

## The Genus *Alchemilla* L. (Rosaceae) in the Turkish Vilayet Rize (Northeastern Anatolia) with some remarks on the distribution of the genus in other parts of Northern Anatolia.

by

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### Abstract:

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The *Alchemilla*-Flora of the Turkish province of Rize is depicted on the basis of collections made by A. GÜNER and M VURAL (Hacettepe University of Ankara, HUB). The number of *Alchemilla* species is raised from 7 to 31, 6 of these are new and described here. All species are keyed and mapped for Rize and the new species are pictured.

### Introduction

B. PAWLOWSKI and S.M. WALTERS (1972) have mentioned 50 species of the genus *Alchemilla* for the Flora of Turkey. In nearly all these species the list of quoted specimens is short, so it is evident that the knowledge of the distribution of these species is at a rather low standard. Out of these 50 species only 7 (*A. sericea*; *A. rizensis*; *A. erytropoda*; *A. pseudocartalinica*; *A. transcaucasica*; *A. retinervis* and *A. ellenbergiana*) are known from the Vilayet Rize. The number of species collected in at least one of the four surrounding Vilayets Trabzon, Gümüşane, Erzurum and Coruh (Artvin) but not in Rize is with 17 species quite high.

Recently I have had the opportunity to check through a collection of *Alchemillas* from Rize which is kept in the Herbarium of the Hacettepe University of Ankara (HUB). I want to thank Dr. Adil Güner for the kindness to lend that collection. Already the first examination showed that there was a lot of species in this collection which has not been reported from Rize. A closer examination showed that in some cases it was impossible to identify these specimen with any of the species mentioned by PAWLOWSKI and WALTERS for Turkey. The consultation of publications of BORNMÜLLER, BUSER (1896, 1906[1] 1906[2]), CZECHOTT (1932, 1938) FRÖHNER, JUZEPČUK (1934, 1941, 1952, 1954), KOLSKOVSKIY (1939, 1948), MULKIDSHANJAN, PAWLOWSKI (1972), RECHINGER, ROTHMALER (1934, 1937, 1939, 1941), SOSNOVSKY and ZAMTARADZE and of material from several Herbaria (B, BM, FR, G, K, LE) settled the question in only one case. So six new species had to be described and will be published in this paper.

**The collection:**

Most of the specimens have been collected in the alpine or subalpine belt, so perhaps species are underrepresented which have the center of their vertical distribution in the montane or the forest belt. An even more systematic collecting should be extended to these altitudes.

If the situation of the genus *Alchemilla* is similar to that in the Alps - and it seems to be so - one should recognize that quite a lot of different species can grow very close together (in the Swiss Alps the author collected 10 species within a range of only 5 m<sup>2</sup>). That means that if you collect specimens you have to check the colour of the plants, their hairiness, the shape and size of leaves and flowers etc. to get the complete spectrum of the species of a region.

The arrangement of the text follows the format of the Generic Revision for the Flora of Rize.

*Alchemilla* L.**Short description of the genus:**

Perennial herbs with woody rhizome. Leaves palmate or palmately lobed. Inflorescence compound, cymose. Flowers small, green or yellowish, more or less aggregate into distinct clusters (glomeruli). Hypanthium urceolate, sepals 4 (-5); epicalyx present, petals absent; stamens 4 (-5), inserted on outer margin of disc; carpel 1; style basal. Fruit of 1 (-2) achenes, wholly or partially enclosed in the thin, dry hypanthium.

It is known that nearly all Eurasiatic species of the genus have proved to be apomictic; the pollen is wholly abortive and the seed develops precociously in the flower. The filogeny of the genus in Europe and western Asia is not clear since crossing experiments are impossible. The high chromosome numbers (WEGENER 1967) suggests complex hybrid origins of the recent species from sexual parent species which are now extinct, but in the development of species separation and isolation must be also taken into consideration at a high grade.

**Key to the species:**

The terminology of the key follows widely that of LIPPERT and MERXMÜLLER (1982) for Bavarian *Alchemillas*.

The key is designed for well-grown specimens with inflorescences and mature basal leaves. Late season's growth or second growth after grazing or cutting may differ considerably in leaf-shape and hairiness and is often unidentifiable.

The term "leaf" unless qualified, refers to mature basal leaves; the term "sinus" refers to the space or angle between the sides of two basal lobes of the leaf. The depth of division of the leaf is expressed by a fraction (1/2 ; 2/3 ; etc.), which is the portion of length of the free lobe to the "radius" of the leaf, measured from the top of the petiole to top of the middle lobe. (see fig. 2) Between the lobes there may be developed a more or less obvious, toothless, V-shaped (rarely U-shaped) incision, so that each lobe has there subparallel sides approximately. This incision is described as long when it exceeds twice the length of the adjacent tooth. The number of teeth is given for one side of the middle lobe, and excludes the apical tooth.

Some more remarks on the terminology are necessary to ensure that the terms are interpreted in the way meant by the author.

(1) Circular and reniform leaves:

Circular and reniform leaves are shown in fig. 4. Leaves are called circular, if  $d = e$ , they are called reniform, if  $e < d$ . (See fig. 2).

(2) Open and closed sinus:

The user who is not familiar with the concept of *Alchemilla* - keys normally believes that an open sinus is always combined with a reniform leaf and a closed one with a circular one, very often an open sinus is taken for a reniform leaf, but this is wrong. (See fig. 4)

(3) The term teeth is always used in the sense of leaf-teeth. The length and width of the teeth are measured as shown in fig. 3.

(4) The basal lobes of a leaf can be complete (v) or incomplete (u). See fig. 2.

(5) The hairs on a nerve of the lower side of a leaf are said to be appressed, when their direction is  $\pm$  parallel to the nerve.

(6) On both sides of a leaf the hairs between the nerves can be appressed to the blade or patent. In dried material it is rather difficult to find this out. In fresh plants one can recognize this by touching (It is a great help, if the collector notes this!). Appressed hairs in dried material normally have the same direction, patent hairs very often seem to be dejected on dried material and point into various directions.

(7) Hairs on stems and petioles may be appressed (pointing upwards), patent or deflexed. In the case of deflexed hairs nearly all are pointing to the base of the stem or the petiole. In plants with patent hairs up to 10% of the hairs may be deflexed. (See fig. 1)

For a reliable determination whole plants are necessary. They should be collected at a time when some flowers are still at anthesis, others should have ripe or nearly ripe seeds. Check always more than one leaf and at least 10 flowers of about the same age to ensure the distinguishing marks.

The time of flowering depends very much on the altitude.

In the key species without numbers refer to those which are till now not observed in Rize but in at least one of the neighbouring vilayets (Trabzon ; Gümüzane ; Erzurum or Coruh ). If texts in the key are set into brackets (...) it means, that these features only belong to the species mentioned. In Turkey and the Caucasus species occur with other features besides those not set into brackets.

- |   |  |                           |
|---|--|---------------------------|
| 1 | Leaves divided to base or nearly so  | 2                         |
| - | Leaves lobed to 1/2 (2/3) at most  | 3                         |
| 2 | All leaf-segments completely free, often the outer 2 on each side of the leaf fused for up to 1/5 of their length  | 1. <i>A. sericea</i>      |
| - | Only the middle leaf-segments free, the outer all (normally 3) fused up to 1/10 - 1/5 of their length  | 2. <i>A. rizensis</i>     |
| 3 | Sepals as long as or shorter than the more or less campanulate hypanthium; epicalyx lobes mostly shorter than sepals; achenes not or only slightly longer than hypanthium      | 4                         |
| - | When the seeds are ripe sepals and achenes distinctly longer than the conical hypanthium; epicalyx lobes as long as or longer than the sepals, very rarely shorter at anthesis | 21                        |
| 4 | Whole plant, including all pedicels throughout all of their length, densely hairy  | 5                         |
| - | Some parts of the plant sometimes only parts of the upper surface of the leaf or distal part of some pedicels or hypanthia glabrous  | 8                         |
| 5 | At least some hairs on petioles and lower part of stem distinctly deflexed. (Leaflobes more or less truncate, separated by obvious toothless incisions, teeth 4-5(6))          | 4. <i>A. erythropoda</i>  |
| 5 | Hairs on stems and petioles patent, erectopatient or adpressed - after heavy rainfall patent hairs sometimes are a little bit deflexed or bent downwards                       | 6                         |
| 6 | Hairs usually adpressed or subadpressed, plant up to 30 cm   | <i>A. sericata</i>        |
| - | Hairs erectopatient or patent, plant up to 15 cm   | 7                         |
| 7 | All pedicels with a dense, erecto-patient pubescens  | 3. <i>A. caucasica</i>    |
| - | Some pedicels with only few erecto-patient hairs, the others with a dense indumentum of hairs of the same type   | 6. <i>A. plicatissima</i> |

- 8 All hypanthia hairy 9  
 - All hypanthia glabrous or on the same plant some hypanthia glabrous and some hairy 16
- 9 Some pedicels hairy at least in part 10  
 - All pedicels glabrous 13
- 10 Upper surface of leaves sparsely or patchily hairy, (sometimes only very few hairs in the folds or on the teeth of leaf, it is possible that the margin of the leaf is ciliate, these hairs are not ment here!) 5. *A. surculosa*  
 - Upper surface of the leaf densely and evenly hairy 11
- 11 Hairs on petioles and lower part of stems erecto-patent; dwarf plant up to 10 cm 6. *A. plicatissima*  
 - Hairs on petioles and lower part of stems patent or deflexed; medium sized plant up to 20 (-40) cm 12
- 12 Leaves orbicular, (7-) 9 lobes; pedicels variably hairy 7. *A. valdehirsuta*  
 - Leaves reniform, 7 lobes; all pedicels hairy in proximal part *A. grossheimii*
- 13 Some hairs on stems and lower part of petioles deflexed 14  
 - All hairs on lower part of stems and petioles patent or erecto-patent 15
- 14 Leaves orbicular, sinus narrow, basal lobes touching or overlapping 9. *A. compactilis*  
 - Leaves reniform, sinus open, basal lobes widely separated *A. crinita*
- 15 Dwarf plant (less than 8 cm), leaves reniform with wide basal sinus *A. microscopia*  
 - Medium to tall plant (up to 50 cm), leaves orbicular with narrow or closed basal sinus, (hairs on stems and petioles erecto-patent, hypanthia densely hairy) 8. *A. stevenii*
- 16 Lower part of stems and petioles of summer leaves with patent or deflexed hairs 18  
 - Stems and petioles either with appressed or subappressed hairs at least on summer leaves 17
- 17 Reniform and orbicular leaves present, both types with narrow or closed sinuses, teeth acute, equal size *A. minusculiflora*  
 - Leaves reniform with wide basal sinus, teeth subacute or ± obtuse, unequal 11. *A. pseudocartalinica*
- 18 Upper surface of leaves glabrous or with some hairs near the edge and on the teeth 10. *A. heterophylla*  
 - Upper surface of leaves with hairs at least in the folds 19
- 19 Petioles of Spring-leaves glabrous and those of Summer-leaves patent hairs, stems glabrous in upper half including complete inflorescence *A. oligotricha*  
 - All petioles hairy, stems hairy at least up to the second branche of inflorescence 20
- 20 Leaves orbicular with basal lobes touching or overlapping 9. *A. compactilis*  
 - Leaves reniform with wide open sinus, basal lobes widely separated *A. crinita*
- 21 Stems and petioles with patent or erecto-patent hairs 22  
 - Stems and petioles glabrous or with adpressed or subadpressed hairs 34
- 22 All pedicels ± densely hairy 23  
 - All pedicels glabrous or some of them sparsely hairy in proximal part 25
- 23 Sepals and epicalyx lobes glabrous *A. orthotricha*  
 - Sepals and epicalyx lobes sparsely hairy and sparsely ciliate 24
- 24 Glomeruli dense, elongated up to 3x as long as broad; leaves with wide sinus 13. *A. orduensis*  
 - Glomeruli lax, short; leaves with narrow or closed sinus 14. *A. hirtipedicellata*
- 25 All leaves densely hairy on both surfaces 26  
 - At least upper surface of leaves not densely and evenly hairy 29
- 26 Leaves divided to more than 1/3, with long toothless incisions, lobes parabolic to semielliptic 24. *A. hemsinica*  
 - Leaves lobed to 1/4 (with distinct lobes) 27
- 27 Flowers 4,5-6,5 mm wide, lower pedicels in each glomerulus sparsely hairy below

- A. porrectidens*
- Flowers 3,5-5 mm wide, all or almost all pedicels glabrous (sometimes 1 or 2 in each glomerulus with few hairs in any part) 28
  - 28 Stems hairy almost throughout, at least 5/6 of their length, leaves with narrow or closed closed sinus 15. *A. mollis*
  - Stems glabrous in their upper 1/4-1/3 leaves with rather wide sinus 16. *A. amoena*
  - 29 At least some hypanthia  $\pm$  hairy 30
  - All hypanthia glabrous 33
  - 30 Upper surface of at least some leaves hairy at least in the folds but always some parts of upper leaf surface glabrous, (leaflobes arcuate, semiorbicular or semi-elliptic, stems glabrous in their upper 1/4-1/3, leaflobes with short but distinct incisions) *A. oriturica*
  - Upper surface of all leaves glabrous 31
  - 31 All leaves divided to more than 1/3, reniform with wide open sinus, lobes long parabolic to semielliptic with long incisions 20. *A. cimilensis*
  - Leaves not divided to more than 1/4 32
  - 32 Leaflobes truncate to arcuate; leaves orbicular with narrow or closed sinus, glomeruli lax 21. *A. ikizdereensis*
  - Leaflobes rounded, semicircular or parabolic; leaves reniform to orbicular-reniform, sinus mostly closed, but open in some leaves, glomeruli dense 23. *A. kackagensis*
  - 33 Stems hairy throughout, leaves without toothless incisions *A. sintenisii*
  - Stems hairy up to the first branches of the inflorescences, some of their lower branches laxly hairy, leaflobes with short but distinct incisions 22. *A. elevitensis*
  - 34 All hypanthia at least partly hairy 35
  - All hypanthia glabrous 40
  - 35 Leaves densely hairy on both surfaces, the lower pedicels in each glomerulus with  $\pm$  dense subappressed hairs in their proximal part 12. *A. ziganadagensis*
  - Upper leaf surfaces glabrous or only sparsely hairy in the folds, all pedicels glabrous 36
  - 36 Leaves very distinctly reniform *A. abchasica*
  - Leaves suborbicular to orbicular-reniform with closed or open but not very wide sinus 37
  - 37 All leaves with open sinuses, glabrous and sparsely hairy hypanthia on the same plant and normally in the same glomerulus 19. *A. stricta*
  - At least some leaves with closed sinus, all hypanthia hairy at least at base 38
  - 38 Stems rigid and  $\pm$  robust, sparsely hairy in the lower 1/5-1/3, hypanthia hairy throughout 18. *A. ciminensis*
  - Stems slender, densely hairy at least to the first branch of the inflorescence, hypanthia hairy only in the lower half 39
  - 39 Flowers 3-4,5 (-5) mm wide 17. *A. barbatiflora*
  - Flowers (4,5-) 5-6,5 mm wide *A. tiryalensis*
  - 40 Leaflobes with rounded apex, without or with only shallow incisions 41
  - Leaflobes  $\pm$  truncate separated by conspicuous incisions 43
  - 41 Flowers 4,5-5,5 mm wide, leaves lobed to 2/5-1/2 26. *A. transcaucasica*
  - Flowers small, 2-4 (-4,5) mm wide 42
  - 42 Leaves orbicular to orbicular-reniform with open but normally narrow sinus, flowers 2-3,5 mm 25. *A. procerrima*
  - Leaves reniform with wide open sinus, flowers 3-4 (-4,5) mm wide 31. *A. ancerensis*
  - 43 Stem glabrous or sparsely hairy in the lower 1/3 44
  - Stem hairy up to the inflorescence, densely so below 45
  - 44 Leaves lobed to 1/4-3/7, with small teeth; cauline leaves small, distinctly lobed 27. *A. retinervis*
  - Leaves lobed to 1/5-1/3 with fairly large teeth; cauline leaves large, only shallowly lobed

- 45 Leaves densely addressed hairy beneath on the entire surface  
 - Leaves addressed hairy beneath only on the veins and often also on the basal lobes
29. *A. dura*  
 30. *A. venosa*  
 28. *A. ellenbergiana*

### Systematic arrangement of the species:

#### Section *Alchemilla*

##### Subsection *Chirophyllum*

##### Series *Sericeae*

1. *A. sericea* Willd.
2. *A. rizensis* Pawl.

##### Subsection *Heliodrosium*

##### Series *Pubescentes*

3. *A. caucasica* Buser
4. *A. erythropoda* Juz.
5. *A. surculosa* S. E. Fröhner
6. *A. plicatissima* S. E. Fröhner

##### Series *Vulgares*

7. *A. valdehirsuta* Buser
8. *A. stevenii* Buser
9. *A. compactilis* Juz.
10. *A. heterophylla* Rothm.
11. *A. pseudocartalinica* Juz.

##### Subsection *Calycanthum*

##### Series *Elatae*

12. *A. ziganadagensis* Pawl.

13. *A. orduensis* Pawl.

14. *A. hirtipedicellata* Juz.

15. *A. mollis* (Buser) Rothm.

16. *A. amoena* (Czeczott) Rothm.

17. *A. barbatiflora* Juz.

18. *A. ciminensis* Pawl.

19. *A. stricta* Rothm.

20. *A. cimilensis* Kalheber

21. *A. ikizdereensis* Kalheber

22. *A. elevitensis* Kalheber

23. *A. kackarensis* Kalheber

24. *A. hemsinica* Kalheber

##### Series *Calycinae*

25. *A. procerrima* S. E. Fröhner

26. *A. transcaucasica* Rothm.

27. *A. retinervis* Buser

28. *A. ellenbergiana* Rothm.

29. *A. dura* Buser ex Rothm.

30. *A. venosa* Juz.

31. *A. ancerensis* Kalheber

##### Subsection *Chirophyllum* Rothm.

##### I. Series *Sericeae* Buser

This series is confined to the Caucasus and the mountain ranges south of it, westward through North Anatolia to Giresun, southward to Hakkari and eastward fide JUZEPCUK (1941) to Northwest Iran. The exact range of the series is unknown, because specimens of the southeastern part of its range are lacking.

Till now 6 species are described, five of which have rather restricted areas and only *A. sericea* Willd. is widely distributed. The areas of *A. raddeana* (Buser) Juz. ex Grossh., *A. chlorosericea* (Buser) Juz. ex Grossh., *A. heteroschista* Juz., *A. alba* Fröhner and *A. rizensis* Pawl. are completely within the area of *A. sericea*.

There is however more variation of the number of leaf segments, of the cutting of the leaves, of the number of teeth and the density of the indumentum on leaves and the hypanthia in every single specimen of the whole group and especially of *A. sericea* Willd. s. str. than it seems after the descriptions of JUZEPCZUK, FRÖHNER and B. PAWLOWSKI. It seems that the markings encountered above do not correlate within the whole range of *A. sericea* s. l. BUSER (1906 [1], [2]) took *A. raddeana* and *A. chlorosericea* as subspecies of *A. sericea* and although this method is not adequate for apomictic species it shows Buser's view of the situation. Since there is a little variation in the pollen of the series it may be possible that the group is not total-

ly apomictic comparable to few species of the series *Saxatiles* and *Hoppeanae* in the Alps. It is unknown whether the species of the series grow on basic or on acid soils.

The generic and choreological situation in the series *Sericeae* seems to be comparable with that of the series *Splendentes* Buser, non Fröhner, in Western Europe, especially in the Alps. It should be questioned if the distribution of the microspecies has any connection with icefree areas during the last glaciation.

#### Key for the species of the Series *Sericeae*:

- 1 All leafsegments free to base, sometimes the outer connected up to 1/5 of their length 2
  - At most the central segment free to base, the outer in all leaves (!) connected at least to 1/5 of their length 4
- 2 Leaves divided into 7-9 segments, upper and lower surface of the leaves silvery white 3
  - Leaves divided into 5-7 segments 3
- 3 Upper surface of leaves laxly sericeous, lower surface very densely silky hairy, shining, central segment with 3-6 unequal teeth on each side, the apical one longer than its neighbours 4
  - Upper surface of leaves glabrous, lower surface laxly sericeous, central segment with 3-6 subequal pectinate teeth, all hypanthia hairy only at base 5
- 4 Leaf segments narrowly oblong but rounded at apex all leaves with 7 segments, the outer connected for 1/2-2/3, leaves densely adpressed yellowish silky on both surfaces 5
  - Leaf segments broadly oblong to obovate 5
- 5 Leaves densely adpressed hairy, the upper surface weakly silky the lower surface strongly silky, leaves always with 7 segments, 3-5 nearly straight teeth on each side of the middle segment 5
  - Leaves gray sericeous the upper surface weakly, the lower surface strongly shining, shining, leaves with 5-7 segments, the central segment with 4-6 subequal, narrow, connivent teeth, the apical one not longer 5

*A. alba*

*A. sericea*

*A. chlorosericea*

*A. raddeana*

*A. heteroschista*

*A. rizensis*

Since many problems of the series are unsolved, I think it would be better to take the whole series provisionally as one species *A. sericea* s.l.

Only *A. rizensis* is quite distinctive, so I will regard it, following B. PAWLOWSKI (1972), as a species of its own.

For the species in question distinguishing marks are compiled in the following scheme:

	<i>sericea</i>	<i>chlorosericea</i>	<i>raddeana</i>
leaves: number of segments	5-7	5-7	7
form of segments	linear lanceolate or oblong, 2,5-5 times longer than wide	oblong ovate, short acuminate	narrowly oblong, rounded at apex
cutting of the segments	completely free to base, the outer often connected for < 1/5	completely free	partite to 1/2 or 2/3
indumentum on upper surface & colour	laxly sericeous hairy, dark green	glabrous above yellowish green	densely adpressed hairy, ?

indumentum on lower surface & colour	very densely silky sericeous silvery shining	thin silky beneath shining	densely adpressed hairy yellowish shining
number of teeth on central segment	3-6 unequal, subdivaricate, the apical distinctly longer	?, teeth evenly pectinate, elongate	2-5 incised dentate
flowers: size	3-5 mm wide	3-5 mm wide	3-4 mm wide 2,5-3 mm long
indumentum and colour of hypanthium	laxly, sericeous hairy	slightly silky hairy at base	densely yellowish silky
indumentum and colour of sepals	laxly sericeous hairy	hairy only in the upper part	densely yellowish silky
indumentum & colour of episeals	laxly sericeous hairy	?	densely yellowish silky

	heteroschista	alba	rizensis
leaves; number of segments	7	7-9	5-7
form of segments	oblong or ovate, rather broad	oblong ovate 2-2,5 times longer than wide	oblong ovate 2-2,5 times longer than wide
cutting of the segments	middle lobe separated from the adjacent ones nearly to base, else cut 2/3-3/4	completely free	the lateral 2-3 joint up to 1/10-1/5 of their length
indumentum on upper surface & colour	densely adpressed hairy, weakly silky	silvery white shining	greenish gray and shining
indumentum on lower surface & colour	very densely adpressed hairy, strongly silky	silvery white shining	gray sericeous and very shining
number of teeth on central segment	3-5 at each side nearly straight	?, incurved, long to very long, the apical shorter	4-6 subequal narrow subconivent, the apical not longer
flowers: size	2 mm wide	3-4 mm wide	3-5 mm wide
indumentum and colour of hypanthium	densely adpressed hairy	densely silvery silky shining	densely silvery sericeous
indumentum & colour of sepals	densely adpressed reddening	densely sericeous shining	densely sericeous
indumentum & colour of episeals	densely adpressed hairy	densely sericeous shining	densely sericeous shining

1. *Alchemilla sericea* Willd., Enum. Plant. Hort. Berolin. 1: 171. 1809 = *A. alpina* L. var. *sericea* (Willd.) Tausch, Flora 24 (1), Beibl. 108/110. 1841. **Type:** Caucasia without indication of locality, (B-WILLD: photo !).  
= *A. alpina* M.Bieb., Fl. Taur.-Cauc. 1: 114. 1808, non L. (1753).



**Icon.:** JUZEPCZUK (1941): 320 (plate 22, fig.2) ; JUZEPCZUK (1952): 90 (plate 12, fig.1) ; MULKISHANJAN (1958): 159 (plate 44 called *A. rigida*).

Perennial; stems mostly numerous, slender, 10 - 20 cm, like the petioles densely adpressed silky-hairy. Leafsegments 5 - 7, all  $\pm$  completely free, the outer two on each side of the leaf often (about 70% of the 120 leaves which were tested) connected to about 1/5 of their length, the inner always completely free to base. Lobes oblong to narrowly oblong, 2,5 - 5 times longer than wide (teeth included); 3 - 6 teeth on each lobe unequal subdivaricate, linear lanceolate, acute decreasing from the base to the apex, the apical tooth exceeding the lateral teeth. Leaves adpressed hairy, rather dull dark green on the upper surface, densely sericeous beneath. Flowers 3 - 5 mm wide, hypanthium, outer side of epicalyx and sepals with lax sericeous hairs. Flowering time: VI-VIII (- IX). Habitat: Rocky mountain slopes 2600 - 3100 m.

Distribution in NE-Anatolia:

Rize (map 2): Camlihemsin: Yukari Kavrun yaylasi, Mezevit üstü, alpinistep, granit arazi, 2900m, 9.8.1980. *A.Güner 2857* - Hisarcik köyü, Ortasirt, yaylasi-lamli, mevkii arasi, *Rhododendron caucasicum* caliligi, granit arazi, 2400 -2600, 20.8.1981. *A.Güner 4192* - Ortayayla köyü, Vercembek dagi, Atemeydan gölü stu, 3100m, 20.8.1982. *A.Güner 4507* - Ortayayla köyü, Vercembek dagi, eteklerj, 2700m, Kayalik yamaclar, Kazmofit, 11.8.1985, *A.Güner & M.Vural (AG 6788)* - Hisarcik köyü, Ortasirt yaylasi, lamli üstü, 2600 - 2800m, Kayalik yamaclar (Kâbecicegi), (Yapraklari cibanlara konuyor), 14.7.1984, *A.Güner & M. Vural (AG 5859)*. (all HUB).

For other localities see PAWLOWSKI & WALTERS.

General distribution: The species is known from the Caucasus (map in JUZEPCZUK 1952), the North-East Anatolian Mountains from Giresun and Gümüsane to Artvin and in Hakkari, in NW-Iran (JUZEPCZUK 1941, p. 310).

**2. *Alchemilla rizensis*** Pawl. in *Fragm. Florist. Geobot.* 18(1): 5. 1972. **Type:** Rize: Cermanin Tepe, 3300 m, *Davis 21075*.

**Icon.:** PAWLOWSKI & WALTERS (1972): 87 (Fig. 1: 5) ; PAWLOWSKI (1972) fig.14.

B.PAWLOWSKI in PAWLOWSKI & WALTERS (1972) gives the following description: Like *A. sericea*, but leaves  $\pm$  concolorous, greenish-grey and  $\pm$  shining above, grey-sericeous and very shining beneath; segments 5 - 7, the middle one completely free, the lateral ones, 2 - 3 on each side, joined up to 1/10 - 1/5 of their length; segments oblong - ovate, 2 - 2.5 x longer than wide; teeth 4 - 6, sub-equal, narrow, sub-connivent, the apicaltooth not higher than the lateral teeth. Flowers as wide as in *A. sericea*, but more densely silvery-sericeous. It is similar to *A. heteroschista* Juz..

Flowering time: VI-VIII (- IX), as in *A. sericea*. Habitat: Like that of *A. sericea*, 2200 - 3300 m.

Specimens from NE-Anatolia: No material besides that quoted by PAWLOWSKI & WALTERS (1972).

The species seems to be endemic to Rize (see map 2).

**Subsection *Heliodrosium* Rothm.****II. Series *Pubescentes* Buser**

*Alchemilla sericata* Rchb. s.l.

For Synonyms see FRÖHNER (1969) p. 145.

For further information about the group JUZEPCZUK (1941: 312 - 313) and BUSER (1906 [1]).

Icon.: REICHENBACH (1823): plate 4, fig.9.

The number of specimens from North-Anatolia is very low (PAWLOWSKI and WALTERS (1972: 86, 88). I have seen additional specimens only from Trabzon. Since *A. sericata* is widely distributed in the Caucasus it is to be expected also in Coruh and Rize especially at altitudes between 1900 and 2300 m.

3. *Alchemilla caucasica* Buser, Bull. Herb. Boiss. 4: 757. 1896. **Type:** Caucasus, ditiones Kuban in jugo Tieberdinski perival, inter flumen Tiberla et Do-nt., *Sommier & Levier* (FI).

A concise description is given by BUSER (1896) and by WALTERS in PAWLOWSKI & WALTERS (1972: 88).

Flowering time: VI-VII. Habitat: Pine forests, mountain slopes; 1665 - 2500 m.

Distribution in Rize (map 3): Camlihemsin: Ortayayla köğü, çevresí, subalpíník step, 16.7. 1985, *M. Vural* (MV 3531) (HUB).

General distribution: The plant is widely distributed in the caucasus regions: Georgia, Armenia and North and Northeast Anatolia from Bursa (Ulu Dag) to Artvin (Coruh).

4. *Alchemilla erythropoda* Juz. in Grossheim Flor. Kavk. ed. 1, 4 : 323. 1934. **Type:** Georgia, near Baku.

**Icon.:** PAWLOWSKI & WALTERS (1972): 87 (Fig.1,6) ; JORDANOV (1973): 291 (plate 60, fig.3).

*Alchemilla erythropoda* differs from *A. caucasica* in its less dwarf habit, flowering stems up to 20 cm, and its deflexed hairs especially evident on the lower internodes of the stem and the petioles of mature leaves.

Flowering time: V-VIII. Habitat: Alpine pastures, rocky slopes; 1700 - 3000 m.

Distribution in Rize (map 3): Besides the specimens quoted in PAWLOWSKI & WALTERS (1972: 88) no other specimens are known from the region.

General distribution: Within the rather large range of distribution (South-Central Europe, Northern Balkans, Crimea, Caucasus, Georgia, Armenia, North and East Anatolia and North-Iran) the species as delimited by WALTERS in PAWLOWSKI & WALTERS (1972), shows a good deal of variation. It is rather difficult to separate small specimens from *A. caucasica*. A further subdivision as suggested by FRÖHNER (1969) is still problematic. In NE-Anatolia (Trabzon, Rize and Artvin) the species seems to be rather rare. Perhaps the centre of its vertical distribution is in the forest belt below the alpine pastures and may be overlooked or neglected.

5. *Alchemilla surculosa* Fröhner in Rechinger, Flora Iranica 66 (Rosaceae 1): 139. 1969.  
**Type:** N-Iran, Mazanderan: M.Uloj 3200 m, 9. 8. 1948, *Rechinger 6482b* (W).

**Icon.:** PAWLOWSKI & WALTERS (1972): 87 (fig.1.7) ; FRÖHNER (1969): plate 52.

For a concise description see FRÖHNER (1969) and PAWLOWSKI & WALTERS (1972: 90).  
 Flowering time: VI-VIII. Habitat: Abies forests, dry slopes, by streams 1800m - 2900 m

Distribution in Rize (map 3): İkizdere: Anzer Kosmar yaylasi civari, 2500 m, 20.7.1985, *M. Vural 3128B* (HUB).

General distribution: The area of the species belongs to the hyrcano-euxine mountains. The specimens from N. and NE. Anatolia do not fit exactly into the description given by FRÖHNER, but they are within the limits of variation of other species of the genus (compare PAWLOWSKI & WALTERS 1972: 90).

6. *Alchemilla plicatissima* Fröhner in Rechinger, Flora Iranica 66 (Rosaceae 1): 143. 1969.  
**Type:** N-Iran, Mazanderan: Hazar Jerib 26. 5. 1948, *Sharif 422* (W).

**Icon.:** FRÖHNER (1969) plate 54.

For a concise description see FRÖHNER's original description and PAWLOWSKI & WALTERS (1972: 90).

Flowering time: VI-VIII. Habitat: Dry slopes on limestone in subalpine belt (Halbtrockenrasen); 1900 - 2500 m.

Distribution in N - Anatolia: Rize (map 3): İkizdere, Anzer 2350-2450 m, alpinik step, 26.8. 1984, *M. Vural 3365A* (HUB) - Trabzon: Macka, 11.6.1973, *A. & Ch. Nieschalk 3629* (FR) (teste WALTERS).

General distribution: The two quoted specimens show a reasonable extension of the hitherto known area of the species in Anatolia. The distribution pattern is perhaps similar to that of *A. surculosa* (see 5.).

### III. Series *Vulgares* Buser

7. *Alchemilla valdehirsuta* Buser in Vestn. Tiflissk. Bot. Sada 5: 18. 1906. **Type:** Turkey: Erzurum distr. Olty, prope pagum Agundir, in silva, 1650 m, *M. König* (G).

For concise descriptions see BUSER's original diagnosis and PAWLOWSKI & WALTERS in DAVIS (1972: 91).

Flowering time: VI-VIII. Habitat: Turf, alpine rocky places, 1150 - 3000 m; acid soils (?).

Distribution in Rize (map 4): İkizdere. Anzer. 2950 - 3000 m, alpinik cayirlik. 26.8.1984 - *M. Vural 3349* (HUB) - Anzer. 2950 m, Hareketli tasli yamaclar, 26.8.1984 - *M. Vural 3341* (HUB).

As in PAWLOWSKI & WALTERS (1972: 91) these are tentative determinations.

General distribution: Caucasus, Georgia, Armenia, N.Iran, N.Iraq and N.Anatolia. The specimens quoted fill a gap between the Kastamonu and the Artvin findings. The range of variation is not yet known. The vertical range of its distribution seems to be quite high and it may be possible to find a lot of other stands in the forest- and the subalpine belt.

8. *Alchemilla stevenii* Buser in Vestn. Tiflissk. Bot. Sada 4: 3. 1906. **Type:** Crimea. Tauri summi montes. Herb. STEVEN (H).

*Alchemilla stevenii* is very close to the very widely distributed *Alchemilla monticola* Opiz from which it differs most obviously in its dense erecto-patent indumentum which is evenly distributed on both leaf surfaces.

Flowering time: VII-VIII. Habitat: Steep rocky places. 2000 - 2200 m.

Distribution in Rize (map 4): İkizdere, Ballıköy (Anzer), 2150 m, Cayirlik. 19.7.1984, *M. Vural* 3078 (HUB).

General distribution: The species is a fine example for a distribution in the Crimea and in NE - Anatolia (Trabzon and Rize).

9. *Alchemilla compactilis* Juz. in Grossheim, Flora Kavk. 1. ed., 4: 325. 1934. **Type:** Armenia, Satanachatsh. (LE !).

= *A. rechingeri* Rothmaler, Ann. Naturhist. Museum Wien 57: 27. 1944.

**Icon.:** PAWLOWSKI & WALTERS (1972): 87 (fig.1.14).

For a concise description see PAWLOWSKI & WALTERS (1972: 92). The species is closely related to the European *A. strigosula* Buser. The species is relatively variable in size, leafshape and hairiness. FRÖHNER (1969) takes *A. rechingeri* as a species of its own.

Flowering time: V-VII (- IX). Habitat: Meadows, streamsides, 1100 - 2500 m.

Distribution in N. Anatolia: Rize (map 4): Camlihemsin: Ayder, Kaler - Kavrun arazi, sulak cayirlar, granit anakaya, 1600-1750 m, 25.6.1980. *A. Güner* 2527 (HUB) - Ayder, Asagi kavrun yaylasi altlari, 1800 m, Picea ormani, 17.7.1984, *M. Vural* & *A. Güner* (MV 3066) (HUB). - İkizdere, Anzer Kosmer yaylasi. cıvari, 2500 m, 20.7.1984, *M. Vural* 3128. - Erzurum: Palandöken daglari, s. Erzurum, Tal n. entlang der Seilbahn, 2270-2560 m. 14.7.1971, *Buttler* 16115 and 16127 (Herb. BUTTLER).

In Turkey the species is known from Kars, Van, Bitlis, Hakkari, from Bolu and from Nigde. The listed specimens extend the E-anatolian range of the species reasonably to the west. The stands at Abant Gülü (!) (Bolu) and Bolkar Maghara (Nigde) seem to be outposts, but it is not impossible, that the large gaps are only gaps in the knowledge of the distribution.

General distribution: Outside Turkey *A. compactilis*, in the wide sense, is found in N-Iran and Armenia.

10. *Alchemilla heterophylla* Rothm., Repert. Spec. Nov. Regni Veg. 46: 128. 1939. **Type:** Albania, Vermos, albanisch montenegrinisches Grenzgeb., 1100 m, *Dörfler* 229 p.p. (holo W; iso WU).

**Icon.:** JORDANOV (1973): 299 (plate 62, fig.3).

For a concise description see PAWLOWSKI & WALTERS (1972): 93 and JORDANOV (1973): 301.

Flowering time: VI-VIII (= IX). Habitat: Pine forests, meadows, stream sides; 1200 - 2400 m.

Distribution in NE Anatolia: Rize (map 4): İkizdere: Cımıl Deresi Tiron cevresi, 1200 m, Sulak cayirlik, 26.6.1984, *A.Güner 5676* (HUB). -- Trabzon: Mackar, 10.6.1973, *A. & Ch. Nieschalk 3630* (FR). -- Erzurum: Planadögen dghlari, 2350-2500 m. 14.9.1971, *Buttler 16126* (Herb.BUTTLER).

General distribution: The species is widespread in the Balkans, in N - Anatolia and the adjacent parts of C. -, NE. - and S.- Anatolia.

**11. *Alchemilla pseudocartalinica*** Juz. in Grossheim, Flor. Kavk. 1. ed. 4: 327. 1934. **Type:** Azerbaijan, near Baku (LE).

**Icon.:** PAWLOWSKI & WALTERS (1972): 87 (fig.1.12).

For a concise description see JUZEPCZUK (1941) and PAWLOWSKI & WALTERS (1972).

Flowering time: V-VIII. Habitat: Damp meadows, rocky igneous slopes, 1200m - 3000m.

Distribution in Rize (map 4): No recent collections. Only known from the specimens mentioned by PAWLOWSKI & WALTERS (1972. p.94). WALTERS (loc. cit.) assumes that the variation of *A. pseudocartalinica* is similar to that of the European *A. glabra* Neygenfind. I agree with that assumption.

General distribution: The species is known from Ulu Dagh through Anatolia, N-Iraq, Georgia, Azerbaijan eastward to Afghanistan, but till now there are no specimens from Iran.

## Subsection *Calycanthum* Rothmaler

### IV. Series *Elatae* Rothmaler

**12. *Alchemilla ziganadagensis*** B. Pawlowski in Fragm. Flor. Geobot. 18: 11 (1972). **Type:** Trabzon: Ciganadagh supra Hamskoei, in silvis 1890, *Sintenisi 3419* (holo K (!), iso G). = *A. orthotricha* Rothmaler f. *adpresse-pilosa* Rothmaler in Repert. Spec. Nov. Regni Veg., Beihefte 100: 75. 1938.

**Icon.:** PAWLOWSKI & WALTERS (1972): 87 (fig.1.15).

The species is similar to *A. orthotricha*. Stem 20 - 40 cm, erect or ascending, firm with dense sub-adpressed hairs throughout like petioles and hypanthia. Only the lower pedicels in each glomerulus have some sub-adpressed hairs in their lower part, the upper being completely glabrous. Leaves orbicular with narrow or closed sinus, densely hairy on both surfaces, lobed to 1/4 - 1/3. Lobes 9 - 11, semi-orbicular or parabolic without toothless incisions. 5 - 8 rather large, sub-equal, ± mammiliform teeth on each side of the lobes, the apical one a little shorter than its neighbours. Inflorescence with rather long, subdivaricate branches. Glomeruli ± lax.

Flowers 3.5 - 5 mm wide sepals and epicalyx segments glabrous, epicalyx segments shorter than sepals.

Flowering time: VI. Habitat: *Picea orientalis* forests on granit, 1200 - 1500 m.

Distribution in Rize (map 5): Camlihemsin: Cat - Elevit arasi, sulak cayirlar ve *Picea orientalis* ormanlari, granit anakaya, 1200-1500 m, 24.6.1980, *A. Güner 2442* (HUB).

General distribution: Till recently only known from the type - gathering. GÜNER'S finding shows that the species is wider distributed in NE - Anatolia. Endemic to this region.

**13. *Alchemilla orduensis*** Pawl. in *Fragm. Flor. Geobot.* 18: 11. 1972. **Type:** Ordu, Cambasi Yavus Bükü, 2100 m, *Tobey 1415* (E).

**Icon.:** PAWLOWSKI & WALTERS (1972): 87 (fig.1.15).

For a concise description see PAWLOWSKI (loc. cit.) and PAWLOWSKI & WALTERS (1972) p.96.

Flowering time: VII. Habitat: Rocky slopes, 2100 - 2500 m.

Distribution in Rize (map 5): İkizdere, Gölyayla - Cihantepe, 2400-2500 m, Cayirlik, 25.7.1985, *A. Güner & M. Vural, AG 6587* (HUB).

General distribution: As in the preceding species the finding in Rize extends the area of distribution reasonably and is the second after the type - gathering. Endemic to NE - Anatolia.

**14. *Alchemilla hirtipedicellata*** Juz. in *Grossheim, Flor. Kavk.* ed. 1: 4: 327. 1934. **Type:** Georgia; Bakuriani near Borzhami (LE).

**Icon.:** -

For a concise description see PAWLOWSKI & WALTERS (1972) p. 96.

Flowering time: VI-VIII. Habitat: Wet meadows, moist (?) clearings in forests. 1100 - 1500 m.

Distribution in E - Anatolia: Rize (map 5): Cayeli, Kaptanpasa, Cataldere Köyü, Cürükbel Mevkii, orman asikligi, karisik calilik ve nemli cayirlik, granit anakaya, 1370-1450 m, 5.7.1979, *A. Güner 1990* (HUB). -- Trabzon: Küçük Konak s. of Maska, 6.6.1974, *A. & Ch. Nieschalk* (FR) - Gürgenasae above Macka, 6.6.1974, *A. & Ch. Nieschalk* (FR).

Besides the gathering cited in DAVIS (1972) these three are the only findings known from Turkey. The above specimens key out to this species, but there is some unusual variation.

General distribution: Caucasia and NE - Anatolia.

**15. *Alchemilla mollis*** (Buser) Rothm. in *Feddes Repert. Spec. Nov.* 33: 347. 1934 ≡ *A. acutiloba* Steven var. *mollis* Buser in *Bull. Herb. Boiss.* 4: 749. 1896 ≡ *A. acutiloba* Steven subsp. *mollis* (Buser) Buser in *schedis imprim-ad DÖRFLER, Herb. Normale* 4655. 1906. **Type:** not designated.

= *A. acutiloba* Steven subsp. *cattilaris* Buser in *schedis impr. ad DÖRFLER, Herb. Normale* 4656, 4657 (1906).

**Icon.:** JORDANOV (1973): 311 (plate 65, fig.3).

For a concise description see PAWLOWSKI & WALTERS (1972) p. 97 and JORDANOV (1973): 313.

Flowering time: VI-VIII. Habitat: By streams, in forests and in rather dry grasslands. 900 - 2400 m.

Distribution in Rize (map 5): Camlihemsin: Amlakit yaylasi, Kaler düzü, 1800 m, 12.8.1984, *M. Vural* 3285 (HUB) - Amalkit yaylasi üstü, Cayirlik 2100 m, 9.8.1984, *M. Vural* 3254B (HUB) - Amalkit yaylasi çevresi, *Picea orientalis* ormani ve calilik, 1950 m, 26.7.1976, *A. Güner* 1445 (HUB) - Hisarik köyü, Ortasirt yaylasi - lamli mevkii arasi, yüksek dag cayirliklari, granit arazi, 2200-2400 m, 20.8.1981, *A. Güner* 4219 (HUB) - Ikizdere: Balliköy (Anzer), çevresi, 2100 m, Sulak cayirleak, 21.7.1984, *A. Güner & M. Vural*. AG 5970 (HUB).

Till now the species was not known from Rize, and there are still no specimens from Trabzon, Erzurum and Coruh (Artvin).

General distribution: The species is widely distributed from SE - Europe, S Russia, Georgia, Armenia, N - Iran and N - Anatolia. The species is widely cultivated in western Europe, is found there as an escape and is established in many places.

**16. *Alchemilla amoena*** (Czeczott) Rothm. in Repert. Spec. Nov. Regni Veg., Beihefte 100: 71. 1938 ≡ *A. acutiloba* Steven subsp. *amoena* Czeczott in Acta Soc. Bot. Polon. 9: 37. 1932. **Type:** Turkey: Sinop in pinetis montis Kadji - Aghach inter Sinopen et Taschkörpü, 1450 m, 1.8.1925, *Czeczott* 407 (Herb. CZECZOTT).

**Icon.:** CZECZOTT (1938/39) plate 32 fig.3.

For a concise description see PAWLOWSKI & WALTERS (1972) p. 98.

Flowering time: VII-VIII (- IX). Habitat: Besides brooks, 1840 - 2550 m.

Distribution in Rize (map 6): İkizdere: Sivrikaya köyü üstü, 1840 m, 19.7.1984, *A. Güner & M. Vural*, MV 2995 (HUB) - Paßhöhe der Straße Rize - İkizdere, Bachufer, 2560 m, 17.9.1971, *Buttler* 16148 (Herb. BUTTLER).

The two quoted specimens are the only known beside the type-gathering. Although the latter is collected rather late, it fits exactly into *A. amoena*.

General distribution: Endemic to N - Anatolia.

**17. *Alchemilla barbatiflora*** Juz. in Grossheim, Flor. Kavkas. ed. 1. 4: 329. 1934. **Type:** Georgia, Bakhmaro (LE !).

For a concise description see PAWLOWSKI & WALTERS (1972) p. 100.

Flowering time: VI-VIII. Habitat: Steep rocky slopes in the forest belt and above of it. 900-2400 m.

Distribution in Rize (map 6): Camlihemsin: Amlakit yaylasi, Cayirlignirmak (Makensuz alt yol) *Rhododendron* - *Picea* - *Fagus* karisik ormani, volkanik arazi, 1900-2000 m, 21.7.1974, *A. Güner* 1146 (HUB) - Hisarcik - Siraköy arasi, yüksek dag cayirliklari, 1600-2000 m, 9.8.1981, *A. Güner & B. Yildiz* (AG 4099) (HUB) - Tar deresi, karisik orman, sarp granit kayalik derin

vadí, 900-1300 m, 29.6.1981, *A. Güner 3899(2)* (HUB) - İkizdere: Cımıl, Basköy üstleri. Cayirlik, 2010 m, 24.7.1984, *M. Vural 3220C* (HUB).

These specimens fill a gap between the western transcaucasian and the Trabzon localities.

General distribution: The species is confined to Georgia and northeast Anatolia. Till now it is not known from Armenia.

**18. *Alchemilla ciminensis*** Pawl. in *Fragm. Flor. Geobot.* 18: 21. 1972. **Type:** Turkey, Erzincan, Kesis Da., above Cimin, 2450 m, 26.7.1957, *Davis 31655* (holo. E)

**Icon.:** PAWLOWSKI (1972) fig.8.4 and 21.

For a concise description see PAWLOWSKI & WALTERS (1972) p. 102.

Flowering time: VII-VIII (- IX). Habitat: By streams 2200-2850 m (?).

Distribution in Rize (map 6): Camlihemsin: Yukari Amlakit Yaylasi - Kisylagi arasi, *Rhododendron caucasicum* cayliligi, granit ana kaya, 2200-2850 m, 20.9.1979, *A. Güner 2172* (HUB).

This specimen corresponds quite good with the *A. ciminensis* features, but it is still doubtful if the specimen belongs to this species or not. Otherwise only known from the type collection.

General distribution: Endemic to Northeast Anatolia.

**19. *Alchemilla stricta*** Rothm. in *Repert. Spec. Nov. Regni Veg., Beihefte* 100: 80. 1938.

**Type:** Turkey, Kars, Kagysman - Dere, 30. 6. 1885/6 (C).

For a concise description see PAWLOWSKI & WALTERS (1972) p. 102.

Flowering time: VI-VIII (- IX). Habitat: Marshy ground by lakes and streams in Pinus forests, 500-2500 m.

Distribution in Rize (map 6): Camlihemsin: Amlakit Yaylasi Uzuncay, 1900m, 8.9.1979, *A. Güner 2165* (HUB) - Tar deresí, karisik orman, sarp granit kayalik derin vadí, 900-1300m, 29.6.1981, *A. Güner 3899(1)* (HUB). -- Findikli: Arslandere köyü, Gürcüdüzü mevkií, karisik orman, 550-700m, 27.6.1980, *A. Güner 2616* (HUB).

General distribution: The species is known from NW - (Bolu, Abant Gölü, !) and NE - Anatolia. The specimens from Rize enlarge the NE - anatolian part of the area reasonably. Endemic to Turkey. Perhaps identical with *A. undecimloba* Juz. from Caucasus.

**20. *Alchemilla cimilensis*** Kalheber spec.nov.

Typus: Turcia, prov.Rize, İkizdere, Cımıl, Basköy üstleri, 2100 m, pratum, 24.7.1984, *M. Vural 3220B* (HUB, holo). (map 7).

**Icon.:** Abb.1

Caules 20 - 25 cm, erecti, tenues et graciles, inferne dense supra sparsius erecto-patenter ad patenter pilosa, in inflorescentia glabra vel subglabra. Foliorum radicalium petioli ad 12 cm, graciles et tenues, erecto-patenter ad patenter pilosi, indumentum in foliorum aestivalium saepe sparsissime. Laminae reniformes vel semicirculares ad 3,5 x 5,5(-6,5) cm, sinu basali apertissimo; plusminusve planae, (sub 9 -) 9-lobae, ad 1/3 - 1/2 incisae, supra glabrae subtus in nervis primariis, in lobis basalibus et in dentibus densius erecto-patenter vel adpresse sericander pilo-



sae, ceterum glabrae. Lobi longe parabolici vel semi-elliptici, incisuris integris longis separati. Dentes utrinque 6 - 7, inaequales, acutiusculi, inferiores triangulares latiores quam longi; superiores longiores quam lati, ovato triangulares, porrecti vel in summo paulum incurvati; dens apicalis multo angustior sed non brevior vicinis. Stipulae brunnescentes auriculatae in nervibus adpresse pilosae. Folia caulina sat parva basi truncata vel sinu basali latissimo, incisuris longis inter lobos, similiter atque folia radicalia pilosa. Lamina foliorum inferiorum petiolibus breviores vel iis aequilongis; petioli in foliorum superiorum laminis breviores. Stipula parva, ovata, dentibus parvis, subtus adpresse pilosa in foliis inferioribus dense in superioribus in nervis laxissime pilosa vel glabra, extus glabra. Inflorescentia angusta et abbreviata, pauciflora, ramis brevibus erectis vel erecto-patentibus, glabris. Glomeruli breves laxiusculi. Pedicelli glabri. Flores 3 - 4,5 mm lati hypanthia glabra vel in neris laxe patenter pilosa. Sepala et episepala glabra; sepala oblonge ovata, hypanthio longiora, episepala eis angustiora et saepius pauce longiora, in florum parte minore 1 - 2 episepalorum dentibus 1 - 2 instructis.

Differt praeterea ab *A. bursensis* foliis radicalibus majus profunde incisus, sinu basali apertissimo et in forma loborum et in glomerulis laxioribus.

Quamquam huius plantae solummodo 2 specimina vidi, haud haesito, eam ut speciem novam describere.

Der Stengel ist 20 -25 cm, aufrecht,dünn und zierlich; unten dicht, oben spärlich aufrechtstehend bis abstehtend behaart, im Blütenstand kahl oder fast kahl. Die Grundblattstiele sind bis 12 cm lang, zierlich, dünn und aufrecht-abstehtend bis abstehtend behaart. Bei den Sommerblättern ist die Behaarung des Stieles oft spärlich. Die Blattspreite ist nieren- oder halbkreisförmig bis 3,5 x 5,5 (-6,5)cm, mit weit offener Basalbucht, mehr oder weniger eben, 9-lappig und bis auf 1/3 - 1/2 eingeschnitten. Sie ist oberseits kahl, unterseits auf den Hauptnerven, den Basallappen und den Zähnen dichter, etwas abstehtend oder angedrückt seidig behaart, sonst kahl. Die Blattlappen sind langparabolisch oder halb elliptisch, durch tiefe Einschnitte getrennt, beiderseits mit 6 - 7 ungleichen, spitzlichen Zähnen besetzt. Die unteren sind dreieckig und breiter als lang, die oberen sind länger als breit, eiförmig bis dreieckig vorgestreckt oder an der Spitze etwas einwärts gebogen. Der Endzahn ist viel schmaler, aber nicht kürzer als die übrigen. Die geöhrten Nebenblätter werden früh braun, sie sind auf den Nerven angedrückt behaart. Die Stengelblätter sind ziemlich klein, am Grunde gestutzt oder haben eine sehr weite Basalbucht. Zwischen den Lappen haben sie tiefe Einschnitte und sind wie die Grundblätter behaart. Die Spreiten der unteren sind kürzer als ihre Stiele oder etwa so lang, bei den oberen sind die Stiele kürzer als die Spreiten. Die Stipeln sind klein und eiförmig und haben kleine Zähne; unterseits sind sie auf den Nerven bei den unteren Blättern dicht, bei den oberen sehr locker behaart oder kahl. Der Blütenstand ist schmal und kurz, wenigblütig mit kurzen aufrechten Ästen und kahl. Die Blütenknäuel sind kurz und locker, die Blütenstiele kahl. Die Blüten sind 3 - 4,5 mm breit. Die Kelchbecher sind kahl oder auf den Nerven abstehtend, sehr locker behaart. Sepalen und Episepalen sind kahl. Die Sepalen sind länglich eiförmig und deutlich länger als der Kelchbecher. Die Episepalen sind schmaler und oft ein wenig kürzer als die Sepalen. Bei einem Teil der Blüten haben 1 - 2 Episepalen 1 - 2 Zähnchen.

## 21. *Alchemilla ikizdereensis* Kalheber spec.nov.

Typus: Turcia, prov.Rize, Ikizdere, Dereköy-Yerelma vicus, inclinatio vallis, pratum, 1000 m, 10.6.1984, *M.Vural 3008(1)*. (holo HUB). (map 7).

Icon.: Abb.2

Planta mediocris. Caules ascendentes vel erecti, tenues et graciles, foliis basalibus multo longiores, inferne dense supra sparse, in inflorescentia sparsissime patenter pilosi. Petioli

foliorum basaliu ad 9 cm longi, toti dense patenter pilosi. Laminae suborbiculares vel orbiculari - reniformes ad 4,5 cm latae, extus obscure viridis subtus pallidior, sinu basali angusto vel clauso, plusminusve planae (vel paulum plicatae), cum 7 - 9 lobis, ad 1/7 - 1/4 incisae, in facie superiore glabrae, subtus in tota facie disperse pilosae, in nervis primariis dense patenter pilosae. Lobi arcuato-truncati incisuris integris parvis aut circumcirca dentati. Dentes utrinque 5 - 6 grossi, late mammiliformes vel ovati, aequilongi atque lati vel paulum latiores quam longi, subaequales vel vix paulum superne accrescentes. Dens apicalis minore et brevior quam vicinis. Stipulae brunnescentes, base disperse pilis adpressis munita. Folia caulina sat magna, basi plusminusve truncato vel sinu basali lato. Similiter atque folia radicalia pilosa. Stipulae in facie superiore glabrae, subtus in nervis primariis patenter pilosae inter nervos glabrae, irregulariter, plusminusve profunde dentatae. Inflorescentia sat multiflora, ramis brevibus divaricatis vel erecto-patentibus. Glomeruli breves et lati, laxiusculi. Pedicelli glabri vel in parte inferiore pilis patentibus paucis muniti. Flores 3,4 - 4,8 mm lati, hypanthia glabra vel in basi laxe patenter pilosa. Sepala et episejala glabra; sepala oblonge-ovata, hypanthio paulo vel manifeste longiora. Episejala anguste vel late ovata iis plusminusve aequilonga sed tenuiora. Praecipue egregius sunt flores singulares in angulis foliorum caulinarum superiorum.

Ab *A. bursensis*, quia in indumento revocat, differt in forma laminae foliorum radicalium structuraeque glomerulorum. Ab *A. dura* quia in habitu revocant, differt in indumento.

Die Pflanze ist mittelgroß. Die Stengel sind aufsteigend bis aufrecht, dünn und zierlich, viel länger als die Grundblätter, unten dicht, oben spärlich, in der Inflorescenz sehr locker, abstehend behaart. Die Stiele der Grundblätter sind bis 9 cm lang, auf der ganzen Länge dicht, abstehend behaart. Die fast kreisförmige bis kreis-nierenförmige Blattspreite ist bis 4,5 cm breit, oberseits dunkelgrün, unterseits blasser, mehr oder weniger eben (oder schwach gefaltet) und hat eine enge oder geschlossene Basalbucht. Sie ist 7 - 9 lappig, bis zu 1/7 - 1/4 eingeschnitten, oberseits kahl, unterseits auf der ganzen Fläche locker, an den Hauptnerven dicht, abstehend behaart. Die Lappen sind bogig bis gestutzt, zwischen ihnen sind kurze Einschnitte vorhanden oder sie sind ringsum gezähnt. Beiderseits haben sie 5 - 6 kräftige breit warzen- oder eiförmige Zähne, die etwa so lang wie breit oder etwas breiter als lang sind. Sie sind etwa gleichgroß oder nehmen nach oben etwas an Größe zu. Der Mittelzahn ist schmaler und kürzer als seine Nachbarn. Die Nebenblätter werden früh braun, sie sind am Grunde angedrückt behaart. Die Stengelblätter sind ziemlich groß, am Grunde gestutzt oder mit offener Basalbucht. Ihre Behaarung ist wie die der Grundblätter, ihre Nebenblätter sind unregelmäßig, mehr oder weniger tief geteilt, oberseits kahl, unterseits auf den Nerven abstehend behaart, zwischen den Nerven kahl. Der Blütenstand ist ziemlich reichblütig und hat kurze ausgebreitete oder aufrecht-abstehende Äste. Die Teilblütenstände sind kurz und breit und auch ziemlich locker. Die Blütenstiele sind kahl oder im unteren Teil mit wenigen abstehenden Haaren besetzt. Die Blüten sind 3,4 - 4,8 mm breit. Die Kelchbecher sind kahl oder am Grunde abstehend, locker behaart. Sepalen und Episejala sind kahl. Die Sepalen sind länglich eiförmig, etwas oder deutlich länger als die Kelchbecher. Die Episejala sind schmal oder breit eiförmig, etwa so lang wie die Sepalen, aber schmaler. Besonders auffällig sind die einzelnen Blüten in den Achseln der obersten Stengelblätter.

Von *Alchemilla bursensis*, an die ihre Behaarung erinnert, unterscheidet sie sich durch die Form der Grundblattlappen und die Struktur der Teilblütenstände; von *A. dura*, an die ihr Habitus erinnert, durch die Behaarung.

## 22. *Alchemilla elevitensis* Kalheber spec.nov.

Typus: Turcia, prov. Rize, Camlihemsin, Elevit, Cevizli vallis, ripa rupester rivi, 2100 m, 15.7.1985, *M. Vural 3512*. (holo HUB). (map 7).

**Icon.:** Abb.3.

Planta mediocris, flavoviridis. Caules ad 25 cm alti, firmi sed non crassi, stricte erecti usque ad ramis inferioribus pilis patenter vel erecto - patenter dense obtekti; manifeste foliis radicalibus longiores. Foliorum radicalium petioli ad 12 cm longi, recti, firmi sed non crassi. Laminae orbiculares ad 6 cm; sinu basali angusto vel clauso, 9-lobatae ad 1/4 - 1/3 incisae; supra glabrae, subtus in nervis primariis et in lobis basalibus dense adpresse sericeo pilosae inter nervos glabrae. Nervi reticulares distinctissime. Lobi semicirculares vel parabolici cum incisuris integris longis vel brevibus sed semper distinctis. Dentes in utroque latere 9 - 10, infimi parvi, superiores maiores subaequales oblique triangulares paucè incurvati vel porrecti; dens apicalis angustior vel brevior vicinis. Stipulae brunnescentes dentibus parvis irregularibus, in nervis adpresse pilosae. Folia caulina mediocria vel parva, 5 - 7 lobata; petioli foliorum infimorum 1 - 2 x longiores quam lamina, inferiora paucè divisa, orbicularia arcuate lobata sine incisuris, superiora reniformia cum lobis parabolicis usque ad 1/2 lobata cum incisuris integris. Stipula irregulariter inciso dentata inferiora subtus dense adpresse pilosa extus glabra, superiora utrinque glabra. Inflorescentia multiflora cum ramis brevibus erectis vel erecto-patentibus, rami inferiores dense, superiores sparsissime patenter pilosi vel glabri. Glomeruli laxi. Pedicelli glabri. Flores 3,5 - 4,5 mm flavovirides. Hypanthia glabra sepalis manifeste breviora. Sepala et episepala subaequilonga, acuta, fere omnia integra, glabra. Sepala ovato-triangularia 1,5 - 2 x latiora episepalis.

Mittelgroße gelbgrüne Pflanze. Stengel bis 25 cm lang, kräftig, aber nicht dick, steif aufrecht, bis zu den untersten Ästen des Blütenstandes dicht, abstehend oder aufrecht-abstehend behaart, deutlich länger als die Grundblätter. Die Grundblattstiele sind bis 12 cm lang, aufrecht, kräftig, aber nicht dick. Die Blattspreiten sind kreisförmig und haben bis 6 cm Durchmesser, sie sind 9-lappig, bis zu 1/4 bis 1/3 eingeschnitten und ihre Basalbucht ist eng oder geschlossen. Sie sind oberseits kahl, unterseits auf den Hauptnerven und den Basallappen angedrückt, dicht seidig behaart, zwischen den Nerven sind sie kahl. Das Nervenetz ist sehr deutlich sichtbar. Die Blattlappen sind halbkreisförmig oder parabolisch durch lange oder kurze, aber immer deutliche Einschnitte, getrennt und haben jederseits 9 - 10 Zähne. Die unteren sind klein, die oberen größer, aber untereinander etwa gleich groß, sie sind schief dreieckig, etwas einwärts gebogen oder vorgestreckt. Der Endzahn ist schmaler und kürzer als die Nachbarzähne. Die Nebenblätter werden früh braun, sind unregelmäßig aber fein gezähnt und auf den Nerven angedrückt behaart. Die 5 - 7-lappigen Stengelblätter sind klein bis mittelgroß. Der Stiel des untersten Blattes ist 1 - 2 mal so lang wie die Spreite. Die unteren sind wenig geteilt, kreisförmig und haben bogige Lappen ohne Einschnitte zwischen ihnen; die oberen nierenförmig mit parabolischen Lappen, die durch tiefe Einschnitte getrennt sind. Die Nebenblätter sind unregelmäßig eingeschnitten gezähnt, die der unteren Stengelblätter sind unterseits dicht behaart, oberseits kahl, die der oberen sind beiderseits kahl. Der Blütenstand ist vielblütig mit kurzen abstehenden oder aufrecht abstehenden Ästen. Die unteren Äste sind dicht, die oberen locker, abstehend behaart oder kahl. Die Teilblütenstände sind locker. Die Blütenstiele sind kahl. Die 3,5 - 4,5 mm breiten Blüten sind gelbgrün, die Kelchbecher sind kahl und viel kürzer als die Sepalen. Sepalen und Episepalen sind kahl, spitz, etwa gleichlang und fast alle ganzrandig. Die Sepalen sind 1,5 - 2 mal so breit wie die Episepalen.

**23. *Alchemilla kackarensis* Kalheber spec.nov.**

Typus: Turcia, prov.Rize, Camlihemsin, Yukari kavrun, Kackar dagi, *Nardus stricta* caespes, 2350 m, 7.8.1985, *M.Vural* 3636. (holo, HUB). (map 7).

**Icon.:** Abb.4.

Planta mediocris vel parva, obscure vel laete viridis. Caules saepius plures, graciles, 10 - 15 cm, arcuato ascendentes saepius plusminusve flexuosi, late viride vel purpureo colorati, in internodiis inferioribus dense, patenter, cum pilis singularibus retrorse directis intermixta, in internodiis superioribus et in ramis inflorescentiarum laxius patenter pilosi. Petioles foliorum radicalium graciles, usque ad 5 cm longis, dense patenter pilosi. Laminae suborbiculares vel orbiculari-reniformes, ad 4,5 x 5 cm, sinu basali angusto vel clauso, 7 - 9 lobis, ad 1/3 - 2/5 incisae extus laete virides, glabrae, subtus griseo virides, dense, plusminusve patenter, in nervis primariis densissime erecto-patenter, splendide pilosi. Lobi parabolici plusminusve aequilongi atque lati, apice rotundati, basi incisuris brevibus separati; dentes utrinque 5 - 8 serrati, acutiusculi vel acuti. Dens apicalis vicinis brevior et multo angustior. Stipulae auriculatae, brunnescentes. Folia caulina mediocria vel parva, modo foliorum radicalium pilosa. Stipula irregulariter inciso dentata dentibus acutiusculis, extus glabra subtus dense plusminusve adpresse pilosa. Inflorescentia ramis divergentibus sed brevibus; glomeruli laxi. Pedicelli glabri vel pilis singularibus. Flores (3,1) 3,5 - 4,8 (5,0) mm lati; hypanthia in parte inferiore patenter piloso vel rarissime glabra; breviter obconica, sepala eis longiora oblongo ovato-triangularia glabra; epise-pala eis manifeste angustior et saepius eis aequilongo vel breviora, lanceolata, acuta, glabra. Sepala epise-palae raro 1 dente munita.

*Alchemilla kackarensis* habitu plantas seriei *Calycinarum* revocat sed causa indumenti membrum seriei *Elatarum* est.

*Alchemilla kackarensis* ist eine kleine bis mittelgroße, dunkel- bis üppiggrüne Pflanze. Die Stengel sind 10 - 15 cm lang, zierlich, bogig aufsteigend, oft hin und her gebogen und leuchtend grün oder purpurn gefärbt. Er ist an den unteren Internodien dicht, an den oberen und den Ästen des Blütenstandes locker, abstehend behaart. Im unteren Stengelteil sind einige abwärts gerichtete Haare unter die Übrigen gemischt. Die Grundblätter haben zierliche bis 5 cm lange Stiele, die dicht abstehend behaart sind. Ihre Spreite ist fast kreisrund bis kreis-nierenförmig und ist bis 4,5 x 5 cm groß; sie hat 7 - 9 Lappen und ist bis auf 1/3 - 1/2 geteilt. Die Basalbucht ist eng oder geschlossen. Oberseits sind die Blätter kahl und leuchtend grün, unterseits grau-grün und dicht, mehr oder weniger abstehend, auf den Hauptnerven sehr dicht, aufrecht abstehend, glänzend behaart. Die Lappen sind parabolisch, etwa so lang wie breit, haben eine gerundete Spitze und sind am Grunde durch kurze Einschnitte getrennt. Beiderseits sind 5 - 8 sägezahnförmige, spitze bis spitzliche Zähne vorhanden. Der Endzahn ist kürzer und schmaler als die benachbarten. Die geöhrteten Nebenblätter werden früh braun. Die Stengelblätter sind klein bis mittelgroß und wie die Grundblätter behaart. Ihre Nebenblätter sind unregelmäßig eingeschnitten gezähnt und haben spitzliche Zähne, oberseits sind sie kahl, unterseits dicht angedrückt behaart. Der Blütenstand hat ausgebreitete, aber kurze Äste. Die Teilblütenstände sind locker. Die Blütenstiele sind kahl oder haben einzelne Haare. Die Blüten sind (3,1) 3,5 - 4,8 (5) mm breit. Die kurz kegelförmigen Kelchbecher sind im unteren Teil abstehend behaart, im oberen kahl. Selten sind sie ganz kahl. Die Sepalen sind länger als die Hypanthien, länglich eiförmig und kahl. Die lanzettlichen, spitzen, kahlen Epise-palen sind viel schmaler, oft gleich lang oder etwas kürzer als die Sepalen. Sepalen und Epise-palen haben selten einen Zahn. Die Art erinnert an Pflanzen der Series *Calycinae*, muß aber wegen des Behaarungstyps den *Elatae* zugeordnet werden.

#### 24. *Alchemilla hemsinica* Kalheber spec.nov.

Typus: Turcia, prov.Rize, Camlihemsin, Ortaköy, Vercenik dagi, Alpinik küçük dere yatagi, 2700 m (Tüylü), 13.8.1985, *M.Vural 3685* (holo, HUB). (map 7).

Icon.: Abb. 5

Planta mediocris, obscure viridis. Caules 15 - 20 cm, arcuato ascendentes, tenues gracilesque, usque ad ramis inflorescentiae patenter pilosi. Foliorum radicalium petioli ad 9 cm longi, toti dense patenter vel erecto patenter pilosi. Laminae reniformes ad 5 x 7 cm, sinu basali aperto vel angusto, plusminusve planae, 9-lobatae, ad 1/3 - 2/5 incisae, extus in tota facie disperse subtus dense adpresse, in nervis primariis patenter pilosae. Lobi parabolici vel semi-elliptici, incisuris integris longis vel brevibus sed distinctis separati. Dentis utrinque 7 - 9 pro portione magna longiores quam lati, sed dentes inferiores latiores quam longi, dentes superiores ad 1,5 x longiores quam lati; acutiusculi, plusminusve porrecti vel paulum prorsus incurvi. Dens apicalis vicinis angustior sed non brevior. Stipulae brunescens longe auriculatae, in nervis laxe adpresse pilosae. Folia caulina sat parva, folium infimum longe petiolatum, eius petiolus 2 - 3 x longior quam lamina. Foliorum superiorum petioli laminis breviores. Laminae sinu basali late aperto vel truncatae, 5 - 7-lobatae; lobi incisuris distinctis separati, similiter atque folia radicalia pilosa. Stipulae foliorum inferiorum dentibus parvis, foliorum superiorum dentibus inaequalibus crassiusculisque instructae; subtus dense, extus disperse patenter pilosae. Inflorescentia abbreviata, pauciflora, ramis brevibus patentibus vel erecto-patentibus patenter pilosis. Glomeruli breves et lati, sed plusminusve laxi. Flores flavescens, 3 - 4 mm lati; hypanthia tota longitudine vel parte inferiore subdense ad dense patenter pilosa; sepala et episepala glabra; sepala oblonge-ovata hypanthio longiora, episepala angustiores sed eis plusminusve aequilongis. Episepala rarissima 1 - 2 dentibus instructa. Quamquam huius plantae solummodo 2 specimina vidi haud haesito, eam ut speciem novam describere.

Differt praeterea ab *A. porrectidens* ramis inflorescentiae dense pilosibus, ab *A. pseudomollis* foliis radicalibus majus profunde incisus, lobis parabolicis, ab *A. cimilensis* quam habitu revocat caulibus arcuato-ascendentibus et in pilis patentibus.

*Alchemilla hemsinica* ist eine mittelgroße, dunkelgrüne Pflanze, ihr bogig aufsteigender Stengel ist dünn und zierlich und bis zu den Ästen des Blütenstandes abstehend behaart. Die Stiele der Grundblätter sind bis 9 cm lang. Sie sind abstehend bis aufrecht-abstehend dicht behaart. Die nierenförmigen Spreiten sind bis 5 x 7 cm groß, ihre Basalbucht ist eng bis weit offen. Die Blätter sind mehr oder weniger eben, 9-lappig, bis 1/3 bis 2/5 eingeschnitten, oberseits auf der ganzen Fläche locker, unterseits dicht, auf den Hauptnerven abstehend behaart. Die parabolischen oder halb elliptischen Lappen sind durch lange oder kurze, aber immer deutliche Einschnitte getrennt, beiderseits haben sie 7 - 9 Zähne, die im oberen Teil länger als breit, im unteren Teil breiter als lang sind - die oberen sind bis zu 1,5 - mal so lang wie breit - sie sind vorgestreckt oder mehr oder weniger einwärts gebogen; der Endzahn ist schmaler, aber nicht kürzer als die Nachbarzähne. Die Nebenblätter sind bräunlich, lang geöhrt und an den Nerven angedrückt locker behaart. Die Stengelblätter sind ziemlich klein. Die Stiele der unteren sind 2 - 3 mal länger, die der oberen kürzer als die Spreite. Diese ist am Grunde gestutzt oder hat eine weit offene Basalbucht, sie hat 5 - 7 Lappen, die durch deutliche Einschnitte getrennt sind, und ihre Behaarung entspricht der der Grundblätter. Die Nebenblätter der unteren sind fein, die der oberen ungleichmäßig grob gezähnt, sie sind unterseits dicht, oberseits abstehend locker behaart. Der Blütenstand ist kurz und wenigblütig mit kurzen abstehenden oder aufrecht abstehenden Ästen, die abstechend behaart sind. Die Teilblütenstände sind kurz und breit und ziemlich locker. Die gelbgrünen Blüten sind 3 - 4 mm breit. Die Hypanthien sind vollständig oder wenigstens im unteren Teil recht dicht abstehend behaart. Die Sepalen und Episepalen sind kahl. Die Sepalen sind länglich eiförmig und länger als das Hypanthium. Die Episepalen sind schmaler als sie, aber etwa gleich lang, sie haben selten 1 - 2 Zähnchen.

Von *A. porrectidens* unterscheidet sie sich durch dicht behaarte Infloreszenzäste, von *A. pseudomollis* durch weniger tief geteilte Grundblätter und die parabolischen Lappen. Von *A. cimilensis*, an die sie im Habitus erinnert, durch die bogig aufsteigenden Stengel und die abstehende Behaarung.

## V. Series *Calycinae* Buser

**25. *Alchemilla procerrima*** S. Fröhner in Rechinger, Fl. Iranica 66 (Rosaceae 1): 132. 1969.  
**Type:** Turkey, Agri, inter Agri (Karaköse) et Horasan, in jugo inter Zidigan et Velibaba, 2500 m, 5.9.1957, *Rechinger f. 15047* (holo W).

**Icon.:** FRÖHNER (1969) plate 45.

For a concise description see PAWLOWSKI & WALTERS (1972) p. 102.

Flowering time: VII-VIII (- IX). Habitat: Rocky Rhododendron forests, 1400 - 2500 m.

Distribution in Rize (map 8): Camlihemsin: Amlakit yaylasi üsterli. Cayirlik, 2100 m, 9.8.1984, *M. Vural 3254A (2)* (HUB) - Amlakit yaylasi üstü, Rhododendron caliliklari, 2100-2200 m, *M. Vural 3276* (HUB) - Ayder - Kaler. 1400-1600 m, 19.7.1985, *M. Vural 3572* (cf.) (HUB).

General distribution: Till now only known from the type gathering. The above cited specimens fit exactly in the type description and the photograph of the type. Perhaps between the Rize findings and the type locality more stations are to be expected.

**26. *Alchemilla transcaucasica*** Rothm. in Repert. Spec. Nov. Regni Veg., Beihefte 100: 83. 1938. **Type:** Georgia, Guria in jugo Adzharo - Imerdico pr. Bachmaro, 2100 m, VII.1924, *Grossheim* (holo S).

For a concise description see PAWLOWSKI & WALTERS (1972) p. 103 and ROTHMALER loc. cit..

Flowering time: VII. Habitat: 2000-2100 m.

Distribution in Rize (map 8): No further information since ROTHMALER'S publication of the species.

General distribution: Caucasia and NE - Anatolia. Euxine (montane) element.

**27. *Alchemilla retinervis*** Buser in Bull. Herb. Boiss. 4: 760. 1896. **Lectotype:** Caucasia. Svanetia, in monte Tetinar, supra pagum Ciolur, ad flumen Hippium (Tzkhenis - Tzkhah), 2000 m, *Somier & Levier* (G).

**Icon.:** JZUZEPCZUK (1941): 399 fig.4 ; PAWLOWSKI & WALTERS (1972): 89 (fig.2.4) ; MULKIDSHANJAN: 177 (tab.50) ; KOLAKOVSKIY (1939): 261 (plate 31 fig.1).

For a concise description see PAWLOWSKI & WALTERS (1972) p.103 and BUSER loc.cit.

Flowering time: VII-VIII. Habitat: By streams and on wet, rocky places in the alpine belt, 2000-3100 m.

Distribution in Rize (map 8): Camlihemsin: Amlakit yaylasi, Kaygut'tan covrnovid yoluyla, volkanik arazi alpinik step, 2200-2720 m, 19.7.1974, *A.Güner 1093* (HUB) - Amlakit yaylasi üsterli. Cayirlik, 2100 m, 9.8.1984, *M. Vural 3254A (1)* (HUB) - Yukari Kackar yaylasi, alpinik cayirlik, granit arazi, 2300-2900 m, 14.8.1981, *A.Güner 4168* (HUB) - Yukari, Kavrün-Mezevit arasi, alpinik step, granit arazi, 2150-2750, 9.8.1980, *A.Güner 2929* (HUB) - Yukari Kavrün-Pornag-Arcovit arasi, alpinik step, granit arazi, 2200-3000 m, 10.8.1980, *A.*

*Güner 3009* (HUB) - Yukarıkavrun yaylasi, Kackar dagi etekler, 3000-3100 m, Hareketli Kayaliklar, 6.8.1985, *A. Güner & M. Vural (AG 6732)* (HUB) - Hisarcik köyü, Ortasirt yaylasi. Lamli üstü, 2780 m, Kayalik yamaclar, 14.7.1984, *M. Vural & A. Güner (MV 3027)* (HUB) - Vercenik dagi, kuzey batsisi. alpinik graminea stepi. kayalik erozynolu yamaclar, 2900-3000 m, 11.8.1985, *M. Vural 3666* (HUB) - Samistal Yaylasinin yakarisi, alpinik step, 2350 m, 7.9.1979, *A. Güner 2148* (cf.) (HUB) - Ayder, Yukari Kavrun, Coovit mevkii 0 kayalik yerler, *Sibbaldia* alpinik stepi, 2800 m. 5.8.1985, *M. Vural 3625* (HUB). -- İkizdere: Anzer, alpinik step, 2350-2450 m, 26.8.1984, *M. Vural 3365B* (HUB) - Anzer Köyü Derebasi, Cayirlik, 2500-2650 m., 11.7.1984, *A. Güner & M. Vural (AG 5754)* (HUB) - Anzer-Hosmen yaylasi arasi, Cayirlik, 2150 m. 21.7.1984, *M. Vural 3170* (HUB) - Sivrikaya köyünden 2 km Ispire dogru, *Rhododendron luteum* calikgi, harektli kayaliklar, granit arasi kaya, 2000 m., 8.7.1979, *A. Güner 2032* (HUB) - Ispir arasi, Ovit Gecidi, alpinik step, granit ana kaya, 2650-2750 m, 8.7.1979, *A. Güner 2069* (HUB).

By far the most specimens collected in Rize belong to this species. I think that this is due to the fact that most of the collections come from the alpine belt of the mountains.

General distribution: Caucasia and Anatolia. The great gap between Nigde and the findings in Giresun, Rize and Coruh seem more to be gaps in the knowledge of the distribution than gaps of the distribution itself.

- 28. *Alchemilla ellenbergiana*** Rothm. in Repert. Spec. Nov. Regni Veg. 50: 254. 1941. **Type:** Turkey, Nigde, Ala Da, 2700 m, *Ellenberg 369*  
- *A. debilis* auct. non Juz.: Rothmaler in Repert. Spec. Nov. Regni Veg., Beihefte 100: 84. 1938.

For a concise description see PAWLOWSKI & WALTERS (1972) p. 103 and ROTHMALER loc. cit..

Flowering time: VII-VIII. Habitat: Steep slopes, by brooks, 1000 - 3000 m.

Distribution in Rize (map 9): İkizdere: Dereköy-Yerelma köyü, dere kenari. Cayirlik, 1000 m, 10.7.1984, *M. Vural 3008(2)* (HUB). -- It is not sure if the following specimen belongs to this species or not: Camlihemsin: Ayder, Yukari Kavrun - Kackar dagi, Coovit mevkii, *Rhododendron caucasicum* alpinik caliligi, 2750 m, 5.8.1985, *M. Vural 3631* (HUB).

General distribution: Caucasus, Transcaucasia, NE - and Central - Anatolia.

- 29. *Alchemilla dura*** [Buser ex] Rothm. in Repert. Spec. Nov. Regni Veg., Beihefte 100: 86. 1938. **Type:** Caucasus, Svanetia in monte Tetenaar supra pagum Ciolur ad flumen Tzkhensitzkhali, 2000 m, *Sommier & Levier 454* (G, holo).  
- *A. firma* auct. non Buser (1893): Buser in Bull. Herb. Boiss. 4: 760. 1896.

For a concise description see PAWLOWSKI & WALTERS (1972) p. 104 and ROTHMALER loc. cit..

Flowering time: VII-VIII. Habitat: Alpine pastures, perhaps only on serpentine rock, 2700-3100 m.

Distribution in NE - Anatolia: Rize (map 9): Camlihemsin: Yukari Kavrun yaylasi, Mezevit-Kackar arasi, alpinik step. Serpentine arazi, 2750-3000 m, 9.8.1980, *A. Güner 2874* (HUB) - İkizdere: Basköy (Cimil), cermaniman yaylasi üstü. 3100 m, Kayalik Cokyllik, 23.7.1984, *A. Güner 6022* (HUB). -- Coruh (Artvin): ca. 1 km w. unterhalb Yalnizcan gecidi an der Straße nach Ardanuc, 2450 m, 17.8.1969, *Butler 14552* (Herb. BUTLER).

These specimens fill the gap between the specimens from Giresun (*Davis 20541* p. p.) and those of Kars and Agri.

General distribution: Caucasia, NE - Anatolia. The total range in Western Caucasus and western Transcaucasia is mapped in JUZEPCZUK (1952, map 136). JUZEPCZUK (1941) points out that *A. dura* belongs to the *A. retinervis* complex "which is extremely polymorphic and requires further study". In his later publications on caucasian *Alchemillas* JUZEPCZUK (1952, 1954) leaves this problem unsolved. PAWLOWSKI (1952 and 1957) showed that in the Carpathians there are *Alchemillas* which are similar to *A. dura*.

**30. *Alchemilla venosa*** Juz. in Grossheim, Flor. Kavk. ed. 1, 4: 328. 1934. **Type:** Caucasus, Nor Bayazet District, Archanots range near Tsymakapert village (LE)

**Icon.:** MULKISHANJAN: 175 (tab.49).

For a concise description see JUZEPCZUK (1941).

Flowering time: VII-VIII. Habitat: Alpine meadows, *Rhododendron caucasicum* communities, 2200-2600 m.

Distribution in Rize (map 9): Camliheimsin: Hisarcik köyü, Ortasirt yaylasi, lamli mevkii arasi, yüksek dag cayirlikari, granit arazi, 2200-2400 m, 20.8.1981, *A. Güner 4217* (HUB) - İkizdere: Basköy (Cimil) incun tepe, alpinik calilik (*Rhododendron caucasicum*), 2500-2600 m. 23.8.1985, *M. Vural 3982*)

New for Turkey.

General distribution: The species known from Caucasus and SW - Transcaucasia is mapped in JUZEPCZUK (1952, map 134). The gatherings of A. GÜNER and M. VURAL show that the species penetrates into Turkey.

**31. *Alchemilla ancerensis*** Kalheber spec.nov.

Typus: Turcia, prov.Rize (A8). İkizdere, Balliköy (Anzer), 2150 m, pratum, 19.8.1984, leg. *M.Vural 3090*. Herb. Univ. Hacettepensis, Ankara (holo, HUB). (map 9).

**Icon.:** Abbildung 6.

Planta mediocris vel parva. Caules 8 - 12 cm alti, arcuato ascendentes vel fere erecti, tenues et graciles, in internodiis inferioribus dense adpresse pilosi, in internodiis superioribus glabri, sed in internodiis mediis laxe adpresse pilosi. Foliorum radicalium petioli ad 7 cm longi, toti dense plusminusve adpresse pilosi; laminae reniformes vel suborbiculares ad 2 x 3,5 cm, planae vel paulum plicatae, sinu basali angusto vel aperto; 7 (- 9) lobae ad 1/4 - 1/3 incisae, extus in dentibus pilosae, ceterum glabrae, viride; subtus griseo-viride, in nervis primariis et in lobis basalibus dense adpresse pilosae (pilis sericeis), dentibus laxe adpresse pilosae. Lobi arcuati vel semiorbiculari paulum truncati, incisuris integris parvis sed distinctis separati. Dentes utrinque 4 (-5), ad 2,5 x longiores quam lati, acuti, plusminusve porrecti, vel vix paulum prorsus incurvati, subaequale dens apicalis autem multum angustior et brevior vicinis. Stipulae brunnescentes cum nervis viridibus, dense adpresse pilosae. Folia caulina parva, petiolis brevibus, stipiliis paucidentatis, dentibus latis brevisusque in utroque latere glabrae. Inflorescentia pauci ramosa, ramis erecto patentibus glabris; glomeruli breves densiusculi; pedicelli glabri vel laxissime erecto patenter pilosi. Flores flavovirides 3 - 4,5 mm lati, hypanthia sepalis episepalisque subaequilonga, glabra vel in dimidio inferiore pilis laxe accumbentibus praedita; sepala anguste ovata in



nervis et in summo cum pilis singulis; episejala angustius lanceolata sepalis aequilonga vel saepius breviora (63% flor.examin.) fere semper integra, saepe apice setula vel setulis paucis munita.

Ab *A.minusculiflora* differt in incisuris inter lobos foliorum, ab *A.pseudocartalinica* numero dentorum foliorum.

Mittelgroße oder kleine Pflanze. Stengel 8 - 12 cm lang, bogig aufsteigend bis fast aufrecht, dünn und zierlich, an den unteren Internodien anliegend dicht, an den mittleren anliegend locker behaart. Die oberen Internodien sind kahl. Die Stiele der Grundblätter sind bis 7 cm lang und alle anliegend mehr oder weniger dicht behaart. Die Spreite ist nierenförmig oder fast kreisförmig bis 2 x 3,5 cm, eben oder schwach gefaltet. Die Basalbucht ist schmal oder offen. Die Spreiten sind 7 (-9) lappig, auf 1/4 - 1/3 geteilt, oberseits grün, auf den Zähnen behaart, sonst kahl, unterseits graugrün, auf den Hauptnerven und den Basallappen dicht, anliegend, seidig behaart. Die Lappen sind bogig oder halbkreisförmig, ein wenig gestutzt, die Einschnitte zwischen ihnen sind kurz aber deutlich. Die Lappen haben jederseits 4 (-5) Zähne, die bis 2,5 mal so lang wie breit sind. Die Zähne sind spitz, mehr oder weniger vorgestreckt oder etwas einwärtsgebogen und etwa gleich groß. Der Endzahn ist allerdings viel schmaler und kürzer als seine Nachbarn. Die Stipeln sind bräunlich mit grünen Nerven. Sie sind dicht, anliegend behaart. Die Stengelblätter sind klein und kurz gestielt, ihre Nebenblätter sind beiderseits kahl und haben wenige kurze und breite Zähne. Der Blütenstand ist wenig verzweigt. Die kahlen Äste stehen aufrecht ab. Die Teilblütenstände sind kurz und dicht. Die Blütenstiele sind kahl oder sehr locker aufrecht abstehend behaart. Die gelbgrünen Blüten sind 3 - 4,5 mm breit. Die Kelch- becher sind etwa so lang wie die Sepalen und Episejalen, sie sind kahl oder im unteren Teil locker, anliegend behaart. Die Sepalen sind schmal eiförmig und haben auf den Nerven und an der Spitze einzelne Haare. Die Episejalen sind schmal-lanzettlich, so lang oder öfter etwas kürzer als die Sepalen und fast immer ganzrandig. An der Spitze haben sie oft eine oder mehrere feine Borsten.

Von *A.minusculiflora* unterscheidet sie sich durch die deutlichen ganzrandigen Einschnitte zwischen den Lappen der Grundblätter, von *A.pseudocartalinica* durch die Anzahl der Zähne an den Grundblättern.

## Conclusion.

As shown on map 1 the knowledge of the distribution of *Alchemillas* in Rize is brought a great step forward by the collections of GÜNER and VURAL. At the moment the knowledge of the species of this genus and their distribution is at the highest standard for all Turkish vilayets. Nevertheless there is a lot of work to be done to bring it to the standard of Northwest-Europe.

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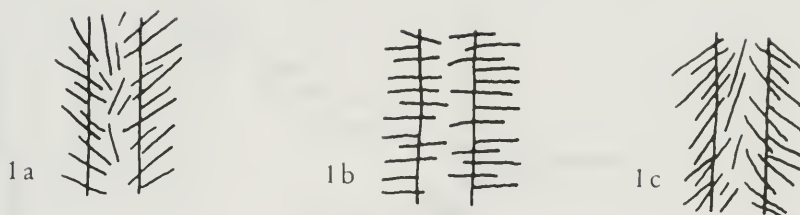


Fig. 1  
Parts of stems (petiols) with erecto-patent (1a), patent (1b) or deflexed (1c) hairs.

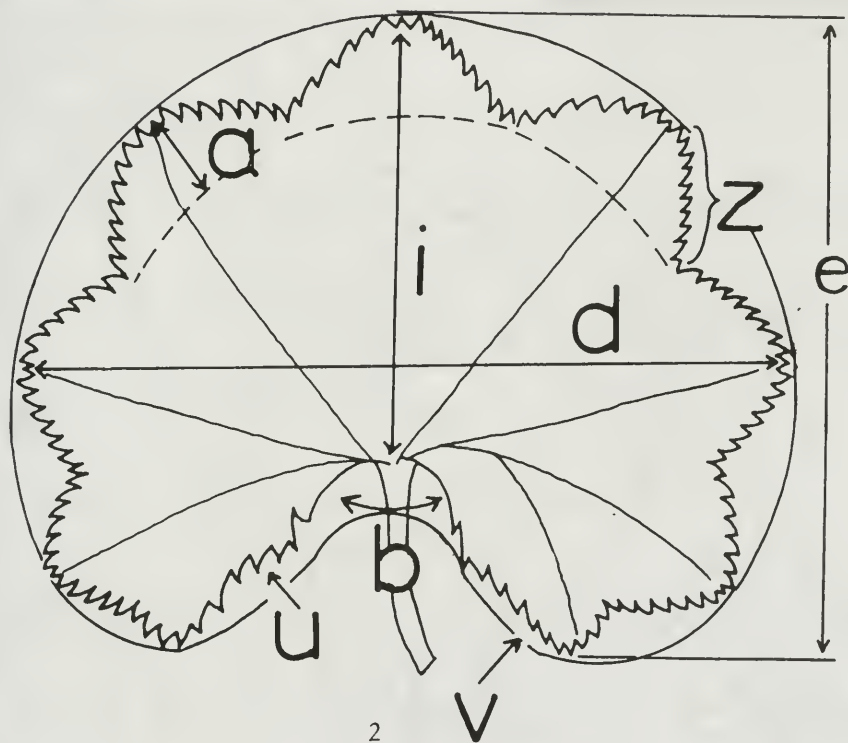


Fig. 2  
The shape of a leaf is the shape of a line which is surrounding the leaf. The magnitude of a leaf is the distance of the tops of two opposite lobes (b). The division of the leaf is the ratio between the length of one of the middle lobes and the total length of the leaf (i). The basal sinus is the space (b) between the two basal lobes, they may be complete (v) or incomplete (u). The number of teeth (z) refers always to one side of one of the middle lobes. The apical tooth is not included in the number.

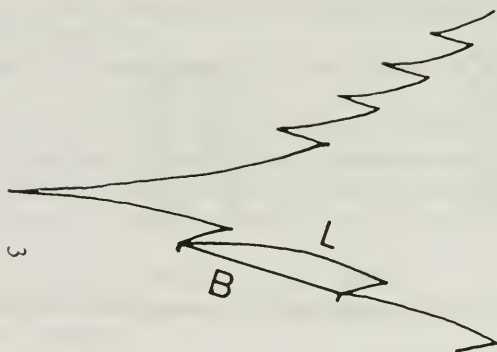


Fig. 3

The length of a tooth is the length (L) of its outer line. The width (B) is the distance of two neighbouring inner points of the teeth.

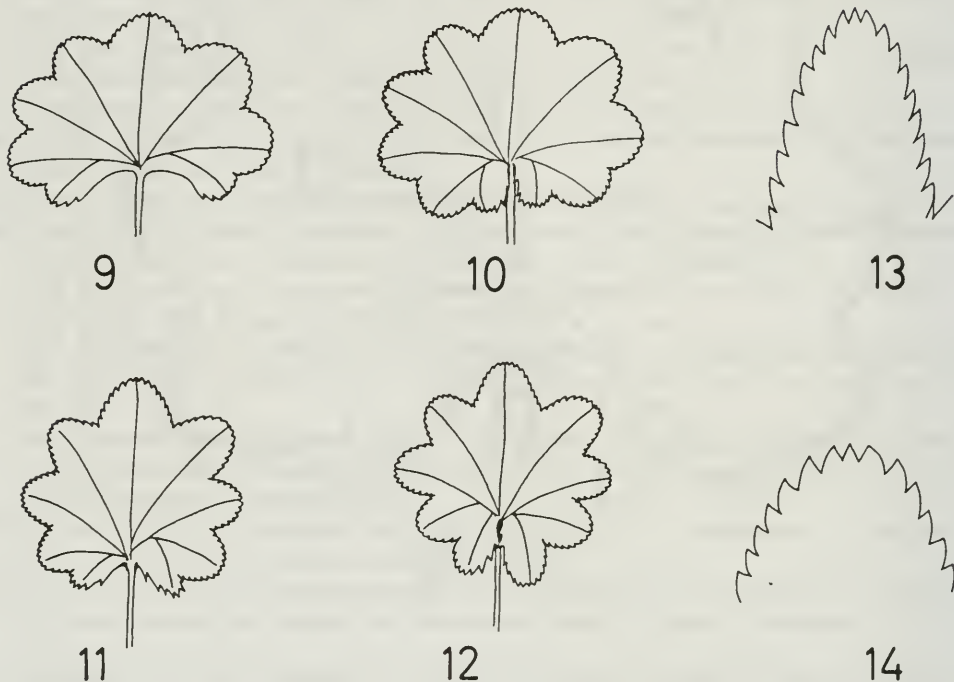
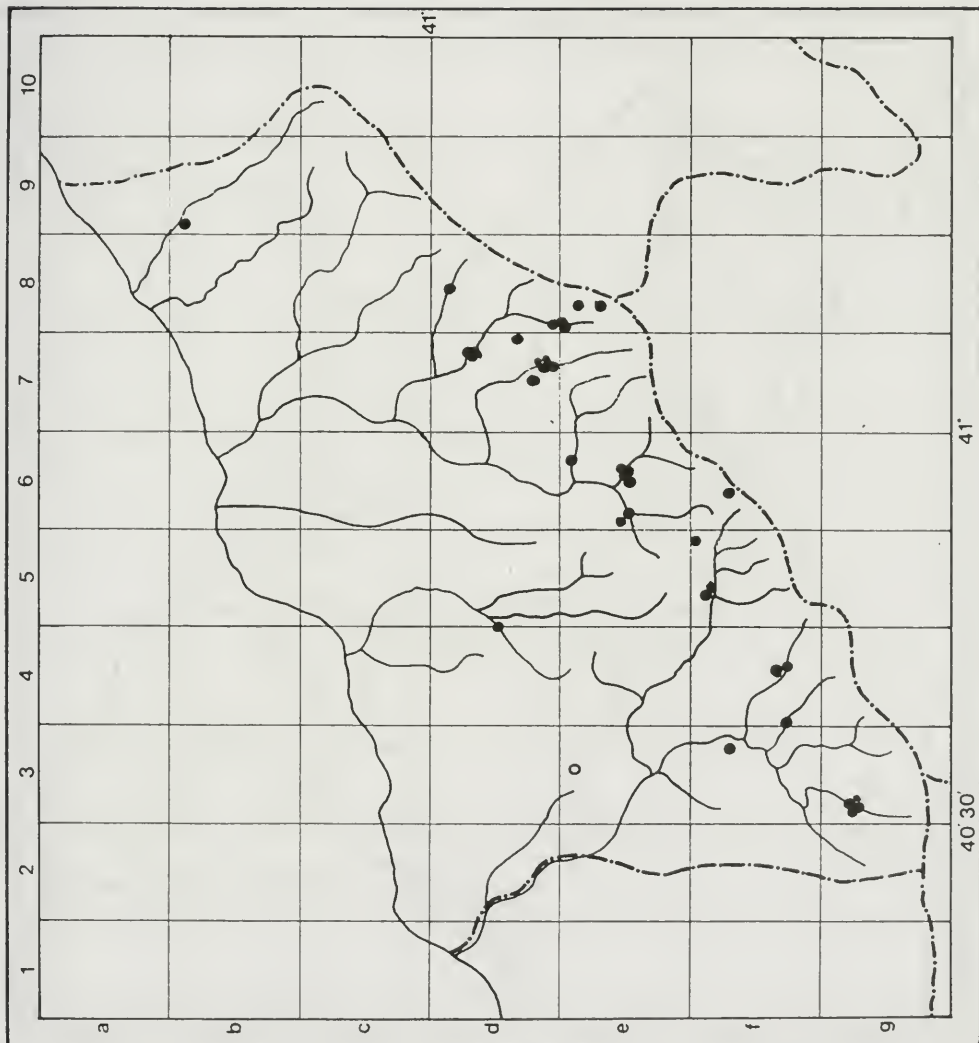


Fig. 4

A kidney shaped leaf may have an open (9) or a closed (10) sinus. An open sinus of a round leaf (11) and a closed one (12) is also possible. The lobes may be parabolic (13) or hyperbolic (14). - The figures are taken from LIPPERT & MERXMÜLLER 1975 (Fig. 4) and LIPPERT & MERXMÜLLER (1982) (Fig 1, 2 and 3).

map 1

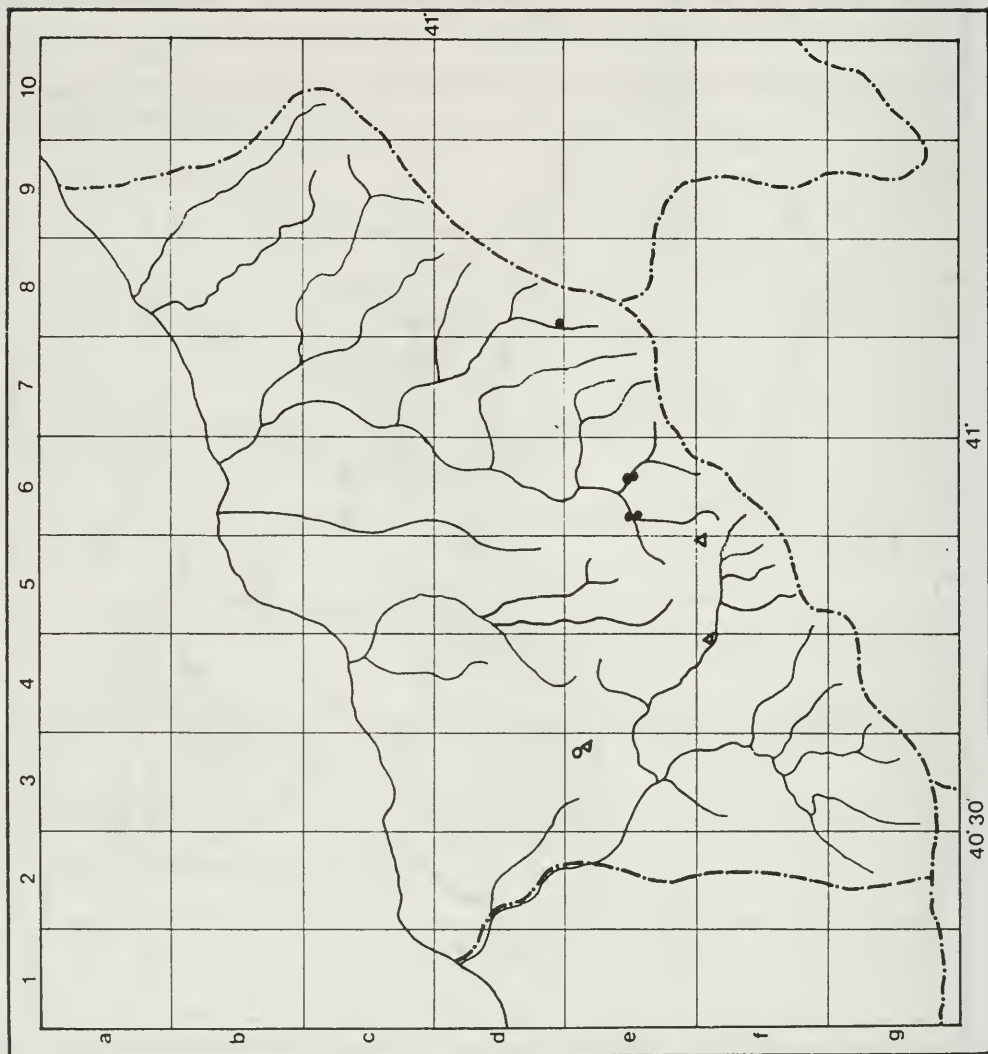
Alchemilla collections  
from Rize



map 2

*A. sericea* Willd. ●, ○

*A. rizensis* B. Pawlowski ▲



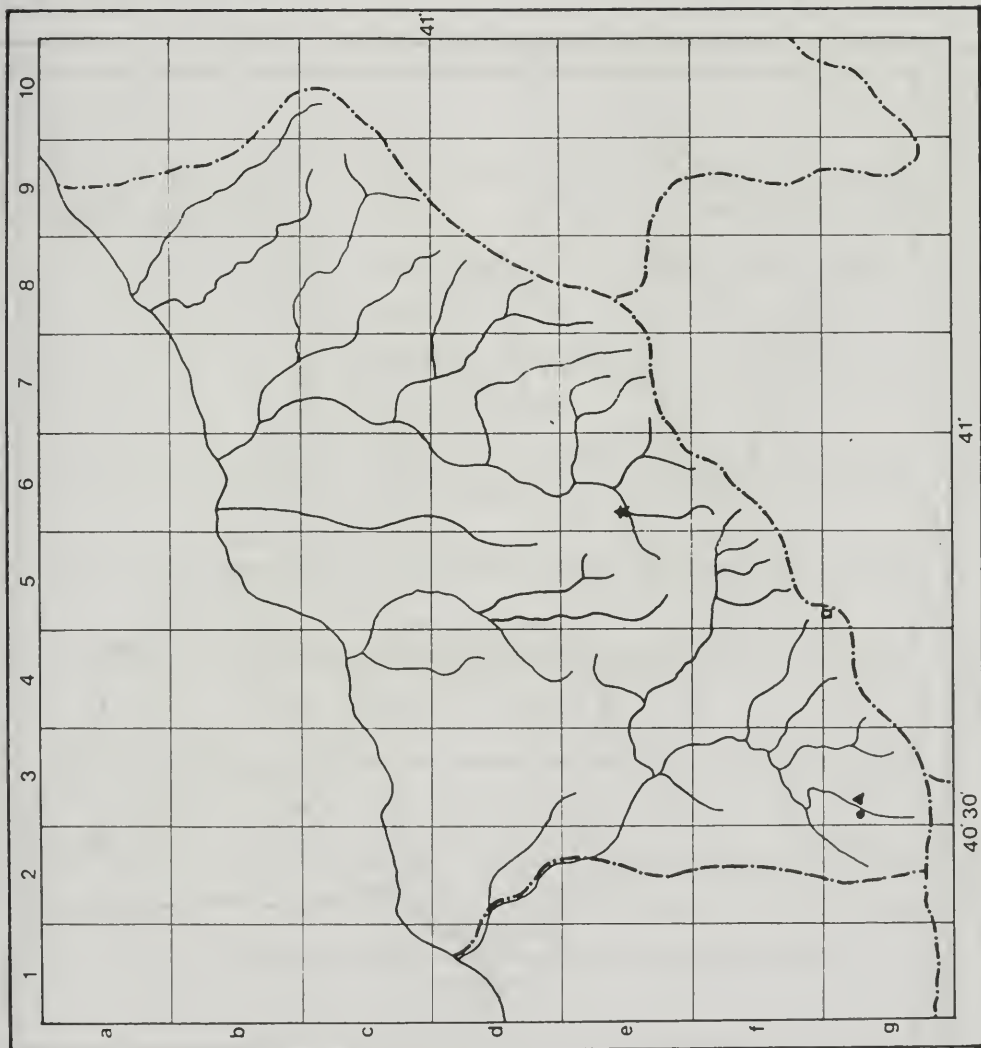
map 3

*A. caucasica* Buser ★

*A. erythropoda* Juzepczuka

*A. surculosa* Fröhner ▲

*A. plicatissima* Fröhner ●



map 4

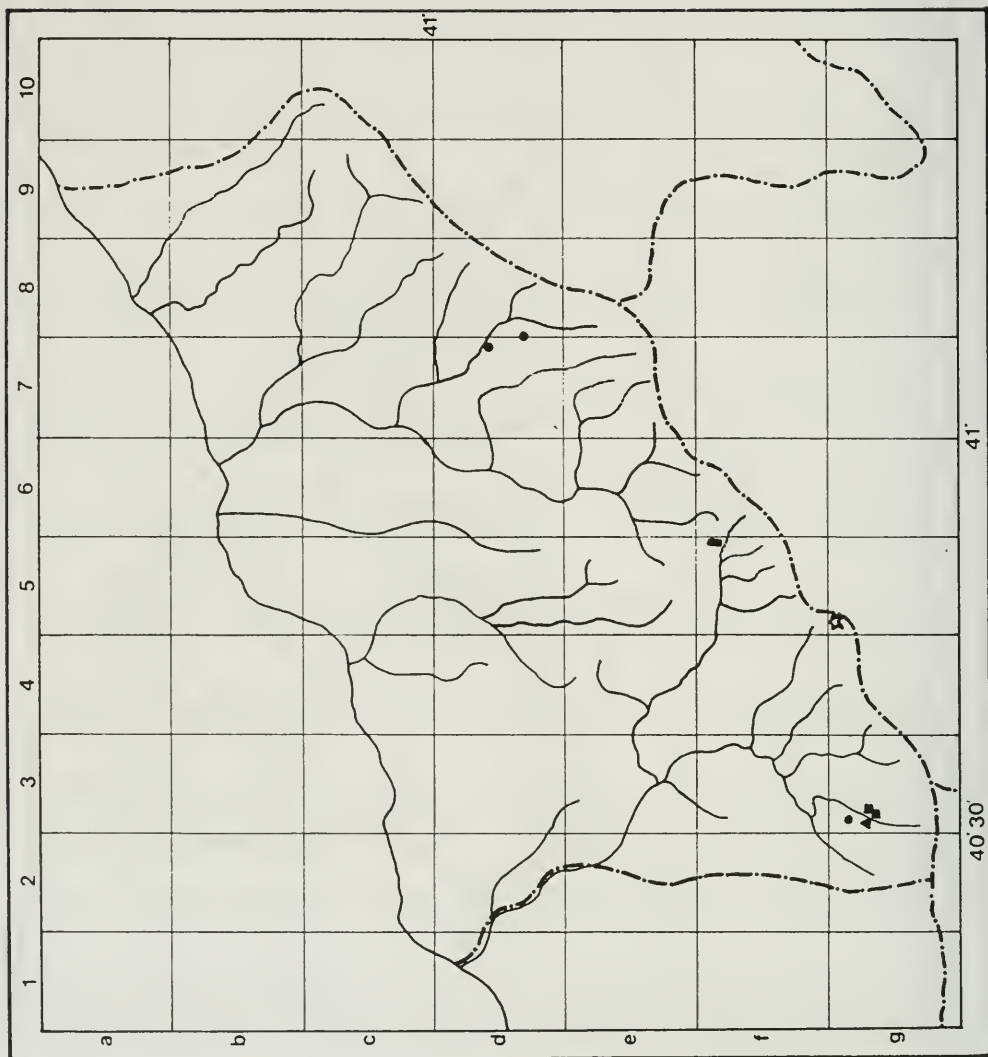
*A. valdehirsuta* Buser ■, □

*A. stevenii* Buser ▲, △

*A. compactilis* Juzepczuk ●, ○

*A. heterophylla* Rothmaler ▨, ▩

*A. pseudocartalinica* Juzepczuk ☆





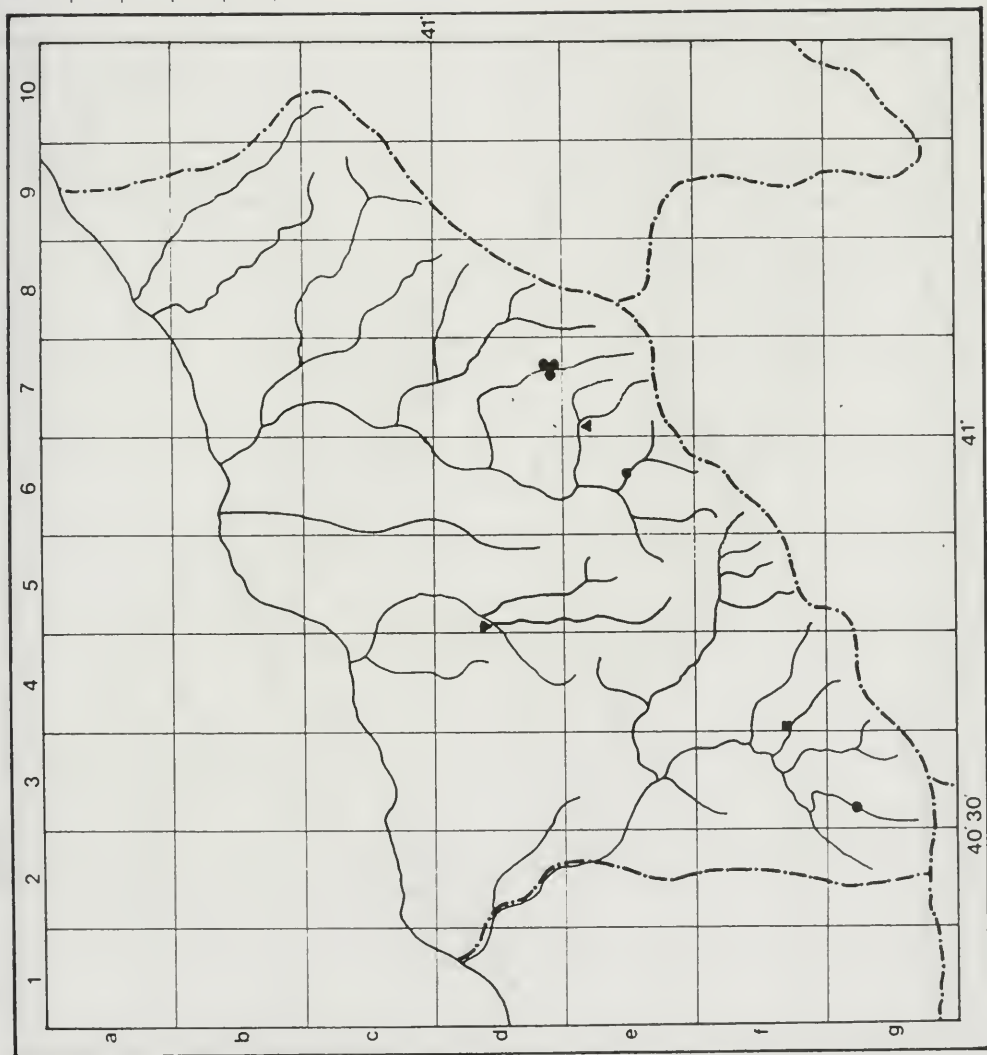
map 5

*A. ziganadagensis* B. Pawlowski ▲

*A. orduensis* B. Pawlowski ■

*A. hirtipedicellata* Juzepczuk ▼

*A. mollis* (Buser) Rothmaler ●



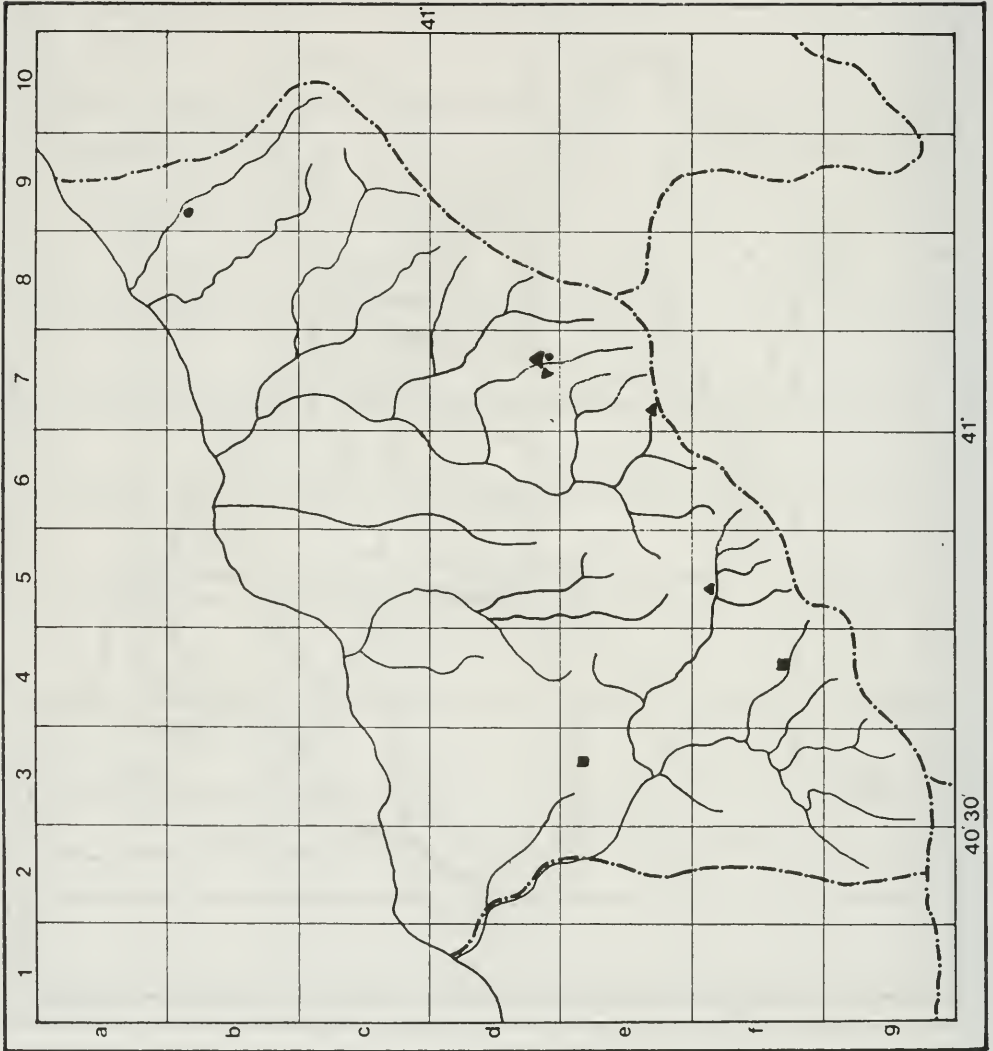
map 6

*A. amoena* (Czeczott) Rothmaler ■

*A. barbatiflora* Juzepczuk ▲

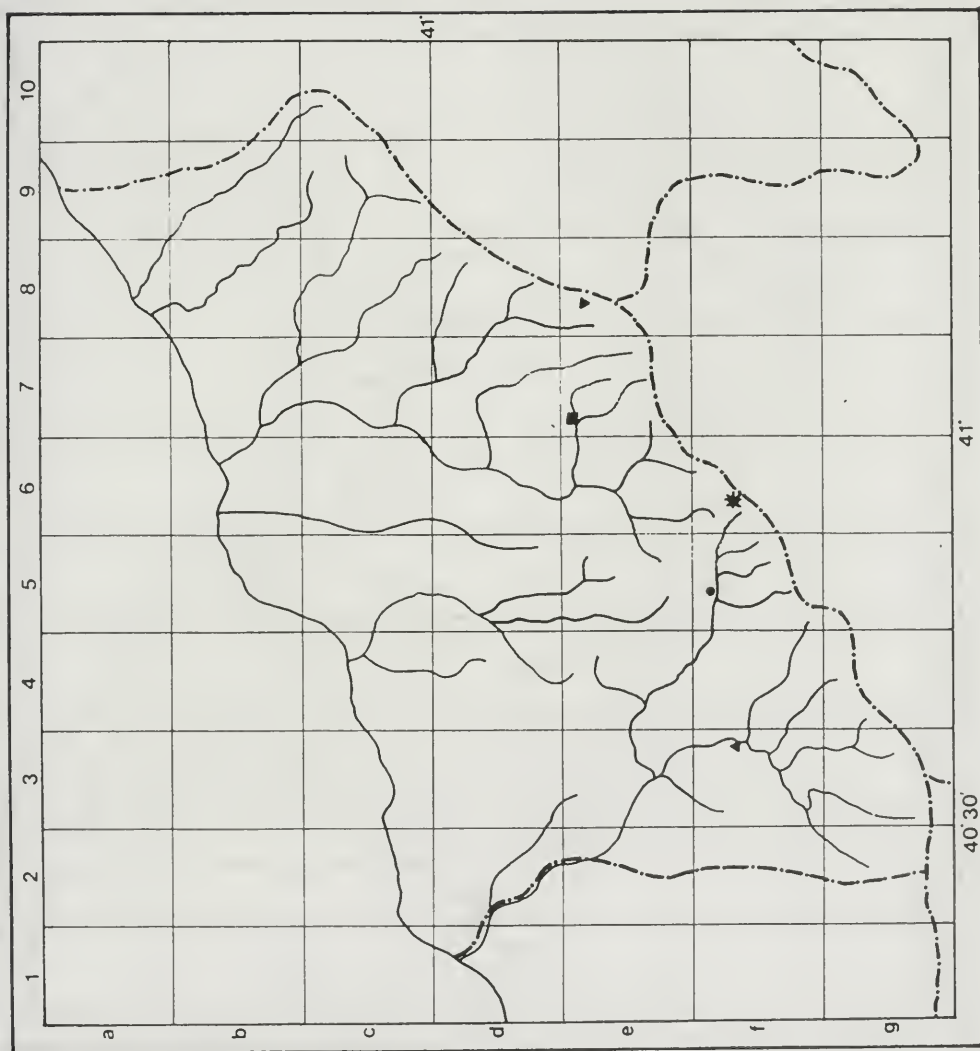
*A. ciminenis* B. Pawlowski ▼

*A. stricta* Rothmaler ●



map 7

- A.cimilensis Kalheber •
- A.kizdereensis Kalheber ▲
- A.elevitensis Kalheber ■
- A.kackarensis Kalheber ▼
- A.hemsinica Kalheber \*

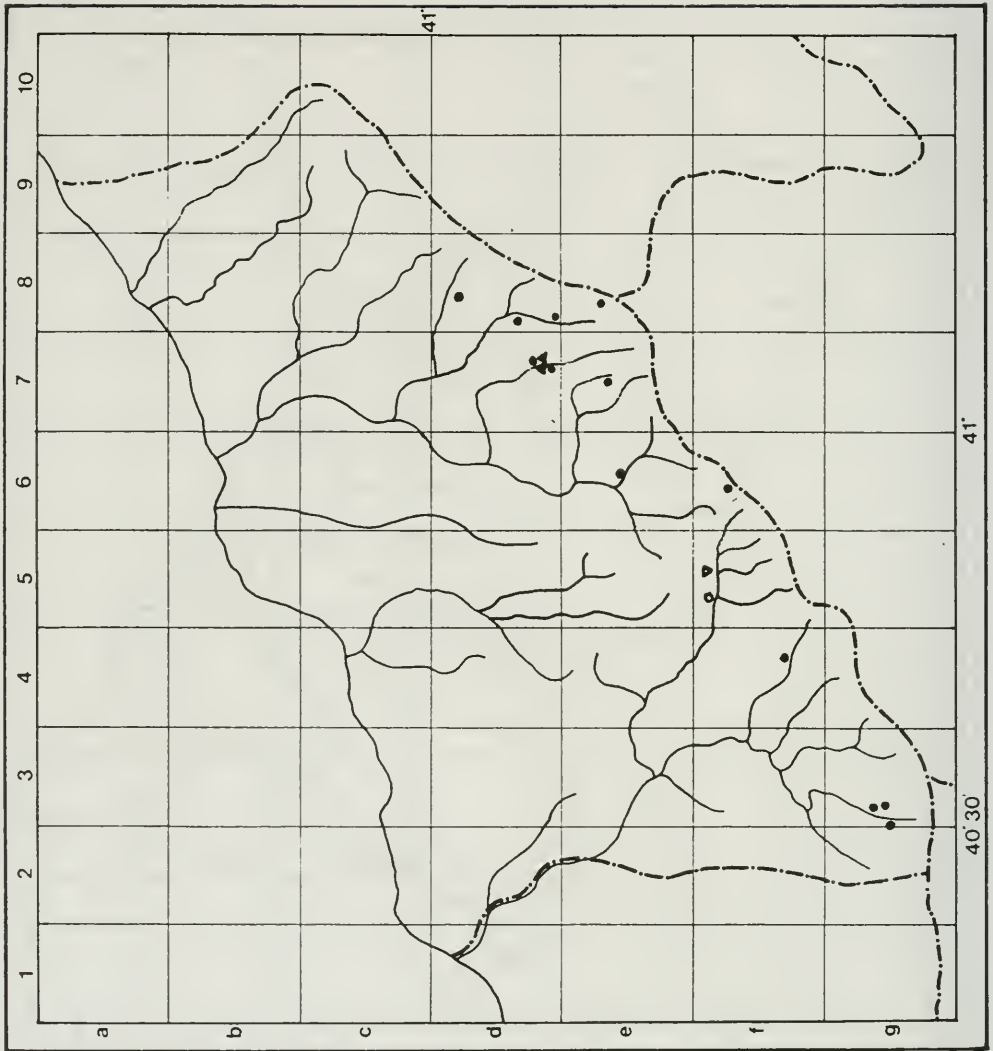


map 8

*A. procerrima* Fröhner ▲

*A. transcaucasica* Rothmaler ▼, ▽

*A. retinervis* Buser ●, ○



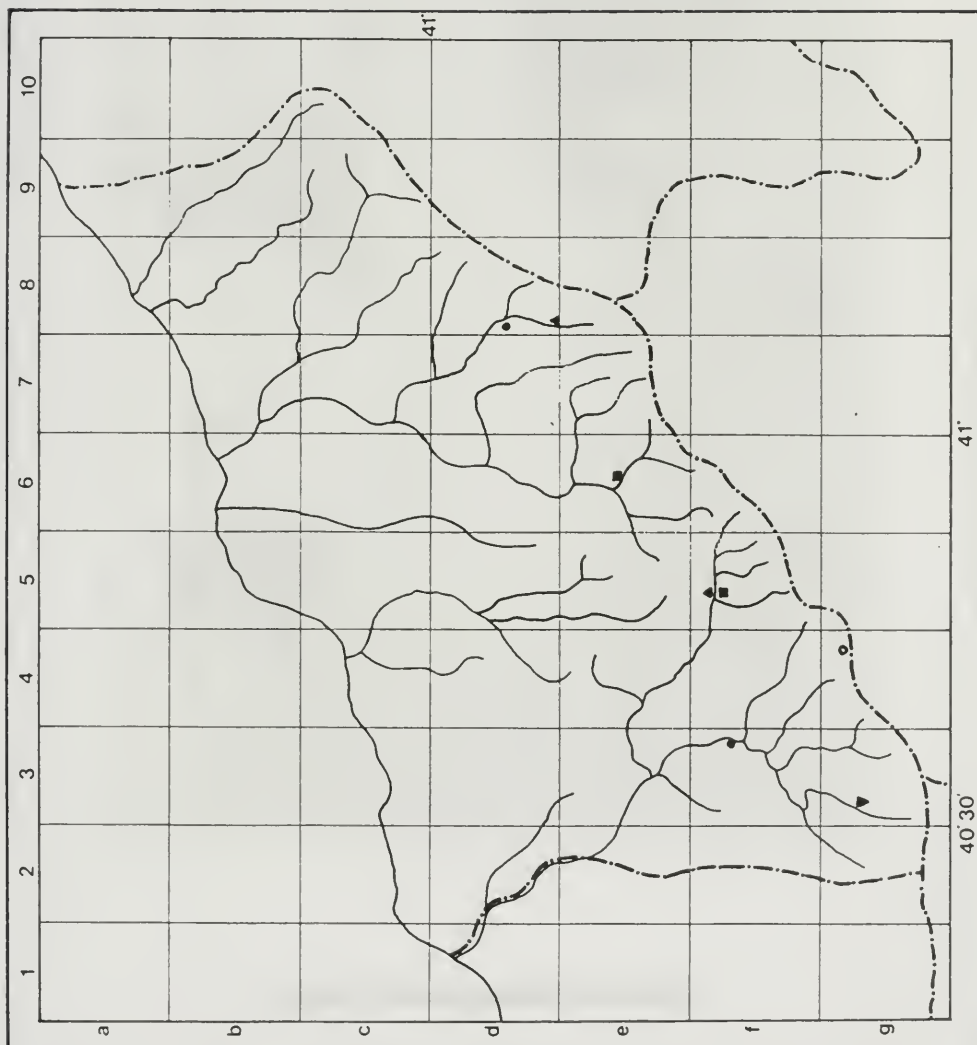
map 9

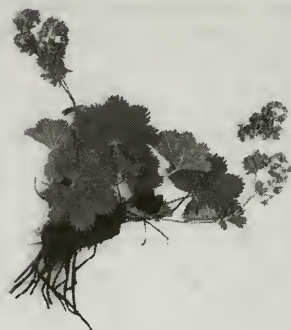
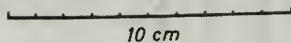
*A.ellenbergiana* Rothmaler ●,○

*A.dura* Buser ex Rothmaler ▲

*A.venosa* Juzepczuk ■

*A.ancerensis* Kalheber ▼





*Alchemilla ancerensis*  
KALHEBER n. sp.

det. H. KALHEBER 1987

no foto

FLORA TURCICA  
Herbarium Universitatis Maastrichtensis  
ANKA 8

Fam.: Rosaceae

Nom.: *Alchemilla stricta* Ledeb.

Loc.: AS Rise: İkinci, Ballıkköy (Antep), 2150 m. Çevirlik.  
19 vii 1984.

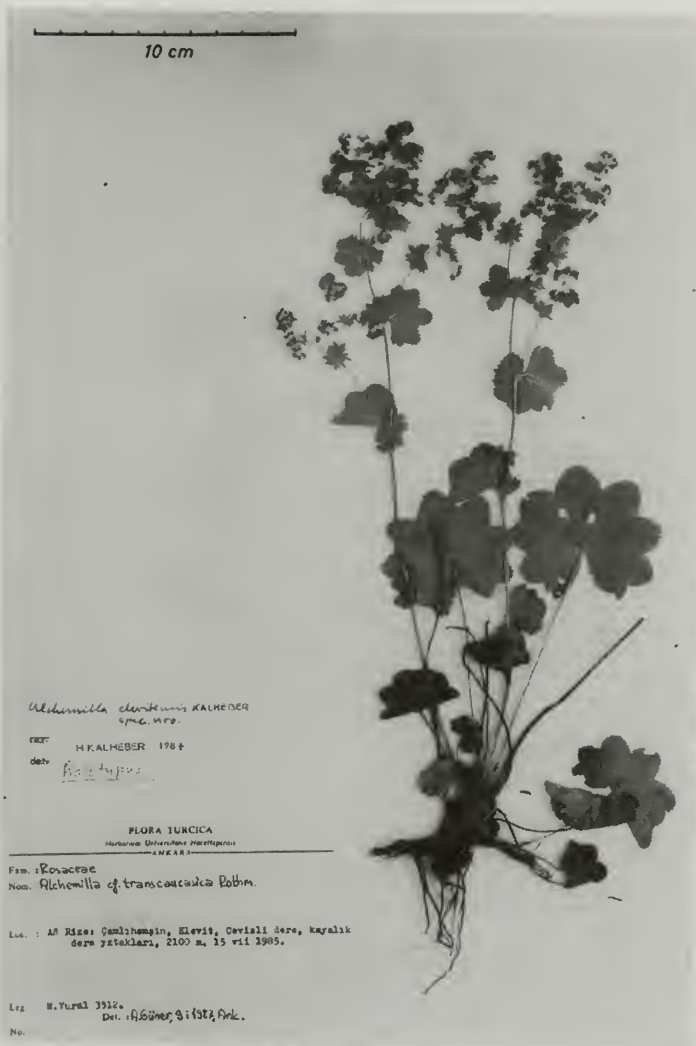
Leg.: M. Vural 3090.

Det.: G. Güner, 7: 1987, Bot.

No.:



*Alchemilla ancerensis* Kalheber, holotype



*Alchemilla elevitensis* Kalheber, holotype



*Alchemilla hemsinica* Kalheber, holotype



10 cm



*Alochemilla* *ikizdereensis* Kalheber  
no. 1984

Herb. ALPHEMILLAE  
1984

FLORA TURCA

Herbarium Turcicum, Istanbul

Fam. Rosaceae

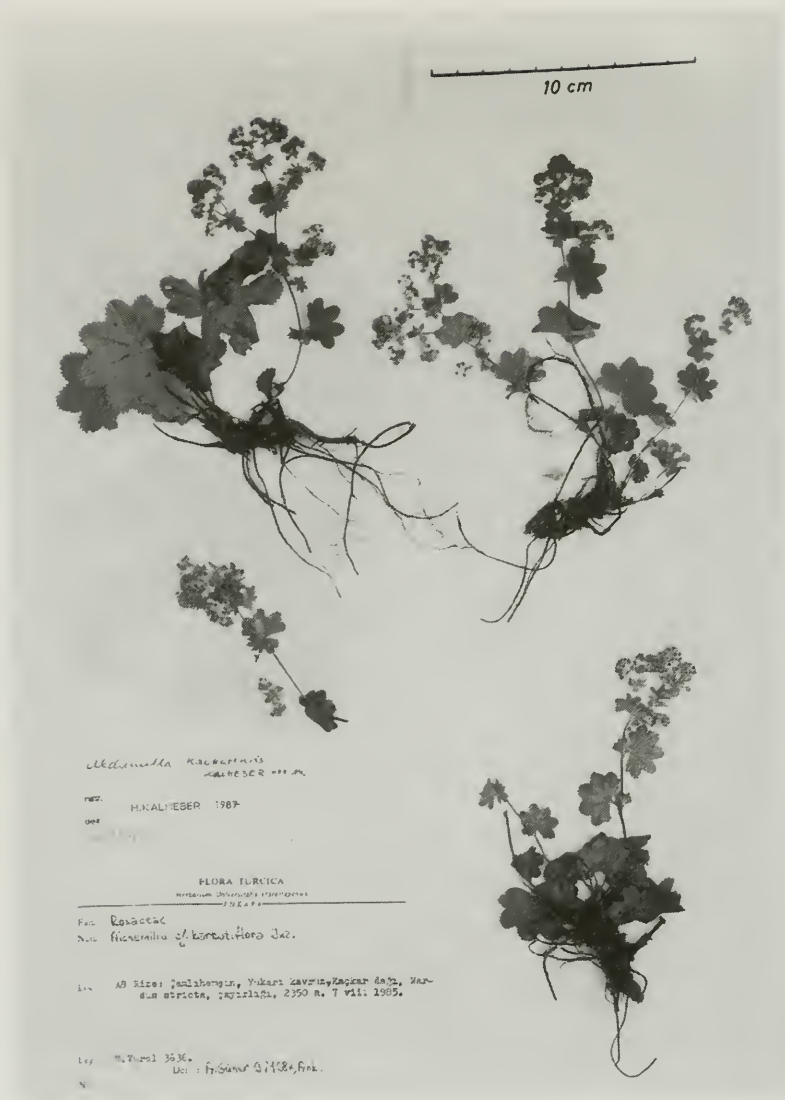
Nom. *Alochemilla* (L.) Link & DC.  
Syn. *galea* Boiss.

Loc. AD Rize: İkizdere, Dereköy-İzcalna köyü, dere kenarı.  
Çayrıt, 1000 m. 10 vii 1984.

Leg. H. Vural 3098.  
Det. E. S. S. 1984

No. 1

*Astragalus ikizdereensis* Kalheber, holotype



*Alchemilla kackarensis* Kalheber, holotype

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Zeitschrift/Journal: [Sendtnera = vorm. Mitt. Bot. Sammlung München](#)

Jahr/Year: 1994

Band/Volume: [2](#)

Autor(en)/Author(s): Kalheber Heinz

Artikel/Article: [The Genus Alchemilla L. \(Rosaceae\) in the Turkish Vilayet Rize \(Northeastern Anatolia\) with some remarks on the distribution of the genus in other parts of Northern Anatolia. 389-430](#)