-	C. Asia + Himalaya	-	-	-	-	-	
159	<i>D. pectinatus</i> (Fisch) Ledeb.	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	Do.	-	-	-	-	-	
160	<i>Notoceras bicornis</i> (Ait.) Amoy	-	-	-	-	+	-	+	+	+	-	-	+	+	+	-	-	-	-	-	-	-	-	Westward to Meditter. region	-	+	+	-	-	
161	<i>Tetracme secunda</i> Boiss	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Endemic to Afghanistan	-	-	-	-	-	
162	<i>T. quadricornis</i> (Steph.) Bunge	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	C. Asian	-	-	-	-	-	
163	<i>T. pamirica</i> Vass	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	Do.	-	-	-	-	-	
164	<i>T. stocksii</i> Boiss	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	Endemic to Baluchistan (W. Pakistan)	-	-	-	-	+	
165	<i>T. contorta</i> Boiss	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	Endemic	-	-	-	-	+	
166	<i>Pyramidium griffithianum</i> Boiss	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Endemic to Afghanistan	-	-	-	-	-	
167	<i>Matthiola incana</i> (L.) R.Br.	-	-	+	+	-	-	+	-	-	-	-	-	-	(+)	-	-	-	-	-	-	-	-	Native of Meditter. region.	cultivated					
168	<i>M. chenopodiifolia</i> F. et M.	-	-	-	-	-	+	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	C. and W. Asian	-	-	-	-	-	
169	<i>M. albicaulis</i> Boiss	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	Do.	-	-	-	-	-	
170	<i>M. tristis</i> (L.) R.Br.	-	-	+	+	+	-	-	+	-	-	-	-	-	(+)	-	-	-	-	-	-	-	-	Native of Meditter. region	cultivated					
171	<i>M. odoratissima</i> (Pall.) R.Br.	-	-	-	-	-	+	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	C. and W. Asian	-	-	-	-	-	
172	<i>M. flavida</i> Boiss	-	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	Do.	-	-	-	-	-	
173	<i>Chorispora bungeana</i> F. et M.	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	Central Asian	+	-	-	-	-	
174	<i>C. tenella</i> (Pallas) DC.	-	-	+	-	+	-	+	-	+	+	+	+	+	+	-	-	+	-	-	-	-	+	Europe, Asia + N. America	-	-	+	-	+	
175	<i>C. sibirica</i> (L.) DC.	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
176	<i>C. elegans</i> Cambess	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-	-	Do.	+	+	-	-	-	
177	<i>C. macropoda</i> Trautv.	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	Do.	+	-	-	-	-	
178	<i>Diptychocarpus strictus</i> (Fisch) Trautv.	-	-	-	-	-	+	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	C. + W. Asian	-	+	-	-	+	

TABLE NO. B - CONTINUED

Serial No.	SPECIES	Countries North and West of the present area.													Present area		Countries East & South of the present area.							REMARKS	Distribution of a species in the 5 provinces of W. Pakistan.								
		S. Africa	Tropical Africa	Europe (1)	Europe (2) (Mediterr. reg.)	Asia Minor	East Meditter. Region.	Trans-Caspian region	N. Africa	Arabia	Iraq	Iran	N. Asia (Siberia)	C. Asia	Afghanistan	W. Pakistan	N.W. Himalayas	India	Malaya	China	Japan	Phillipines	Australia		New Zealand	North America	Chitral	N.W.F. Province	Punjab	Sind & Karachi	Baluchistan		
179	<i>Parrya nudicaulis</i> (L.) Boiss	-	-	+	-	-	-	-	-	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-	+	N. Europe, C. & N. Asia and N. America	+	-	-	-	-		
180	<i>P. pinnatifida</i> Kar. et Kir	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
181	<i>P. minjanensis</i> Rech. f.	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	Endemic to Afghanistan	-	-	-	-	-	
182	<i>P. stenocarpa</i> Kar. et Kir	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
	1. sub sp. <i>stenocarpa</i>																																
	2. sub sp. <i>gilitica</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Endemic to Kashmir (N.W. Himalayas)	-	-	-	-	-	
183	<i>P. chitralensis</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Endemic to Chitral (W. Pakistan)	+	-	-	-	-	
184	<i>P. exscapa</i> C.A.M.	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	Himalaya + C. Asia	-	-	-	-	-	
185	<i>Cithareloma lehmannii</i> Bunge	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	+	
186	<i>Leptaleum filifolium</i> (Willd.) DC.	-	-	-	-	+	+	-	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-	C. & W. Asian	-	+	-	-	+	
187	<i>L. hamatum</i> Lace & Hems.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Endemic to Baluchistan (W. Pakistan)	-	-	-	-	+	
188	<i>Malcolmia africana</i> (L.) R.Br.	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	+	-	-	-	-	-	-	+	Mediterr. region + Temperate Asia	+	+	-	-	+	
189	<i>M. behboudiana</i> Rech. f.	-	-	-	-	-	-	-	+	+	+	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	W. Asian	-	+	-	-	+	
190	<i>M. circinata</i> (Bunge) Boiss	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
191	<i>M. strigosa</i> Boiss	-	-	-	-	-	-	-	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	W. Asian	-	-	-	-	+	
192	<i>M. taraxacifolia</i> Balb.	-	-	-	-	-	+	-	-	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Do.	+	-	-	-	-	
193	<i>M. cabulica</i> (Boiss) H.f. et T.	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	Endemic	+	+	+	-	+	
194	<i>Eremobium aegyptiacum</i> (Spreng) Auchers	-	-	-	-	-	-	+	+	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	W. Asia + N. Africa	-	-	-	-	+	
195	<i>Hesperis matronalis</i> L.	-	-	+	-	-	+	-	-	+	+	+	+	+	+	+	(+)	-	-	-	-	-	-	-	+	+	Native of Europe, C. & W. Asia	-	-	-	-	-	
196	<i>Atelantha perpusilla</i> H.f. et T.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
197	<i>A. pentandra</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Endemic to Kashmir (N.W. Himalayas)	-	-	-	-	-	
198	<i>Cryptospora falcata</i> Kar. et Kir.	-	-	-	-	-	+	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
199	<i>Anchonium elichrysiifolium</i> (DC.) Boiss	-	-	-	-	+	-	-	-	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	West Asia + Asia minor	-	-	-	-	+	
200	<i>Goldbachia laevigata</i> (MB) DC.	-	-	-	-	-	+	-	-	+	+	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	+	+	-	+	
201	<i>G. verrucosa</i> Komarov	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	+	
202	<i>Erysimum sisymbrioides</i> C.A.M.	-	-	-	-	+	-	-	-	-	+	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	C. & W. Asia + Asia minor	-	-	+	-	+	
203	<i>E. griffithianum</i> Boiss	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	Endemic	-	-	-	-	+	
204	<i>E. repandum</i> L.	-	-	+	+	+	+	+	-	+	+	-	+	+	+	+	+	-	-	-	-	-	-	-	+	+	Europe, Temp. Asia + N. America	+	+	-	-	-	

TABLE NO. B - CONTINUED

Serial No.	SPECIES	Countries North and West of the present area.													Countries East & South of the present area.							REMARKS	Distribution of a species in the 5 provinces of W. Pakistan.										
		S. Africa	Tropical Africa	Europe (1)	Europe (2) (Mediterr. reg.)	Asia Minor	East Meditter. region.	Trans-Caspian region	N. Africa	Arabia	Iraq	Iran	N. Asia (Siberia)	C. Asia	Afghanistan	W. Pakistan	N.W. Himalayas	India	Malaya	China	Japan		Phillipines	Australia	New Zealand	North America	Chitral	N.W.F. Province	Punjab	Sind & Karachi	Baluchistan		
205	<i>E. schlagintweitianum</i> Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	Himalayan	-	-	-	-	-	
206	<i>E. hookeri</i> Boiss	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	Endemic to Afghanistan	-	-	-	-	-
207	<i>E. hieracifolium</i> L.	-	-	+	+	-	-	+	-	-	-	+	+	-	+	+	-	-	+	-	-	-	-	-	-	-	-	Europe + Temperate Asia	+	+	+	-	-
208	<i>E. pachycarpum</i> H. f. et T.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	East Himalayan	-	-	-	-	-
	1. sub sp. <i>pachycarpum</i>																																
	2. sub sp. <i>cachemiricum</i> (Schulz) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Endemic to Kashmir (N. W. Himalaya).	-	-	-	-	-
209	<i>E. leucanthemum</i> (Steph) Fedtsch	-	-	+	+	+	+	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C. + W. Asia + Meditter. region.	-	-	-	-	-
210	<i>E. persicum</i> Boiss	-	-	-	-	-	-	+	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	W. Asian	-	-	-	-	-
211	<i>E. persepolitatum</i> Boiss	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	Do	-	-	-	-	-
212	<i>E. stocksianum</i> (Boiss) Boiss	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	Endemic	-	-	-	-	+
213	<i>E. perofskianum</i> F. et M.	-	-	-	-	+	+	-	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	W. Asia + Asia minor	-	-	-	-	+
214	<i>E. erosum</i> Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Endemic to Chitral (W. Pakistan).	+	-	-	-	-
215	<i>E. thomsoni</i> H. f.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Endemic to N. W. Himalaya	-	-	-	-	-
216	<i>E. aitchisonii</i> Schulz	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	Afghano-Iranian	-	-	-	-	-
217	<i>E. melicentae</i> Dunn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Himalayan	-	-	-	-	-
	1. var. <i>melicentae</i>																																
	2. var. <i>multibracteatum</i> Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Do.	-	-	-	-	-
	3. var. <i>falconerianum</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Endemic to Kashmir (N. W. Himalaya)	-	-	-	-	-
218	<i>E. altaicum</i> C.A.M.	-	-	-	-	+	+	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Central Asian; also in Asia minor	-	-	-	-	-
219	<i>Cheiranthus cheiri</i> L.	-	-	+	+	+	+	-	-	-	-	-	-	(+)	(+)	(+)	-	-	-	-	-	-	-	-	-	-	-	Native of E. Meditter. region, but widely naturalized through cultivation.	-	-	-	-	cultivated
220	<i>Pycnophilanthus uniflorus</i> (H. f. et T.) Schulz	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Himalayan	-	-	-	-	-
221	<i>Alliaria petiolata</i> (MB.) Cav. & Grande	-	-	+	+	+	-	+	-	-	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	Europe + Temp. Asia	+	+	+	-	+
222	<i>Sisymbrium heteromallum</i> C.A.M.	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	-	+	-	-	-	-	-	-	-	-	Temperate Asian	-	-	-	-	-
223	<i>S. brassicaeforme</i> C.A.M.	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	Do.	+	-	-	-	+
224	<i>S. irio</i> L.	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	Europe, C. + W. Asia.	+	+	+	+	+
225	<i>S. loeselii</i> L.	-	-	+	-	-	-	+	-	-	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	+	Europe, C. + N. Asia and N. America	-	+	-	-	+

TABLE NO. B - CONTINUED

Serial No.	SPECIES	Countries North and West of the present area.											Present area		Countries East & South of the present area.							REMARKS	Distribution of a species in the 5 provinces of W. Pakistan.								
		S. Africa	Tropical Africa	Europe (1)	Europe (2) (Mediterr. reg.)	Asia Minor	East Meditter. region.	Trans-Caspian region	N. Africa	Arabia	Iraq	Iran	N. Asia (Siberia)	C. Asia	Afghanistan	W. Pakistan	N.W. Himalayas	India	Malaya	China	Japan		Phillipines	Australia	New Zealand	North America	Chitral	N.W.F. Province	Punjab	Sind & Karachi	Baluchistan
226	<i>S. altissimum</i> L.	-	-	+	-	+	-	+	-	+	+	-	+	+	+	-	-	-	-	-	-	-	-	+	Europe, temp. Asia, and N. America	+	-	-	-	-	
227	<i>S. orientale</i> L.	-	-	+	+	+	+	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	Europe, C. + W. Asia	-	-	-	-	-	
	1. var. <i>orientale</i>																								Do.						
	2. var. <i>leiocarpum</i> (DC.) Hal.	-	-	+	+	+	+	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	Do.	-	-	-	-	-	
228	<i>S. septulatum</i> DC.	-	-	-	-	-	+	-	-	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-	W. Asian	-	-	-	-	-	
229	<i>S. pakistanicum</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	Endemic	-	+	-	-	-	
230	<i>S. erysimoides</i> Desf.	-	-	-	+	+	+	-	+	+	+	-	-	-	+	+	-	-	-	-	-	-	-	-	W. Asia + Meditter. region.	-	+	+	-	+	
231	<i>Microsisymbrium duthiei</i> Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	Endemic to Kumaon (N.W. Himalaya)	-	-	-	-	-	
232	<i>M. axillare</i> (H. f. et T.) Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	East Himalayan	-	-	-	-	-	
	1. sub sp. <i>axillare</i>																														
	2. sub sp. <i>brevipedicellatum</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	Endemic to N.W. Himalaya	-	-	-	-	-	
233	<i>M. minutiflorum</i> (H. f. et T.) Schulz	-	-	-	-	-	-	-	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	-	C. + W. Asian	+	-	-	-	-	
234	<i>M. flaccidum</i> O.E. Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	Endemic to Kashmir (N.W. Himalaya)	-	+	-	-	-	
235	<i>M. bracteosum</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	Endemic to Kumaon (N.W. Himalaya)	-	-	-	-	-	
236	<i>M. angustifolium</i> Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	Endemic to W. Pakistan	-	+	-	-	-	
237	<i>M. griffithianum</i> (Boiss) Schulz	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	C. + W. Asian	-	-	-	-	-	
238	<i>Arcyosperma primulaefolium</i> (Thom.) Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	Himalayan	+	+	-	-	-	
239	<i>Aphragmus obscurus</i> (Dunn.) Schulz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	Endemic	-	+	-	-	-	
240	<i>A. oxycarpus</i> (H. f. et T.) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	Himalayan	-	-	-	-	-	
241	<i>Streptoloma desertorum</i> Bunge	-	-	-	-	-	+	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
242	<i>Torularia torulosa</i> (Desf.) Schulz	-	-	-	-	+	+	+	-	-	+	+	-	+	+	-	-	-	-	-	-	-	-	-	Central + W. Asian	-	+	-	+	+	
243	<i>T. adpressa</i> (Trautv.) Schulz	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	Central Asian	-	-	-	-	-	
244	<i>T. brevipes</i> (Kar. et Kir.) Schulz	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	Do.	+	-	-	-	+	
245	<i>T. aculeolata</i> (Boiss) Schulz	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	W. Asian	-	-	-	-	+	
246	<i>T. humilis</i> (C.A.M.) Schulz	-	-	-	-	-	-	-	-	-	-	+	+	+	-	+	+	-	+	-	-	-	-	-	Temp. Asian	-	-	-	-	-	
	1. var. <i>humilis</i>																														
	2. var. <i>plasezkii</i> (Maxim.) Jafri	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-	+	-	-	-	-	Do.	-	+	-	-	-	

