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# SEED MORPHOLOGY OF SOME TAXA OF ASTERACEAE

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## ABSTRACT

Seed morphology of 136 species distributed in 68 genera have been described. Of these, seed morphology of 51 genera are described for the first time. Systematic keys based on seed morphology for the identification of genera have been provided.

## INTRODUCTION

The characteristics of the seeds, apart from differences in the development of an aril, have been little used in the classification of most seeds.

The orientation, colour, thickness and measurements which make up the morphometrics differ considerably from taxa to taxa. The differences in the shape and size apparently varied considerably between and within different taxa. (Gill and Omoigui, 1988; Gunn, 1972), so that rather few of the accumulated data bear directly on the problem of tribal and genetic relationship.

Martin and Burkley (1973) indicated that the ability to recognize seeds as an important diagnostic feature has become more essential in modern scientific agriculture, as without it, there will be little merit in perfecting methods of growing useful plant.

Many cereal grains, and the achenes of

the Asteraceae, besides the testa proper, have additional coats derived from reduced calyx. Sometimes those layers and the seed coat proper are so intimately associated that it becomes difficult to distinguish the individual layers. The coats of some seeds are expanded into wings while others bear tufts of hairs. In other cases, similar structures are derived from the fruit (e.g. the pappus of many Asteraceae). Information on the seed morphology of Asteraceae is not forthcoming, the only classical work are those of Martin and Burkley (1973) who gave the seed morphology of 35 genera. Corner (1976) described in general terms the seed anatomy and morphology of about 37 genera. Gill and Omoigui (1988) described achene morphology of 16 species from the tribe Heliantheae. Recently, Ayodele (1995) gave the achene morphology of the genus *Vernonia* from Nigeria.

To fill the gap in the knowledge of seed

morphology, the present study has been taken up and present the seed morphology of 136 species distributed in 61 genera of these only 16 genera were described by Martin and Burkley (1973).

## MATERIALS AND METHODS

Seeds of 136 taxa from 68 genera were obtained from Botanischen Garten and Botanischen museum, Berlin-Dahlem Koniginluise strasse, Germany. Voucher of the seeds examined are kept in the Botany Department of the University of Benin, Benin-City, Nigeria. The general terminology used for describing the seed morphology is that of Gunn and Barnes (1977), Martin and Burkley (1973) and Gill *et al.* (1993). Ten seeds were examined for each sample. Depending on the seed size, seeds were examined under stereoscope Usch and combdissecting microscope fitted with light or vernier callipers. The colour of seed was determined by comparing the seed colour with "Colour for specific Purpose" Anon. (1964). The seed outline was drawn with seed surface fitted in by examining the seed under a dissecting stereoscopic microscope and a magnifying lamp, each equipped with fluorescent light.

## RESULTS

In the present contribution, the results are presented in two parts, the first contain the study on seed morphometrics and secondly, illustration of line drawing. The taxonomic arrangement of the genera and taxa studied under this family is alphabetical.

## DISCUSSION

Comparative seed morphology

continue to be generally neglected by taxonomist. The lack of reliable seed morphological data has hindered the identification of isolated seeds and reduced their significance in the phylogenetic consideration of the taxa consign. Many floras do not highlight the taxonomic value of seed characteristics. Several workers who had earlier contributed to the morphological features of seeds in this family include Singh (1964), Sehgal (1966), Dittrich (1968) and Vaughan (1970). They described them as small, enclosed in the achene, with thin papery seed coat. Corner (1976), noted that most botanists are satisfied with the external fetures of the achene and a few have enquired into the development of the embryo and ovule. Little attention has been given to the seed coat since the time of Kuhn (1927). It is clear, nevertheless, the seed coat has not completely deteriorated in the achene but has retained the exotesta palisade. However, in the present work, the testa surface is classified as smooth (*Aster*), puckered (*Senecio*) and rarely wrinkled (*Chaptalia*); glossy (*Crepis*) to dull (*Tanacetum*), coarsely ridged with pappus and seed colour often brown, light, grey and yellow. The seed shape varies from oblong to obovate, cylindrical, ellipsoidal and lanceolate. Other features of the seeds are winged as exemplified in *Coreopsis lanceolata* and hairs e.g. in *Conyza bonariensis* and *Aster tripolium*. Seed size ranges from 1.2 mm in *Pulicaria dystenterica* to 27 mm in *Tragopogon tommasinii*. Before now, Corner (1976) gave general features in this family, Gill and Omoigui (1988) gave features of 16 species from Heliantheae. Of the presently investigated 68 genera, 17 were already described by Martin and Burkley (1973). Of

the remaining 51 genera, 13 were tropical, 23 temperate and 15 cosmopolitan in distribution.

From taxonomic point of view, the morphology of seeds is of great value and the seed characteristics, support the concept of use in better understanding of the systematic of these taxa. The science of seed identification has become increasingly important in modern scientific agriculture and without it, there would be little use in perfecting the methods of cultivating useful plants. Over the years the knowledge of seed characteristics has been used to meet the needs for correct labelling of seeds in commercial channels to detect the adulteration, potential toxic plant materials and to assure consumer of high quality seeds.

#### *Achillea* L.

***Achillea abrotanoides*** (Vis.) Vis. (Fig. 1) (DPS 0325)

Seed puckered, glossy, dichromatic cream on brown, flat oblong, truncate at the top and narrowed to a rounded base, pappus none. Size range 2 mm x 0.5 mm x 0.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim aril. Lens not apparent. Size 0.09 mm x 0.1 mm. Micropylar pit not apparent.

***Achillea ageratum*** L. (Fig. 2) (DPS 0327)

Seed smooth, glossy-dull, monochromatic dark brown, flat - oblong, thin margins whitish and the body dark, no pappus, truncate at the top and narrowed to a rounded base. Size range 2 mm x 1 mm x 1 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size 0.1 mm x 0.1 mm. Micropylar pit not apparent.

***Achillea coarctata*** Poiret (Fig. 3) (DPS 0328)

Seed smooth, dull, monochromatic brown, flat oblong-obovate, truncate at the top and narrowed to a rounded base, the thin margins

whitish on the dark body, no pappus. Size range 1.2 mm x 0.2 mm x 0.2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim aril. Lens not apparent. Size 0.03 mm x 0.02 mm. Micropylar pit not apparent.

***Achillea crithmifolia*** Waldst. & Kit. (Fig. 4) (DPS 0330)

Seed smooth, dull, monochromatic brown, flat obovate - oblong, the thin margins whitish on the brown body, truncate at the top and narrowed to a rounded base. Size range 1 mm x 0.2 mm x 0.2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size 0.03 mm x 0.03 mm. Micropylar pit not apparent.

***Achillea grandifolia*** Friv. (Fig. 5) (DPS 0332)

Seed puckered, dull, monochromatic brown, flat oblong - obovate, margins forms thick whitish surface on the brown body, truncate at the top also narrowed a rounded base, no pappus. Size range 2 mm x 0.3 mm x 0.3 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim- aril. Lens not apparent. Size 0.08 mm x 0.07 mm. Micropylar pit not apparent.

***Achillea millefolium*** L. (Fig. 6) (DPS 0334)

Seed smooth, glossy, dull, monochromatic brown, covered with thick whitish thin margins, flat oblong, no pappus, truncate at the top narrowed to a rounded base. Size range 2 mm x 0.5 mm x 0.2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size 0.07 mm x 0.08 mm. Micropylar pit not apparent.

***Achillea ptarmica*** L. (Fig. 7) (DPS 0335)

Seed smooth, dull, monochromatic brown, flat obovate - oblong, truncate at the top and narrowed to a rounded base, no pappus, thin margins dense white on the brown body. Size range 2 mm x 1.5 mm x 1.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size 0.1 mm x 0.09 mm. Micropylar pit not apparent.

**Achillea teretifolia** Willd. (Fig. 8) (DPS 0336)

Seed puckered, dull, monochromatic brown, thin margins whitish on the brown body, flat oblong, truncate at the top and narrowed a rounded base, no pappus. Size range 1.9 mm x 0.9 mm x 0.9 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size 0.09 mm x 0.08 mm. Micropylar pit not apparent.

**Ageratum** L.

**Ageratum conyzoides** L. (Fig. 9) (DPS 214)

Seed smooth, dull, monochromatic dark brown body small, oblong - cylindric to compressed oblong - elliptic arid with a tapering base, hairy, pappus 5-6 branch out, white plumose bristles, pubescence on body surface. Size range 3-3.5 mm x 1.1 mm x 1.2 mm. Halos not apparent but present. Hilum flush ovate to ellipsoidal, white due to scant funicular overlay, funicular margin and lotoid split absent. Lens not apparent. Micropylar pit not apparent.

**Ageratum houstonianum** Miller (Fig. 10) (DPS 0337)

Seed puckered, dull, monochromatic dark light, oblong, coarsely ridged, narrowed towards base, no pappus scales, the hairs short - plumose with fine secondary hair. Size range 3 mm x 0.5 mm x 0.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Anaphalis** DC.

**Anaphalis triplinervis** Sims ex. C.B. Clarke (Fig. 11) (DPS 0338)

Seed smooth, dull, monochromatic brown, oblong-cylindric, pappus is a ring of white minutely plumose bristles, pubescence sparsely short hair over the surface. Size range 1 mm x 0.3 mm x 0.3 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Antennaria** Gaertner

**Antennaria alpina** (L.) Gaertner (Fig. 12) (DPS 0340)

Seed smooth, dull, monochromatic brown, oblong, no visible lengthwise ridges or line surface mottled with bristle, short hair. Size range 1.2 mm x 0.3 mm x 0.3 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size 0.04 mm x 0.06 mm. Micropylar pit not apparent.

**Anthemis** L.

**Anthemis australis** R.R. Fernandes (Fig. 13) (DPS 0344)

Seed smooth, glossy, monochromatic brown, oblong - elliptic, four angled, crown cup shaped with about eight lengthwise knobby ridges, rounded top. Size range 2 mm x 0.5 mm x 0.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Anthemis macedonica** Boiss. & Orph. (Fig. 14) (DPS 0342)

Seed puckered, dull, monochromatic dirty white, oblong-cylindric, rounded top, visible lengthwise ridges, rough surface. Size range 2.5-3 mm x 0.9 mm x 1 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Anthemis pallida** DC. (Fig. 15) (DPS 0345)

Seed smooth, glossy, monochromatic reddish brown, obovate elliptic, upper part, cup-shaped, visible lengthwise ridges, rounded top. Size range 3 mm x 1.3 mm x 1.3 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Anthemis tinctoria** L. (Fig. 16) (DPS 0343)

Seed smooth, dull, monochromatic brown oblong to slightly ellipsoidal, four sided, crowned by a cap with several lengthwise, knobby ridges



Fig. 1. *Achillea abrotanoides* (Vis.) Vis.



Fig. 2. *Achillea ageratum* L.



Fig. 3. *Achillea coarctata* Poiret



Fig. 4. *Achillea crithmifolia* Waldst. and Kit.



Fig. 5. *Achillea grandifolia* Friv.



Fig. 6. *Achillea millefolium* L.



Fig. 7. *Achillea ptarmica* L.



Fig. 8. *Achillea teretifolia* Willd.



Fig. 9. *Ageratum conyzoides* L.



Fig. 10. *Ageratum houstonianum* Miller



Fig. 11. *Anaphalis triplinervis* Sims  
ex C.B. Clarke



Fig. 12. *Antennaria alpina* (L.) Gaertner



Fig. 13. *Anthemis australis* R.R. Fernandes



Fig. 14. *Anthemis macedonica* Boiss and Orph.



Fig. 15. *Anthemis pallida* DC.



Fig. 16. *Anthemis tinctoria* L.



Fig. 17. *Anthemis triumfetti* (DC.) All.



Fig. 18. *Arctium lappa* L.

and has a rounded top. Size range 3 mm x 1 mm x 0.9 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Anthemis triumfetti** (L.) DC. (Fig. 17) (DPS 0346)

Seed smooth, dull, monochromatic brown, oblong-cylindric, rounded top, visible lengthwise ridges, cup shaped. Size range 2.5 mm x 1.1 mm x 0.9 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Arctium L.**

**Arctium lappa** L. (Fig. 18) (DPS 0347)

Seed puckered, dull, monochromatic brown, streaked, compressed, oblong, truncate at top slightly narrowed towards base, arched side ways with one edge straight, or concave and the other convex, surface marked by lengthwise lines. Size range 6-7 mm x 2.3 mm x 1.2 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay rim-aril absent. Size range 0.3 mm x 0.4 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Arctium minus** Bernh. (Fig. 19) (DPS 0348)

Seed puckered, dull, dichromatic cream on dark light, mottled, oblong, compressed truncate at top, narrowed towards base, marked by lengthwise lines, arched sideways with one edge straight or concave and the other convex. Size range 6-7 mm x 3 mm x 1.2 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.4 mm x 0.3 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Arctium nemorosum** Lej. (Fig. 20) (DPS 0349)

Seed wrinkled, dull, monochromatic dark brown, mottled, black, oblong, compressed truncate at top, narrowed towards base, marked by lengthwise lines, arched sideways with one edge straight or concave and the other convex. Size range 7 - 7.5 mm x 3 mm x 1.5 mm. Halos

not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.4 mm x 0.3 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Arctotis L.**

**Arctotis venusta** Norlindh (Fig. 21) (DPS 0351)

Seed puckered, dull, monochromatic dark brown, compressed oblong- elliptic, pappus is a ring of white plumose bristles, present also at the base, no ridge or surface line, surface densely hairy. Size range 3.5-4 mm x 1.5 mm x 1.5 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.1 mm x 0.2 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Artemisia L.**

**Artemisia pedemontana** Balbis. ex Loisel. (Fig. 22) (DPS 0353)

Seed puckered, dull, monochromatic brown, oblong-elliptic, narrowed towards the base, surface marked by lengthwise line. Creamy crown, size range 2.2 mm x 1.3 mm x 0.8 mm. Halos apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Aster L.**

**Aster alpinus** L. (Fig. 23) (DPS 0355)

Seed smooth, dull, monochromatic brown, compressed, oblong cylindric, hairy pappus is a ring of white minutely plumose bristles which are wavy near the base, lengthwise ridges, delicate pappus on a smaller body. Size range 4 - 4.5 mm x 2 mm x 1 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.09 mm x 0.08 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Aster amellus** L. (Fig. 24) (DPS 0356)

Seed smooth, dull, monochromatic brown, compressed oblong - cylindric, lengthwise ridge not obvious short pubescence on surface, pappus is a ring of white minutely plumose bristles. Size range 4-5 mm x 1.5 mm x 0.5 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 1 mm x 0.8 mm. Lens not apparent. Micropylar pit not apparent.

**Aster cordifolius** L. (Fig. 25) (DPS 0357)

Seed smooth, glossy-dull, monochromatic brown, oblong - cylindric, tapering base pappus is a ring of white minutely plumose bristles, wavy near their base, lengthwise ridge surface. Size range 2.5 - 3 mm x 0.5 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.06 mm x 0.07 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Aster foliaceus** Lindley (Fig. 26) (DPS 0358)

Seed smooth, dull-glossy, monochromatic brown, compressed oblong-cylindric, lengthwise ridge present on surface, no pubescence on surface, pappus is a ring of white minutely plumose bristles. Size range 4 mm x 1.2 mm x 0.8 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size 0.9 mm x 1.2 mm. Micropylar pit not apparent.

**Aster pyrenaicus** Desf. ex DC. (Fig. 27) (DPS 0359)

Seed puckered, dull, monochromatic brown, oblong - cylindric, no lengthwise ridge on surface, tapering base, pappus is a ring of white minutely plumose bristles, wavy near the base. Size range 5 mm x 2.1 mm x 1.9 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.3 mm x 0.4 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Aster tripolium** L. (Fig. 28) (DPS 0360)

Seed smooth, dull - glossy, monochromatic straw - color to light brown, cylindric - oblong, pubescence on surface, no lengthwise ridge,

tapering base, pappus form a ring of white minutely plumose bristles, wavy near the base. Size range 6 mm x 1.3 mm x 1.3 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.8 mm x 0.7 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Asteriscus** Miller

**Asteriscus sericeus** DC. (Fig. 29) (DPS 0361)

Seed puckered, dull, monochromatic brown, obconic to obovate, and several sided. Crowned with semitransparent broad tapering pappus scales tipped by awns. Scant pubescence on surface. Size range 3 mm x 1 mm x 1 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.2 mm x 0.2 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Bidens** L.

**Bidens cernua** L. (Fig. 30) (DPS 0363)

Seed puckered, dull, monochromatic brown, flat oblong to flat oblanceolate. 4 awns, which are barbed, extending upwards from the top, barbs present on margins. Size range without awns 7-8 mm x 2 mm x 1 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong- ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Bidens leucanthus** (L.) Willd. (Fig. 31) (DPS 0365)

Seed puckered, dull, monochromatic dark light with brownish ends, linear and several sided to flat oblanceolate, four awns barbed present, extend upward from the top, barbs are present on the surface along the margin. Size range 20 mm x 0.5 mm x 0.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong- ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.



**Bidens pilosa** L. (Fig. 32) (DPS 215)

Seed smooth, dull, monochromatic brown - black, linear and several sided to flat oblanceolate, 2-4 awns which are generally barbed, extended upwards from the top. Size range without awns 8- 9 mm x 1.2 mm x 1.5 mm. Halos not apparent but present. Hilum flush, ovate to ellipsoidal, white due to scant funicular overlay, funicular margin and lotoid split absent. Lens not apparent. Micropylar pit not apparent.

**Carduus** L.

**Carduus crispus** L. (Fig. 33) (DPS 0369)

Seed smooth, glossy, monochromatic gray to brown, compressed oblong- lanceolate, top cup shaped, tilted slightly side ways and enclosing a large knoblike style base, pappus deciduous. Size range 4 mm x 1.5 mm x 1 mm. Halos, funicular margin absent. Hilum bulgy, obovate-ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.5 mm x 0.3 mm. Lens not apparent. Size range not applicable. Micropylar pit not apparent.

**Carduus nutans** L. (Fig. 34) (DPS 0370)

Seed smooth, glossy, monochromatic grey, compressed lanceolate - oblong, tilted slightly sideways with top cup shaped, large knoblike style base present, pappus deciduous. Size range 4.2 mm x 2 mm x 1 mm. Halos, funicular margin absent. Hilum bulgy, obovate - ellipsoidal, brown due to scant funicular overlay, rim- aril, lotoid split absent. Size range 0.6 mm x 0.55 mm. Lens not apparent. Size range not applicable. Micropylar pit not apparent.

**Carduus tmoleus** Boiss. (Fig. 35) (DPS 0371)

Seed smooth, glossy, monochromatic grey to brown, compressed oblong - lanceolate tilted slightly sideways and enclosing a knoblike style base top is cup shaped, pappus is deciduous. Size range 4 mm x 1.3 mm x 0.9 mm. Halos, funicular margin absent. Hilum bulgy, obovate-ellipsoidal, brown due to scant funicular overlay, rin-aril, lotoid split absent. Size range not applicable. Micropylar pit not apparent.

**Carlina** L.

**Carlina vulgaris** L. (Fig. 36) (DPS 0373)

Seed puckered, glossy, monochromatic grey to brown, oblong cylindric to compressed oblong - elliptic, pappus is a ring of white minutely plumose bristles, tapering base and hairy. Size range 5 mm x 1 mm x 1 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split, and rim- aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Catananche** L.

**Catananche caerulea** L. (Fig. 37) (DPS 0374)

Seed puckered, glossy, monochromatic dark brown, oblong, 4-5 sides, tapering towards base, pappus of delicate, stiff brown hairs, which are plumose. Size range 6 mm x 1.8 mm x 1.9 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split, and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Centaurea** L.

**Centaurea jacea** L. (Fig. 38) (DPS 0376)

Seed smooth, glossy, monochromatic grey - stray color, oblong, compressed, truncate at top, narrowed towards base, arched sideways, surface marked by lengthwise lines, no pappus. Size range 3mm x 1.5 mm x 1 mm. Halos, funicular margin absent. Hilum bulgy, obovate-ellipsoidal, brown due to funicular overlay, rim-aril, lotoid split absent. Size range 0.5 mm x 0.4 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Centaurea ornata** Willd. (Fig. 39) (DPS 0377)

Seed smooth, glossy, monochromatic grey, compressed - cylindric, elliptic - obovate, top truncate, base narrowed and notched like a hook, pappus white to tawny, persistent, compressed of stiff, bristle - like scales, making the seed look like a shaving brush. Size range 6 mm x 1.5 mm x 3 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split, and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.



Fig. 19. *Arctium minus* Bernh.



Fig. 20. *Arctium nemorosum* Lej.



Fig. 21. *Arctotis venusta* Norlindh



Fig. 22. *Artemisia pedemontana* Balbis  
ex Loisel.



Fig. 23. *Aster alpinus* L.



Fig. 24. *Aster amellus* L.



Fig. 25. *Aster cordifolius* L.



Fig. 26. *Aster foliaceus* Lindley



Fig. 27. *Aster pyrenaicus* Desf. ex DC.



Fig. 28. *Aster tripolium* L.



Fig. 29. *Asteriscus sericeus* DC.



Fig. 30. *Bidens cernua* L.



Fig. 31. *Bidens leucanthus* (L) Willd.



Fig. 32. *Bidens pilosa* L.



Fig. 33. *Carduus crispus* L.



Fig. 34. *Carduus nutans* L.



Fig. 35. *Carduus timoleus* Boiss.



Fig. 36. *Carlina vulgaris* L.

**Centaurea salonitana** Vis. (Fig. 40) (DPS 0379)

Seed smooth, glossy, monochromatic grey, compressed - cylindric, top truncate, base narrowed and notched like a hook, pappus light brown to tawny, compressed of stiff, bristle like scales, like a shaving brush. Size range 5 mm x 2 mm x 0.4 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split, and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Chamomilla** S.F. Gray

**Chamomilla suaveolens** (Pursh) Rydb. (Fig. 41) (DPS 0381)

Seed smooth, dull-glossy, monochromatic brown, with tin margins whitish, making surface whitish compressed - oblong, truncate at the top and narrowed to a rounded base. Size range 1.5 mm x 0.5 x 0.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split, and rim-aril. Lens not apparent. Size 0.06 mm x 0.08 mm. Micropylar pit not apparent.

**Chaptalia** Ventenat

**Chaptalia arechavaletai** Arechav. (Fig. 42) (DPS 0382)

Seed wrinkled, dull, monochromatic brown, flat, elliptic to lanceolate pointed at both ends, obscured to visible lengthwise ridges, pappus delicate, deciduous. Size range 7 mm x 2 mm x 1.1 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split, and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Chondrilla** L.

**Chondrilla juncea** L. (Fig. 43) (DPS 0383)

Seed smooth, dull, monochromatic light brown, oblong, lanceolate, arched sideways, with fine lengthwise ridges lower part break into step like arrangement. Size range 4-5 mm x 1.5 mm x 1.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split, and rim-aril. Lens not apparent.

Size not applicable. Micropylar pit not apparent.

**Chromolaena** L.

**Chromolaena odorata** (L.) R.M. King and Robinson (Fig. 44) (DPS 216)

Seed puckered, dull, monochromatic dark light, oblong, 4-5 sided tapering towards base, white-tipped pappus of delicate, stiff light brown hairs, which are minutely plumose sharp hook like hair present on surface. Size range 4-5 mm x 1.3 mm x 1.3 mm. Halos not apparent but present. Hilum flush, ovate - ellipsoidal, white due to scant funicular overlay, funicular margin and lotoid split absent. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Chrysanthemum** L.

**Chrysanthemum coronarium** L. (Fig. 45) (DPS 0384)

Seed smooth, dull, monochromatic brown alternating lighter colour ridges, cylindric with numerous lengthwise ridges, cup shaped at the top and truncated with prominent, knoblike style base and body stripted with light - coloured ridges alternating with dark line. Slightly winged. Size range 3 mm x 2.3 mm x 1.2 mm. Halos, funicular overlay, rim-aril, lotoid split absent. Size range not applicable. Micropylar pit not apparent.

**Chrysanthemum segetum** L. (Fig. 46) (DPS 0385)

Seed puckered, dull, monochromatic brown, oblong-cylindric with several lengthwise ridges, truncate at the top, having a prominent knoblike style base. Size range 4-5 mm x 2 mm x 2 mm. Halos, funicular margin absent. Hilum bulgy, obovate-ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.5 mm x 0.4 mm. Lens not apparent. Size range not applicable. Micropylar pit not apparent.

**Chrysopsis** (Nuttall) S. Elliott

**Chrysopsis villosa** (Pursh) Nutt. (Fig. 47) (DPS 0386)

Seed puckered; dull, monochromatic brown, flat, ovate to elliptic - oblong, hairy,

pappus double, hair of inner ring brownish, stiff, minutely plumose, outer ring composed of short, hair like scales, lengthwise line present. Size range 3-3.5 mm x 0.4 mm x 1.2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split, and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Cirsium** Miller

**Cirsium arvense** (L.) Scop. (Fig. 48) (DPS 0390)

Seed smooth, glossy, monochromatic dark brown, compressed, lanceolate - oblong, top cup shaped, tilted slightly sideways, body narrow to a rounded base and marked by obscure lengthwise lines. Size range 2.5 mm x 0.9 mm x 1.2 mm. Halos, funicular margin absent. Hilum bulgy, obovate - ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.3 mm x 0.3 mm. Lens not apparent. Size range not applicable. Micropylar pit not apparent.

**Cirsium candelabrum** Griseb. (Fig. 49) (DPS 0392)

Seed smooth, glossy, monochromatic gray, compressed lanceolate to oblong, cup shaped top tilted slightly sideways, body narrowed to base that is rounded marked by obscured lengthwise lines, pappus present, plumose, bristles uniting at the base. Size range 5 mm x 0.8 mm x 1.3 mm. Halos, funicular margin absent. Hilum bulgy, obovate - ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range not applicable. Micropylar pit not apparent.

**Cirsium flavispina** Boiss. ex DC. (Fig. 50) (DPS 0394)

Seed smooth, glossy, monochromatic brown - gray, compressed lanceolate-oblong, top cup shaped tilted slightly sideways, narrowed to a rounded base and marked by obscured lengthwise lines, pappus composed of many long, plumose bristles which are united at the base into a readily detached ring. Size range 4 mm x 0.9 mm x 2.5 mm. Halos, funicular margin absent. Hilum bulgy, obovate-ellipsoidal, brown due to the scant funicular overlay, rim-aril,

lotoid split absent. Size range not applicable. Micropylar pit not apparent.

**Cirsium monspessulanum** (L.) Hill (Fig. 51) (DPS 0395)

Seed smooth, glossy, monochromatic light-grey, lanceolate-oblong, compressed, cup shaped top tilted slightly sideways, narrow body to a rounded base and marked by obscured lengthwise lines, pappus compressed of many long, plumose bristles which are united at the base into a readily detached ring. Size range 4 mm x 1.3 mm x 1.5 mm. Halos, funicular margin absent. Hilum bulgy, obovate-ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.5 mm x 0.4 mm. Lens not apparent. Size range not applicable. Micropylar pit not apparent.

**Cirsium palustre** (L.) Scop. (Fig. 52) (DPS 0396)

Seed smooth, glossy, monochromatic grey, lanceolate-oblong compressed, cup shaped, tilted slightly sideways, body narrow to a rounded base and marked by obscured lengthwise lines, pappus has many long, plumose bristles that united at the base. Size range 3.9 mm x 1.1 mm x 1.3 mm. Halos, funicular margin absent. Hilum bulgy, obovate-ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.6 mm x 0.5 mm. Lens not apparent. Size range not applicable. Micropylar pit not apparent.

**Cirsium trachylepis** Boiss. (Fig. 53) (DPS 0397)

Seed smooth, glossy, monochromatic grey to dark brown, compressed lanceolate - oblong cup top, tilted slightly sideways, pappus compressed of many long, plumose bristles which are united at the base into a readily detached ring, narrowed to a rounded base and marked by obscure lengthwise line. Size range 6-7 mm x 1 mm x 2.1 mm. Halos, funicular margin absent. Hilum bulgy, obovate-ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.6 mm x 0.4 mm. Lens not apparent. Size range not applicable. Micropylar pit not apparent.

**Cirsium vulgare** (Savi) Ten. (Fig. 54) (DPS 0399)



Fig. 37. *Catananche caerulea* L.



Fig. 38. *Centaurea jacea* L.



Fig. 39. *Centaurea ornata* Willd.



Fig. 40. *Centaurea salonitana* Vis.



Fig. 41. *Chamomilla suaveolens* (Pursh) Rydb.



Fig. 42. *Chaptalia arechavaletai* Arehav



Fig. 43. *Chondrilla juncea* L.



Fig. 44. *Chromolaena odorata* (L.) R.M. King and Robinson



Fig. 45. *Chrysanthemum coronarium* L.



Fig. 46. *Chrysanthemum segetum* L.



Fig. 47. *Chrysopsis villosa* (Pursh) Nutt.



Fig. 48. *Cirsium arvense* (L) Scop.



Fig. 49. *Cirsium candelabrum* Griseb.



Fig. 50. *Cirsium flavispina* Boiss. ex DC.



Fig. 51. *Cirsium monspessulanum* (L.) Hill



Fig. 52. *Cirsium palustre* (L.) Scop.



Fig. 53. *Cirsium trachylepis* Boiss.



Fig. 54. *Cirsium vulgare* (Savi) Ten.

Seed smooth, glossy, monochromatic grey to slight brown, compressed lanceolate to oblong, cup shaped top, tilted slightly sideways, body narrowed to base. Obscured lengthwise line, pappus present, bristles uniting at the base. Size range 4 mm x 1 mm x 2 mm. Halos, funicular margin absent. Hilum bulgy, obovate - ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.3 mm x 0.3 mm. Lens not apparent. Size range not applicable. Micropylar pit not apparent.

**Conyza** Less.

**Conyza bonariensis** (L.) Cronq. (Fig. 55) (DPS 0400)

Seed smooth, dull, monochromatic brown, oblong - cylindrical to compressed oblong - elliptic, pappus is a ring of white minute plumose bristles, with delicate pappus on surface pubescence sparsely hairy. Size range 2 mm x 0.1 mm x 0.1 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Conyza canadensis** (L.) Cronq. (Fig. 56) (DPS 0402)

Seed puckered, glossy, monochromatic greyish brown, oblong-cylindrical to compressed oblong-elliptic, and with a tapering base, hairy, pappus is a ring. White minutely plumose bristles also sparsely short hair on the surface. Size range 1-2 mm x 1.2 mm x 1.2 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril, absent. Size range 0.2 mm x 0.08 mm. Lens not apparent. Size range not applicable. Micropylar pit not apparent.

**Coreopsis** L.

**Coreopsis lanceolata** L. (Fig. 57) (DPS 0403)

Seed puckered, glossy, monochromatic dark brown with light brown wing. Mottled at the seed centre, flattish, circular oval to oblong, arched like a curred potato chip, wing-margined, tuberculate on both faces. Size range 3-4 mm x 1.2 mm x 4.5 mm. Halos not apparent, no

funicular margin. Hilum bulgy, ellipsoidal-obovate, black to brownish due to scant funicular overlay, lotoid split, rim-aril absent. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Crassocephalum** Moench.

**Crassocephalum crepidioides** (Benth.) S. Moore (Fig. 58) (DPS 217)

Seed smooth, dull, monochromatic dark brown, compressed oblong - elliptic with a ring of white minutely plumose bristles - pubescence, densely hairy. Size range 3 mm x 1.2 mm x 1.2 mm. Halos not apparent but present. Hilum flush, ovate to ellipsoidal, white due to scant funicular overlay, funicular margin and lotoid split absent. Lens not apparent. Micropylar pit not apparent.

**Crepis** L.

**Crepis commutata** (Sprengel) Babs. (Fig. 59) (DPS 0404)

Seed cross-wrinkled ridges, glossy cylindrical to oblong monochromatic light brown to dark brown, with light brown pointed tip also ridged, narrowed towards the base and upper part, pappus not apparent. Size range 5 - 6 mm x 1.1 mm x 1 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.06 mm x 0.07 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Crepis foetida** L. (Fig. 60) (DPS 0405)

Seed wrinkled, glossy, monochromatic service brown, triangular - oblong. Size range 10 - 11 mm x 1 mm x 1 mm. Halos recessed, no funicular margin. Hilum bulgy, oblong - ellipsoidal, black, funicular overlay, lotoid split and rim-aril absent. Size range 0.08 mm x 0.06 mm. Lens not apparent, circular to deltoid. Size 0.3 mm x 0.1 mm. Micropylar pit not apparent.

**Crepis multiflora** Sibth. & Sm. (Fig. 61) (DPS 0407)

Seed smooth, glossy, monochromatic service brown, oblong-plano-concave, four sided each side with a fine lengthwise line. Short pappus scales present. Size range 3 mm x 1.2

mm x 1.8 mm. Halos recessed, no funicular margin. Hilum bulgy, oblong - ellipsoidal, black, funicular overlay, lotoid split and rim-aril absent. Size range 0.09 mm x 0.06 mm. Lens not apparent, circular to deltoid. Size 0.3 mm x 0.1 mm. Micropylar pit not apparent.

***Crepis pyrenaica*** (L.) Greuter (Fig. 62) (DPS 0409)

Seed puckered, glossy, monochromatic greyish brown, oblong to linear to compressed - cylindric. Sides with lengthwise line, short pappus scales present. Size range 8-9 mm x 1 mm x 1-2 mm. Halos recessed, no funicular margin. Hilum bulgy, oblong-ellipsoidal, black, funicular overlay, lotoid split and rim-aril absent. Size range 0.1 mm x 0.08 mm. Lens not apparent, circular to deltoid. Size 0.3 mm x 0.1 mm. Micropylar pit not apparent.

***Crepis rhoeadifolia*** M. Bieb. (Fig. 63) (DPS 0406)

Seed wrinkled, glossy, monochromatic greyish brown, triangular-oblong. Size range 8-9 mm x 0.3 mm x 0.3 mm. Halos recessed, no funicular margin. Hilum bulgy, oblong-ellipsoidal, black, funicular overlay, lotoid split and rim-aril absent. Size range 0.06 mm x 0.03 mm. Lens not apparent, circular to deltoid. Size 0.3 mm x 0.1 mm. Micropylar pit not apparent.

***Dendroseris*** D. Don

***Dendroseris micrantha*** Hook. & Arn. (Fig. 65) (DPS 0410)

Seed wrinkled, glossy, monochromatic light, triangular-oblong. Size range 3-3.5 mm x 0.3 mm x 1.3 mm. Halos recessed, no funicular margin. Hilum bulgy, oblong-ellipsoidal, black funicular overlay, lotoid split and rim-aril absent. Size range 0.6 mm x 0.3 mm. Lens not apparent, circular to deltoid. Size 0.3 mm x 0.1 mm. Micropylar pit not apparent.

***Dimorphotheca*** Moench

***Dimorphotheca pluvialis*** Moench (Fig. 66)

(DPS 0411)

Seed puckered, glossy, monochromatic brownish yellow, rounded - triangular to obovate, semi-transparent wing tapering around the seed edges, flattish. Some with surface circled inward. Size range 8-9 mm x 1.5 mm x 5 mm. Halos present, incomplete, funicular margin thin. Hilum brownish recessed, circular to ellipsoidal, no lotoid split, rim-aril, funicular overlay scanty. Size 1 mm x 0.5 mm. Lens black circular to deltoid. Size 0.5 mm x 0.2 mm. Micropylar pit not apparent.

***Dittrichia*** W. Greuter

***Dittrichia graveolens*** (L.) Greuter (Fig. 67) (DPS 0413)

Seed puckered, glossy, monochromatic light beige to leaf brown, oblong-ellipsoidal, clothed with whitish hairs, more at the ends, pappus a ring of scales. Size range 2-3 mm x 0.5 mm x 0.8 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.08 mm x 0.09 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

***Doronicum*** L.

***Doronicum austriacum*** Jacq. (Fig. 68) (DPS 0414)

Seed puckered, glossy, surface striped with monochromatic light beige ridges, alternating with black lines, numerous lengthwise ridges, rounded to truncate top. A prominent knoblike style base present clothed with whitish hairs, pappus a ring of scales. Size range 3-4 mm x 1 mm x 1.5 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 1.5 mm x 1 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Dyssodia Cavanilles**

**Dyssodia setifolia** (Lagasca) Robinson (Fig. 69) (DPS 0415)

Seed puckered, glossy, monochromatic light with whitish pappus, purple - tinged, no hair on surface, base of pappus encircled by a series of semitransparent, flat, hair like scales, obovate-cylindrical. Coarsely ridged. Size range 3-4 mm x 0.4 mm x 0.4 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.09 mm x 0.06 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Echinops L.**

**Echinops albidus** Boiss. and Spruner (Fig. 70) (DPS 0417)

Seed puckered, dull, monochromatic dirty white with slight brown at the base. Obovate-cylindrical, not too prominent knoblike style base, pappus absent. Size range 8-9 mm x 2 mm x 3mm. Halos not apparent but present. Hilum flush, ovate to ellipsoidal, whitish due to scant funicular overlay, funicular margin, lotoid split and rim-aril absent. Lens not apparent. Micropylar pit not apparent.

**Echinops sphaerocephalus** L. (Fig. 71) (DPS 0416)

Seed puckered, dull, dichromatic, dirty white with slight - brown at the base. Obovate-cylindrical, having a prominent knoblike style base, pappus absent. Size range 15-16 mm x 2 mm x 2.5 mm. Halos not apparent but present. Hilum flush, ovate to ellipsoidal, whitish due to scant funicular overlay, funicular margin, lotoid split and rim-aril absent. Lens not apparent. Micropylar pit not apparent.

**Emilia Cassini**

**Emilia sonchifolia** (L.) DC. (Fig. 72) (DPS 219)

Seed smooth, dull, monochromatic dark brown, oblong-cylindric with a tapering base hairy, pappus is a ring of white minutely plumose bristles. Size range 3 mm x 0.5 mm x 0.5 mm. Halos not apparent but present. Hilum

flush, ovate to ellipsoidal, whitish due to scant funicular overlay, funicular margin and lotoid split absent. Lens not apparent. Micropylar pit not apparent.

**Erigeron L.**

**Erigeron speciosus** (Lindley) DC. (Fig. 73) (DPS 0418)

Seed puckered, glossy, monochromatic leaf brown, oblong-cylindrical to compressed oblong - ellipsoidal, with a tapering base hair, pappus is a ring of white minutely plumose bristles, seed surface pubescence. Sparsely short - hair size range 2-3 mm x 1.1 mm x 1 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.3 mm x 0.1 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Eupatorium L.**

**Eupatorium cannabinum** L. (Fig. 74) (DPS 0419)

Seed puckered, glossy, monochromatic light, oblong, 4-5 sided, tapering towards base and with white tipped, pappus delicate stiff white hairs, which are minutely plumose. Size range 3-4 mm x 0.5 mm x 0.5 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.5 x 0.3 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Eupatorium purpureum** L. (Fig. 75) (DPS 0422)

Seed puckered, glossy, monochromatic light, oblong, 4-5 sided, tapering towards base and with white tipped, pappus delicate stiff white hairs, which are minutely plumose. Size range 4-5 mm x 0.6 mm x 0.6 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.6 mm x 0.4 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.





Fig. 55. *Conyza bonariensis*  
(L.) Cronq.



Fig. 56. *Conyza canadensis* (L.)  
Cronq.



Fig. 57. *Coreopsis lanceolate* L.



Fig. 58. *Crassocephalum crepidioides*  
(Benth.) S. Moore

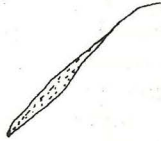


Fig. 59. *Crepis commutata*  
(Sprengel) Babs.

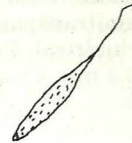


Fig. 60. *Crepis foetida* L.



Fig. 61. *Crepis multiflora* Sm



Fig. 62. *Crepis pyrenaica* (L)  
Greuter



Fig. 63. *Crepis rhoeadifolia*  
M. Bieb.



Fig. 65. *Dendroseris micrantha*  
Hook and Arn.



Fig. 66. *Dimorphotheca pluvialis* (L.)  
Moench



Fig. 67. *Dittrichia graveolens*  
(L) Greuter



Fig. 68. *Dornicum austriacum* Jacq.



Fig. 69. *Dysodia setifolia*  
(Lagasca) Robinson



Fig. 70. *Echinops albidus*  
Boiss & Sprunaw



Fig. 71. *Echinops sphaerocephalus* L



Fig. 72. *Emilia sonchifolia* (L.) DC.

**Gaillardia Foug.**

**Gaillardia aristata** Pursh (Fig. 76) (DPS 0424)

Seed smooth, dull, monochromatic dark brown, obconic densely coated with stiff hairs, crowned by six or more long awned pappus scales. Size range 10 mm x 2 mm x 2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Galinsoga Ruiz & Pavon**

**Galinsoga ciliata** (Raf.) S.F. Blake (Fig. 77) (DPS 0425)

Seed puckered, dull, monochromatic dark light, rounded triangular cup shaped yellow - head, four sided, hair on surface several whitish awned pappus scales, pointed tip at the lower point. Size range 2.1 mm x 0.6 mm x 0.6 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Galinsoga parviflora** Cav. (Fig. 78) (DPS 0426)

Seed puckered, dull, monochromatic dark light, rounded triangular yellowish cup shaped head, whitish hair on surface, four sided, pappus present, pointed tip at the bottom, several long awned pappus scales. Size range 2 mm x 0.5 mm x 0.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Gerbera L.**

**Gerbera anandria** (L.) Schultz-Bip. (Fig. 79) (DPS 0427)

Seed puckered, dull, monochromatic dark brown, flattish-oblongate, arched sideways with fine lengthwise ridge of lighter brown colour truncated at the top. One edge straight or concave and the other convex, pubescence sparsely short-hairy. Size range 6 mm x 1.2 mm x 0.5 mm. Halos not apparent, no funicular

margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Gnaphalium L.**

**Gnaphalium sylvatica** (L.) Schultz-Bip & F. Schultz. (Fig. 80) (DPS 0428)

Seed smooth, dull, monochromatic brown, oblong-cylindrical to compressed oblong-elliptic, pappus is a ring of white minutely plumose bristle, delicate pappus on a smaller body which is flattish, pubescence sparsely short hairy. Size range 1.3 mm x 0.4 mm x 0.4 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Helianthus L.**

**Helianthus annuus** L. (Fig. 81) (DPS 412)

Seed smooth, dull to glossy, monochromatic dark light, compressed to flattish, oblong, top truncate and base narrowed, greyish lengthwise streaks present and mottlings. Size range 8 mm x 3 mm x 5 mm. Halos not apparent, no funicular margin. Hilum recessed to flush, oblong, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Helichrysum Miller**

**Helichrysum rupestre** (Raf.) DC. (Fig. 82) (DPS 0430)

Seed puckered - smooth, dull, monochromatic brown, rodlike, swollen at both ends, no pappus and visible lengthwise line, rounded ends. Size ranged 3-3.5 mm x 0.2 mm x 0.2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Hieracium L.**

**Hieracium amplexicaule** L. (Fig. 83) (DPS 0431)

Seed puckered, glossy, oblong to cylindrical, top truncate, monochromatic light to

dark brown, body narrowed towards the base and marked by about ten lengthwise ridges, which are cross marked, pappus whitish bristles, stiff, delicate in a single series. Size range 5-6 mm x 0.8 mm x 0.5-0.8 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal lotoid split, funicular overlay, rim-aril absent. Size range 0.08 mm x 0.05 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Hieracium bornmuelleri** Freyn (Fig. 84) (DPS 0432)

Seed puckered, glossy, oblong to cylindrical, top truncate, monochromatic dark reddish brown, body narrowed towards base and marked by about ten lengthwise ridges, which are cross marked, pappus whitish bristles, stiff, delicate in a single series. Size range 5-6 mm x 1.1 mm x 1 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.9 mm x 0.6 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Hieracium sabaudum** L. (Fig. 85) (DPS 0435)

Seed puckered, glossy, oblong to cylindrical, top truncate, body narrowed towards base and marked by about ten distinct lengthwise ridges which are cross-marked. Monochromatic light, pappus whitish bristles stiff, delicate in a single series. Size range 3-4 mm x 1 mm x 1.2-1 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.07 mm x 0.08 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

#### **Hypochoeris L.**

**Hypochoeris maculata** L. (Fig. 86) (DPS 0436)

Seed cross - wrinkled ridged, glossy, cylindrical to oblong monochromatic dark brown, 5-6 groove along the length of the seed surface pappus not apparent. Size range 15 mm x 1 mm x 1 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 1

mm x 0.8 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Hypochoeris oligocephala** (Svent and Bramn) Lack. (Fig. 87) (DPS 0437)

Seed wrinkled, ridge, glossy, cylindrical to oblong. Monochromatic purplish brown with a lighter brown pointed tip that is also ridged cross. Pappus present and not apparent. Size range 9-10 mm x 0.8 mm x 0.8 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.1 mm x 0.08 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Hypochoeris radicata** L. (Fig. 88) (DPS 0438)

Seed cross- wrinkled, ridge, glossy, cylindrical to oblong. Monochromatic brown with light brown pointed tip also ridged, narrowed towards the base and upper part. Pappus not apparent. Size range 8-9 mm x 1.2 mm x 1.2 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.3 mm x 0.1 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Hypochoeris uniflora** Villars. (Fig. 89) (DPS 0439)

Seed puckered, glossy, dichromatic light brown upon dark brown, cylindrical oblong, pointed tip, marked with several not too distinct lengthwise ridges. Pappus present not very apparent. Size range 19-20 mm x 2 mm x 2 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.5 mm x 0.2 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

#### **Inula L.**

**Inula orientalis** Lam. (Fig. 90) (DPS 0441)

Seed puckered to wrinkled, dull to glossy, cross marked, cylindrical to oblong, body narrowed towards base and marked by several distinct lengthwise ridges. Pappus present, bristles, stiff, delicate in single series. Size range 3-4 mm x 1.5 mm x 1.5 mm. Halos not



Fig. 73. *Erigeron speciosus*  
(Lindley) DC.



Fig. 74. *Eupatorium cannabinum* L.



Fig. 75. *Eupatorium purpureum* L.



Fig. 76. *Gaillardia aristata* Pursh



Fig. 77. *Galinsoga ciliata* (Raf.)  
S.F. Blake



Fig. 78. *Galinsoga parviflora* Cav.



Fig. 79. *Gerbera anandria*  
(L.) Schultz-Bip.



Fig. 80. *Gnaphalium sylvatica* (L.)  
Schultz-Bip and F. Schultz.



Fig. 81. *Helianthus annuus* L.



Fig. 82. *Helichrysum rupestre* (Raf.) DC.



Fig. 83. *Hieracium amplexicaule* L.



Fig. 84. *Hieracium bornmuelleri* Freyn



Fig. 85. *Hieracium sabaudum* L.



Fig. 86. *Hypochaeris maculata* L.



Fig. 87. *Hypochaeris oligocephala*  
(Svent. and Bram) Lack.



Fig. 88. *Hypochaeris radicata* L.



Fig. 89. *Hypochaeris uniflora* Villars



Fig. 90. *Inula orientalis* Lam.

apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 1 mm x 0.5 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Inula salicina** L. (Fig. 91) (DPS 0442)

Seed puckered, glossy, finely cross marked, dark brown to lead brown in groove cylindrical to oblong, top truncate, body narrowed towards base and marked by several distinct lengthwise ridges, pappus bristles stiff, delicate, in a single series. Size range 2-3 mm x 0.5 mm x 0.5 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.08 mm x 0.5 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Inula thapsoides** (Willd.) Sprengel (Fig. 92) (DPS 0443)

Seed puckered, glossy, monochromatic brown, oblong -cylindric, finely ridges, pappus extending more than body, hairs short plumose, base of pappus encircled by a series of flat hairlike scales, body narrowed down towards the base. Size range 4 mm x 0.9 mm x 0.9 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Inula verbascifolia** (Willd.) Hausskn. (Fig. 93) (DPS 0444)

Seed puckered, glossy, monochromatic brown, oblong, coarsely ridges, pappus present, the hair short-plumose with very fine secondary hairs base of pappus encircled by a series of flat hairlike scales, body narrowed towards the base. Size range 3 mm x 0.3 mm x 0.3 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

#### **Jurinea** Cassini

**Jurinea alata** (Desf.) Cass. (Fig. 94) (DPS 0445)

Seed puckered to pitted, dichromatic cream on dark, angular edge creamy, obovate, four

sided, several lengthwise ridges rather knobby ridges, pappus deciduous, body narrowed towards the base. Size range 3.5 - 4 mm x 1.8 x 1.9 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 2 mm x 0.8 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

#### **Lactuca** L.

**Lactuca serriola** L. (Fig. 95) (DPS 0447)

Seed smooth, dull monochromatic brown, flat, elliptic to lanceolate, pointed near both ends with several ridges which are finely cross-marked, pappus delicate deciduous. Size range 4-4.5 mm x 1.4 mm x 0.6 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

#### **Lapsana** L.

**Lapsana communis** L. (Fig. 96) (DPS 0448)

Seed smooth, dull-glossy, monochromatic light brown, flattish-oblong, arched side ways with fine lengthwise lines, colour yellow. Size range 4 mm x 1.2 mm x 1.2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

#### **Leontodon** L.

**Leontodon autumnalis** L. (Fig. 97) (DPS 0451)

Seed puckered, dull, monochromatic brown, coarsely ridged lengthwise, compressed oblong to cylindrical, with delicate pappus on a smaller body, yellow to brown, short hairs on surface. Size range 5-6 mm x 1.5 mm x 1.6 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Leontodon hispidus** L. (Fig. 98) (DPS 0452)

Seed puckered, dull, monochromatic brown, coarsely ridged lengthwise, compressed

oblong to cylindrical, with delicate pappus on a smaller body, yellow to brown, short hairs on surface. Size range 9-10 mm x 1.9 mm x 2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Leontodon glabratus** (W. Kock) Bisch. (Fig. 99) (DPS 0453)

Seed puckered, dull monochromatic brown, oblong, coarsely ridged, hairy, narrow towards base, no pappus scales. Size range 6-7 mm x 1.5 mm x 1.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Leuzea DC.**

**Leuzea centauroides** (L.) Holub (Fig. 100) (DPS 0457)

Seed smooth, glossy, monochromatic yellowish brown, oblong-ellipsoidal, compressed cylindrical, upper end truncate, sides with fine lengthwise lines, short pappus scales absent. Size range 11-12 mm x 4 mm x 2 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 3 mm x 2 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Matricaria L.**

**Matricaria maritima** L. (Fig. 101) (DPS 0461)

Seed smooth, dull, monochromatic brown, triangular-obovate, compressed, four sided, deep visible line ridges on surface top truncate and fringed with a ring of stubby scales, body narrowed to base. Size range 3 mm x 1.8 mm x 1.9 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.5 mm x 0.3 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Onopordum L.**

**Onopordum acanthium** L. (Fig. 102) (DPS 0463)

Seed puckered, dull, monochromatic light brown to straw colour, compressed lanceolate, top cup-shaped, body narrowed down and marked by several lengthwise (4 prominent) lines, pappus bristle compose of several short plumose. Size range 5 mm x 3 mm x 1.8 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 2 mm x 1.9 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Onopordum bracteatum** Boiss. and Heldr. (Fig. 103) (DPS 0464)

Seed puckered, dull, monochromatic light brown to straw colour, compressed lanceolate, top cup-shaped, body narrowed down and marked by several lengthwise (4 prominent) lines, pappus bristle compose of several short plumose. Size range 6-7 mm x 4.5 mm x 2.5 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 3 mm x 3 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Onopordum illyricum** L. (Fig. 104) (DPS 0465)

Seed puckered, dull, monochromatic straw - colour to light brown, obovate to ellipsoidal compressed, lanceolate, top cup shaped, body narrowed to a rounded base and marked by prominent lengthwise lines, pappus composed of many short, plumose bristles, which are limited at the base into a readily detached ring. Size range 6-7 mm x 4 mm x 2 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 2.5 mm x 3 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Picris L.**

**Picris evae** Lack (Fig. 105) (DPS 0470)

Seed puckered, dull, monochromatic dark to light brown, oblong- flattish-oblancheolate, tubercles or teeth all around the surface of the lengthwise ridges, the pappus delicate and



Fig. 91. *Inula salicina* L.



Fig. 92. *Inula thapsoides* (Willd.) Sprengel



Fig. 93. *Inula verbascifolia* (Willd.) Hausskn.



Fig. 94. *Jurinea alata* (Desf.) Cass.



Fig. 95. *Lactuca serriola* L.



Fig. 96. *Lapsana communis* L.



Fig. 97. *Leontodon autumnalis* L.



Fig. 99. *Leontodon glabratus*  
(W. Koch.) Bisch.



Fig. 98. *Leontodon hispidus* L.



Fig. 100. *Leuzea centauroides* (L.) Holub.



Fig. 101. *Matricaria maritima* L.



Fig. 102. *Onopordum acanthium* L.



Fig. 103. *Onopordum bracteatum* Boiss.  
and Heldr.



Fig. 104. *Onopordum illyricum* L.



Fig. 105. *Picris evae* Lack



Fig. 106. *Porophyllum ruderales* Cass.



Fig. 107. *Pulicaria dysenterica* (L.) Benth.



Fig. 108. *Pulicaria odora* (L.) Reichenb.

appearing like an inverted umbrella on a short handle, protruding upper part. Size range 9-10 mm x 1 mm x 1 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

#### Porophyllum Adanson

**Porophyllum ruderales** Cass. (Fig. 106) (DPS 220)

Seed smooth, dull, monochromatic dark light oblong, elongated, coarsely ridged, pappus generally purple - tinged and longer than the body, the hairs short - plumose with very fine secondary hairs, base of pappus encircled by a series transparent, flat, hairlike scales, hairy narrowed towards base. Size range 7-8 mm x 0.8 mm x 0.9 mm. Halos not apparent but present. Hilum flush ovate to ellipsoidal, white due to scant funicular overlay, funicular margin and lotoid split absent. Lens not apparent. Micropylar pit not apparent.

#### Pulicaria Gaertner

**Pulicaria dysenterica** (L.) Bernh. (Fig. 107) (DPS 0474)

Seed puckered, dull, monochromatic brown, oblong, coarsely ridged, pappus tinged, the hair short plumose, base of pappus encircled by a series of semitransparent hair like scales, narrowed towards base. Size range 1.2 mm x 0.2 mm x 0.2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Pulicaria odora** (L.) Reichenb. (Fig. 108) (DPS 0475)

Seed puckered, glossy, monochromatic brown, oblong, ridged, coarsely, short plumose hair, base of pappus is encircled by a series of semitransparent hair like scales, narrowed towards the rounded base. Size range 2 mm x 0.3 mm x 0.3 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

#### Santolina L.

**Santolina chamaecyparissus** L. (Fig. 109) (DPS 0476)

Seed puckered, dull-glossy, monochromatic brown, compressed oblong, cylindrical, body narrowed towards the base, truncated top, surface marked with several lengthwise line. Size range 3 mm x 1 mm x 1 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Santolina squarrosa** (DC.) Nyman (Fig. 110) (DPS 0477)

Seed puckered, glossy, monochromatic leaf brown, no pappus, compressed oblong-obovate, truncate at top, narrowed towards base arched side ways with edge concave and the other convex, surface marked by lengthwise lines. Size range 2-3 mm x 0.3 mm x 1.2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Santolina rosmarinifolia** L. (Fig. 111) (DPS 0478)

Seed puckered, glossy, monochromatic leaf brown, greenish yellow, no pappus, compressed oblong-obovate, truncate at top, narrowed towards base arched sideways with one edge concave and the other convex, surface marked by lengthwise lines. Size range 2-2.5 mm 0.15 mm x 0.8 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

#### Sanvitalia Lamarck

**Sanvitalia procumbens** Lam. (Fig. 112) (DPS 0479)

Seed puckered - wrinkled, glossy, monochromatic grey - brown to dark earth, obovate, semitransparent wing, tapering and the seed edges, flattish, with surface arched inwards, wing board by two (2) awn (horn-like awn) with white short hairs on surface. Size range 3-4 mm 0.4 mm x 1-2 mm. Halos not



apparent, no funicular margin. Hilum bulgy, ellipsoidal to obovate, black to brownish to scant funicular overlay, lotoid split, rim-aril absent. Lens not apparent. Size not applicable. Micropylar pit brown.

*Scorzonera* L.

***Scorzonera cretica*** Willd. (Fig. 113) (DPS 0481)

Seed puckered, dull, monochromatic lead brown, obconic, densely coated with stiff hairs, crowned by several long-awned pappus scales. Size range of entire seed 14-15 mm x 1-2 mm x 3-4 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.04 mm x 0.02 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

*Senecio* L.

***Senecio adonidifolius*** Lois. (Fig. 114) (DPS 0482)

Seed puckered, glossy, monochromatic greyish brown, flattish - oblanceolate and arched sideways with fine lengthwise lines, no pappus. Size range 4-5 mm x 0.5 mm x 1 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

***Senecio appendiculatus*** (L.f.) Schultz-Bip. (Fig. 115) (DPS 0483)

Seed puckered, glossy, monochromatic light, oblong-ellipsoidal, style base knoblike, arched sideways with fine lengthwise lines. Short pappus scales present. Seed size 1-2 mm x 0.2 mm x 0.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size 0.04 mm x 0.02 mm. Micropylar pit not apparent.

***Senecio aquaticus*** Hill (Fig. 116) (DPS 0484)

Seed puckered, glossy, monochromatic greyish brown, flattish-oblanceolate and arched sideways with fine lengthwise lines, no pappus. Size range 2-2.5 mm x 0.4 mm x 0.5 mm. Halos not apparent, no funicular margin. Hilum

recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

***Senecio chrysanthemoides*** DC. (Fig. 117) (DPS 0485)

Seed puckered, glossy, monochromatic greyish brown, flattish-oblanceolate and arched sideways with fine lengthwise lines, no pappus, style base knoblike. Size range 2.5 - 3 mm x 0.8 mm x 0.8 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

***Senecio doria*** L. (Fig. 118) (DPS 0486)

Seed puckered, glossy, monochromatic straw - colour to brown, compressed oblong, cylindric - lanceolate, top cup-shaped and also at the bottom, tilted slightly sideways and enclosing a prominent knoblike style base, colour, yellow, distinct ridges with sharp pubescence, pappus deciduous. Size range 4 - 4.5 mm x 1.3 mm x 1.3 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown, obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.1 mm x 0.15 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

***Senecio gnaphalodes*** Sieber (Fig. 119) (DPS 0487)

Seed puckered, dull, monochromatic dark light, cylindric - obovate, top truncate, body narrowed towards the base, marked by several distinct ridges with pubescence, pappus present. Size range 2.3 mm x 1 mm x 1 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown, obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.09 mm x 0.08 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

***Senecio hansenii*** Kunkel. (Fig. 120) (DPS 0488)

Seed dull, puckered, monochromatic brown, cylindric top truncate, body narrowed towards base and marked by several distinct lengthwise ridges, pappus stiff. Size range 2 mm x 0.3 mm x 0.3 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown, obovate to ellipsoidal, lotoid split,

funicular overlay, rim-aril absent. Size range 0.1 mm x 0.09 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Senecio thapsoides** DC. (Fig. 121) (DPS 0489)

Seed puckered, dull, monochromatic brown, slightly compressed and arched - oblong, top truncate and fringed with a ring of stubby scales, body narrowed into a rounded base. Size range 4 - 5 mm x 0.8 mm x 0.8 mm. Halos not apparent and complete, thin funicular margin. Hilum flush, brown, obovate to ellipsoidal, lotoid split, funicular overlay, rim-aril absent. Size range 0.3 mm x 0.2 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Sonchus** L.

**Sonchus arvensis** L. (Fig. 122) (DPS 221)

Seed puckered, dull, monochromatic brown, flat, ellipsoidal to lanceolate - elliptic, ridging and minute wrinkling obtuse at end, pappus bristles long, soft, delicate, deciduous. Size range 4-5 mm x 0.3 mm x 1.5 mm. Halos not apparent but present. Hilum flush ovate to ellipsoidal, white due to scant funicular overlay, funicular margin and lotoid split absent. Lens not apparent. Micropylar pit not apparent.

**Spilanthes** N.J. Jacq.

**Spilanthes ocymifolia** (Lam.) A. Moore (Fig. 123) (DPS 0492)

Seed puckered, dull - glossy, monochromatic dark light, mottled, flat obovate to elliptic-oblong, pappus stiff plumose, obscured lengthwise line and visible equal sided projection. Size range, 3 mm x 1 mm x 0.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Stachelina** L.

**Stachelina uniflosculosa** Sm. (Fig. 124) (DPS 0493)

Seed puckered, dull, monochromatic dark brown, oblong to linear, compressed-cylindric, upper end truncate, sides with lengthwise line. Short pappus scales present. Size range 7-8 mm x 1.3 mm x 1.3 mm. Halos, funicular margin

absent. Hilum bulgy, obovate to ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.8 mm x 1 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Tanacetum** L.

**Tanacetum cilicicum** (Boiss.) Grierson (Fig. 125) (DPS 0494)

Seed puckered, dull, monochromatic light brown, cylindric - obovate, narrowed towards the base marked by distinct lengthwise ridges, pappus bristles and stiff. Size range 4 mm x 1.2 mm x 1.1 mm. Halos, funicular margin absent. Hilum bulgy, obovate - ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.2 mm x 0.1 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Tanacetum parthenium** (L.) Schultz - Bip. (Fig. 126) (DPS 0495)

Seed smooth, puckered, dull, monochromatic white brown, cylindric - obovate, marked by distinct lengthwise ridges, narrowed towards the base, pappus bristles stiff. Size range 2 mm x 0.5 mm x 0.6 mm. Halos, funicular margin absent. Hilum bulgy, obovate - ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.09 mm x 0.1 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Tanacetum pseudoachillea** Winkler (Fig. 127) (DPS 0496)

Seed smooth, puckered, dull, monochromatic straw - colour brown, cylindric, marked by distinct lengthwise ridges, alternating a lighter colour edges, narrowed towards the base, pappus bristles stiff. Size range 3.5 - 4 mm x 1 mm x 1 mm. Halos, funicular margin absent. Hilum bulgy, obovate - ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.2 mm x 0.3 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Tanacetum vulgare** L. (Fig. 128) (DPS 0497)

Seed puckered, dull-glossy, monochromatic yellowish - green, cylindric, truncate top, narrowed towards base and marked by lengthwise ridges, pappus bristles and stiff. Size range 2 mm x 0.5 mm x 0.5 mm. Halos,



Fig. 109. *Santolina chamaecyparissus* L.



Fig. 111. *Santolina rosmarinifolia* L.



Fig. 110. *Santolina squarrosa* (DC.) Nyman



Fig. 112. *Sanvitalia procumbens* Lam.



Fig. 113. *Scorzonera cretica* Willd.



Fig. 114. *Senecio adonidifolius* Lois.



Fig. 115. *Senecio appendiculatus*  
(L.f.) Schultz - Bip



Fig. 116. *Senecio aquaticus* Hill.



Fig. 117. *Senecio chrysanthemoides* DC.



Fig. 118. *Senecio doria* L.



Fig. 119. *Senecio gnaphalodes* Sieber



Fig. 120. *Senecio hansenii* Kunkel

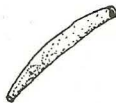


Fig. 121. *Senecio thapsoides* DC.



Fig. 122. *Sonchus arvensis* L.



Fig. 123. *Spilanthes ocymifolia* (Lam.) A. Moore



Fig. 124. *Staehelina uniflosculosa* Sm.



Fig. 125. *Tanacetum cilicicum* (Boiss.)  
Grierson



Fig. 126. *Tanacetum parthenium*  
(L) Schultz-Bip

funicular margin absent. Hilum bulgy, obovate-ellipsoidal, brown due to scant funicular overlay, rim-aril, lotoid split absent. Size range 0.1 mm x 0.1 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Telekia Baumg.**

**Telekia speciosa** (Schreber) Baumg. (Fig. 129)  
(DPS 0501)

Seed smooth, glossy, monochromatic straw-colour, cylindrical, top truncate narrowed towards base and marked by distinct lengthwise ridges, pappus bristles stiff. Size range 3.5-4 mm x 0.9 mm x 0.9 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Telekia speciosissima** (L.) Less. (Fig. 130)  
(DPS 0502)

Seed puckered, glossy, monochromatic dark brown, obconic to oblong, four sided, crowned with broad tapering pappus scales tipped by awns. Size range 4-5 mm x 0.8 mm x 0.8 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong - ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Tragopogon L.**

**Tragopogon tommasinii** Schultz-Bip. (Fig. 131) (DPS 0504)

Seed wrinkled, dull, monochromatic brown, oblong oblanceolate, narrowed towards both ends, tubercles or teeth all over the surface, lengthwise ridges present, pappus delicate appearing like an inverted umbrella on a long handle. Size range 27 mm x 2 mm x 2 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Tridax L.**

**Tridax procumbens** L. (Fig. 132) (DPS 222)

Seed puckered, dull, monochromatic brown, oblong, coarsely ridged, pappus generally purple-tinged and longer than the body, the hairs short-plumose with very fine secondary

hairs. Size range 2.5-3 mm x 1.2 mm x 1.2 mm. Halos not apparent but present. Hilum flush, ovate to ellipsoidal, white due to scant funicular overlay, funicular margin, and lotoid split absent. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Vernonia Schreber**

**Vernonia macrocyanus** O. Hoffm. (Fig. 133)  
(DPS 413)

Seed puckered, dull, monochromatic brown, oblong, coarsely ridged. Pappus purple-fringed, glossy, longer than the body, the hair short-plumose with very fine secondary hairs, base pappus encircled by a series of semi-transparent, flat hair like scales. Size range 3-4 mm x 1.5 mm x 1.5 mm. Halos not apparent, no funicular margin. Hilum recessed, oblong-ellipsoidal, no lotoid split and rim-aril. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**Xanthium L.**

**Xanthium spinosum** L. (Fig. 134) (DPS 0505)

Seed puckered, dull, monochromatic brown armed by numerous hooks tipped bristles around the seed, ellipsoidal-obovate, sharply truncate at top and rounded at base, without pappus scales. Size range 13-14 mm x 3-4 mm x 6 mm. Halos not apparent but present. Hilum flush, ovate to ellipsoidal, white due to scant funicular overlay, funicular margin and lotoid split absent. Size 1 mm x 0.5 mm. Lens not apparent, broadly linear to circular. Size 0.5 mm x 1 mm. Micropylar pit black.

**Xanthium strumarium** L. (Fig. 135) (DPS 0506)

Seed puckered, dull to glossy, oblong, monochromatic brown armed by numerous hooks tipped bristles around the seed, ellipsoidal to obovate, sharply truncate at top and rounded at base, without pappus scales. Size range 21-22 mm x 9 mm x 9-10 mm. Halos not apparent but present. Hilum flush, ovate to ellipsoidal, white due to scant funicular overlay, funicular margin, and lotoid split absent. Size 0.8 mm x 0.5 mm. Lens not apparent, broadly linear to circular. Size 0.4 mm x 0.1 mm. Micropylar pit black.



Fig. 127. *Tanacetum pseudoachillea*  
Winkler



Fig. 128. *Tanacetum vulgare* L.



Fig. 129. *Telekia speciosa*  
(Schreber) Baumg.



Fig. 130. *Telekia speciosissima*  
(L.) Less.



Fig. 131. *Tragopogon tommasinii*  
Schultz-Bip.



Fig. 132. *Tridax procumbens* L.



Fig. 133. *Vernonia macrocyanus*  
O. Hoffm.



Fig. 134. *Xanthium spinosum* L.



Fig. 135. *Xanthium strumarium* L.



Fig. 136. *Zinnia peruviana* (L.) L.

**Zinnia L.**

***Zinnia peruviana* L. (Fig. 136) (DPS 0509)**

Seed pucker, dull, monochromatic greyish brown, flat to compressed oval to oblong to ellipsoidal, wing margined and have a deep apical notch which is bordered by a single awns

(horn like awns). Size range 9-10 mm x 0.4 mm x 2 mm. Halos, funicular margin absent. Hilum flush, obovate to ellipsoidal, whitish due to scant funicular overlay, rim-aril, lotoid split absent. Size 0.09 mm x 0.06 mm. Lens not apparent. Size not applicable. Micropylar pit not apparent.

**KEY TO GENERA IN THE FAMILY : COMPOSITAE**

- 1. Seed surface smooth, pucker and dull ..... *Achillea*
- 2. Shape, oblong-cylindric to compressed oblong-elliptic arid..... *Ageratum*
- 3. Surface with pappus ring of white plumose..... *Anaphalis*
- 1. Seed surface smooth and dull..... *Antennaria, Aster, Conyza*

1. Seed surface smooth and glossy.....*Anthemis, Cirsium*  
 3. Surface, streaked.....*Arctium*  
 4. Plumose, bristles.....*Arctotis, Crassocephalum*  
 1. Seed puckered, dull.....*Artemisia, Asteriscus*  
 5. Four armed barbed present.....*Bidens*  
 2. Shape, Cup-like.....*Carduus*  
 6. Pubescence present.....*Carlina, Catananche*  
 7. Hilum, bulgy.....*Centaurea*  
 7. Hilum, recessed.....*Chamomilla, Leontodon*  
 1. Seed wrinkled.....*Chaptalis Crepis*  
 8. Beak like structure on surface.....*Chondrilla*  
 9. Delicate pappus.....*Chromolaena*  
 10. Colour, brown.....*Chrysanthemum, Chrysopsis, Emilia*  
 1. Seed puckered and glossy.....*Coreopsis, Dronicum, Erigeron*  
 6. Dense hair present.....*Dittrichia*  
 7. Hilum, oblong to ellipsoidal.....*Dendroseris, Lactuca*  
 11. Hilum colour, brown.....*Dimorphothecca*  
 6. No dense hair on surface.....*Dyssodia*  
 12. No prominent knoblike stylebase.....*Echinops*  
 6. Stiff white hair.....*Eupatorium, Scorzonera*  
 2. Shape triangular - cup like.....*Galinsoga, Onopordum*  
 2. Shape, arched sideways with ridge.....*Gerbera*  
 13. Mottled.....*Helianthus*  
 2. Shape rod-like.....*Helichrysum*  
 1. Seed cross wrinkled.....*Hypochoeris*  
 14. Thin funicular.....*Inula*  
 15. Halos not apparent.....*Jurinea, Staehelina*  
 10. Colour, yellowish brown.....*Leuzea*  
 2. Top truncate and fringed with scale.....*Matricaria*  
 2. Surface, oblanceolate, tubercules.....*Picris, Trapogon*  
 9. Pappus longer than body.....*Porophyllum*  
 9. Pappus tinged.....*Pulicaria*  
 2. Shape narrowed forwards the base.....*Santolina, Telekia*  
 1. Surface, semi-transparent and winged.....*Sanvitalia*  
 9. No pappus.....*Senecio, Xanthium*  
 7. Hilum, ovate to ellipsoidal.....*Sonchus*  
 10. Colour, night, mottled.....*Spilanthas*  
 15. Halos absent.....*Tanacetum*  
 6. Short hair an surface.....*Tridox*  
 9. Pappus, purple-fringed.....*Vernonia*  
 16. Horn-like awns present.....*Zinnia*

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