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Genus *Inula* L. (s. str.) (Compositae-Inuleae) in Pakistan and Kashmir

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ABSTRACT

ABID, R. & M. QAISER (2002). Genus *Inula* L. (s. str.) (Compositae-Inuleae) in Pakistan and Kashmir. *Candollea* 56: 315-325. In English, English and French abstracts.

A revision of the genus *Inula* L. (s. str.) in Pakistan and Kashmir is presented; eleven species are recognized including *Inula stewartii* Abid & Qaiser as a species new to science. In addition, key to the related genera and species, distribution, ecological notes and an illustration of the new species, are also provided.

RÉSUMÉ

ABID, R. & M. QAISER (2002). Le genre *Inula* L. (s. str.) (Compositae-Inuleae) au Pakistan et au Cachemire. *Candollea* 56: 315-325. En anglais, résumés anglais et français.

Une révision du genre *Inula* L. (s. str.) est présentée. Onze espèces sont reconnues dont *Inula stewartii* Abid & Qaiser, espèce nouvelle pour la science. Une clé de détermination des genres affines et des espèces reconnues est fournie, ainsi que la distribution, des commentaires écologiques et une illustration de la nouvelle espèce.

KEY-WORDS: *Inula* – COMPOSITAE – Pakistan – Kashmir.

Introduction

The genus *Inula* L. (s. str.) belongs to the tribe *Inuleae* of the family *Compositae* including about 100 species, mainly distributed in Europe, Africa and Asia.

The genus *Inula* was described by LINNAEUS with thirteen species (1753, 1754). The protologue used by LINNAEUS was quite generalized as he did not give the weightage to the finer details of floral characters. Later on, this genus was treated by various workers from time to time (viz., CANDOLLE, 1836; BENTHAM & HOOKER, 1873; BOISSIER, 1875; CLARKE, 1876; HOOKER, 1881; BECK, 1882; HOFFMANN, 1890; GORSCHKOVA, 1959; KITAMURA, 1960; GRIERSON, 1975; BALL & TUTIN, 1976; RECHINGER, 1980; ANDERBERG, 1991; KUMAR, 1995). The purpose of present studies is two fold. Most of the above mentioned treatments are not only outdated during which lot of nomenclatural changes have taken place but also do not cover the entire area of Pakistan and Kashmir. Therefore, not a single treatment is available which could identify all the species belonging to the genus *Inula* (s. str.). Secondly almost all the workers broadened the generic circumscription of the genus *Inula*, and included number

of heterogenic taxa under the broad canopy of *Inula*. Such as the taxa (*Dittrichia* Greuter) having non ribbed cypselae with basally connate pappus in a minute cupule, scale like ridges on receptacle surface and polarized endothelial tissues were placed under *Inula*, by CANDOLLE (1836), BENTHAM & HOOKER (1873), BOISSIER (1875), CLARKE (1876), HOOKER (1881), BECK (1882), HOFFMANN (1890), GRIERSON (1975) and KUMAR (1995). Another taxon (*Iphiaona grantioides* (Boiss.) Anderb.) with neutral ray florets, usually apically trilobed and fleshy leaves was also treated under *Inula* by BOISSIER (1875), HOOKER (1881) and RECHINGER (1980). Similarly a group of taxa (*Duhaldea* DC.) which is clearly distinguished from *Inula*, by having scale like ridges on receptacle surface, truncate-emarginate anther appendices and polarized endothelial tissues was placed under *Inula*, by various workers viz., CANDOLLE (1836), BENTHAM & HOOKER (1873), CLARKE (1876), HOOKER (1881), RECHINGER (1980) and KUMAR (1995). Furthermore, the genus *Pentanema* Cass., is closest ally of *Inula*, but differs from *Inula*, in having thin walled cypselae with 3-18(-20) pappus bristles. Later on, it was treated as congeneric with *Inula*, by CANDOLLE (1836), BOISSIER (1875) and CLARKE (1876).

The genus *Inula* (*s. str.*) is characterized by heterogamous radiate, disciform or discoid capitula. Marginal florets when present female. Receptacle epaleate and without scaly ridges. Anther appendices acute-obtuse and radial endothelial tissues. Cypselae thick walled, ribbed and above non attenuate. Pappus of numerous (20-52) bristles.

Therefore all those taxa which do not fulfill this criterion in the strict sense have been accommodated in their respective genera. A synoptic key is given below for the related genera of *Inula* (*s. str.*):

1. Marginal florets when present, neuter. Leaves always fleshy, at least some of them apically lobed **Iphiaona**
- 1a. Marginal florets when present, female. Leaves never fleshy, all of them entire, serrate or dentate 2
2. Cypselae with short attenuate apex. Pappus bristles basally connate in a minute cupule **Dittrichia**
- 2a. Cypselae without attenuate apex. Pappus bristles basally not connate in a minute cupule .3
3. Receptacle with scaly ridges. Anther appendices truncate-emarginate. Endothelial tissues polar **Duhaldea**
- 3a. Receptacle without scaly ridges. Anther appendices acute-obtuse. Endothelial tissues radial 4
4. Cypselae thick-walled, ribbed. Pappus bristles 20-52 in number **Inula** (*s. str.*)
- 4a. Cypselae thin-walled, non-ribbed. Pappus bristles 3-18(-20) in number **Pentanema**

In Pakistan genus *Inula* (*s. str.*) is represented by 11 species mainly confined to the northern parts i.e., Chitral, Gilgit, Baltistan, Kurram valley, Kashmir, Swat and Waziristan. Specimens are cited according to the grid system used for "Flora of Pakistan" (NASIR & ALI, 1970).

Inula L., Sp. Pl.: 881. 1753; Gen. Pl.: 861. 1754.

Annual, biennial-perennial herbs or shrubs. Indumentum variable, rarely glabrous. Stemless or with well developed stem, often branched, rarely simple. Leaves herbaceous, membranous, alternate, simple, generally sessile. Capitula solitary terminal, or several, arranged in corymbs or cymes, heterogamous radiate, disciform or homogamous discoid. Receptacle epaleate and without scaly ridges. Involucral bracts 3-7-seriate, imbricate, outer herbaceous, inner usually rigid and narrow. Marginal florets female, ligulate-miniligulate, 2-3-toothed or hermaphrodite, tubular, 5-toothed. Central florets hermaphrodite, tubular, 5-toothed. Anthers tailed, appendices acute-obtuse, endothelial tissues radial. Styles with acute sweeping hairs not reaching to the fur-

cation. Stigmatic lines confluent apically but basally separate. Cypselae subterete, above non attenuate, usually thick walled and ribbed. Pappus bristles 1-2-seriate, persistent, numerous (20-52), barbellate.

Key to the species of *Inula* (s. str.) in Pakistan and Kashmir

1. Herb without stem. Capitula encircled by rosette of leaves **11. *I. rhizocephala***
- 1a. Herb or shrub with stem. Capitula not encircled by rosette of leaves 2
2. Capitula arranged in lax corymbs. Cypselae with at least 1/4 part pubescent 3
- 2a. Leaves not as above. Cypselae pubescent or hirsute, 1-3mm long 6
3. Capitula arranged in lax corymbs. Cypselae with at least 1/4 part pubescent **.4. *I. stewartii***
- 3a. Capitula solitary axillary or solitary terminal or cymosely arranged. Cypselae entirely glabrous 4
4. Capitula arranged in cymes. Pappus bristles reddish-brown **3. *I. racemosa***
- 4a. Capitula axillary solitary or solitary terminal. Pappus bristles yellowish 5
5. Outer involucral bracts lanceolate, up to 3 mm broad. Pappus bristles biseriate **1. *I. koelzii***
- 5a. Outer involucral bracts ovate-obovate, 5-10 mm broad. Pappus bristles uniseriate **2. *I. royleana***
6. Stem many branched from base. Stem and leaves papillate-glandular along with pilose hairs or tomentose only 7
- 6a. Stem simple or corymbosely branched above. Stem and leaves not as above 8
7. Stem and leaves tomentose. Leaves entire, acuminate- apiculate **6. *I. clarkei***
- 7a. Stem and leaves papillate-glandular along with pilose hairs. Leaves entire-obscurely dentate, acute-obtuse **7. *I. obtusifolia***
8. Stem corymbosely branched above. Leaves entire or minutely dentate or serrate. Capitula 1.5-2.5 cm in diameter 9
- 8a. Stem simple. Leaves serrate-glandular. Capitula 5-7.6 cm in diameter **5. *I. orientalis***
9. Leaves villous on both sides and \pm glandular dorsally, with cordate-auriculate base **8. *I. britannica***
- 9a. Leaves dorsally pilose, with attenuate or cordate base 10
10. Leaves linear-lanceolate, acuminate, veins prominent below **9. *I. acuminata***
- 10a. Leaves linear, acute-acuminate, veins obscure all over **10. *I. falconeri***

1. *Inula koelzii* Abid & Qaiser in Candollea 52: 283. 1997.

Type: Kashmir, Kanga Nulla below Kangi, Ladakh, in river beds, alt. 12.500', 5-9-1931, Walter Koelz 2818 (Holo-: RAW!; Iso-: NY!).

Perennial herb, 23-24 cm tall, lax hirsute and \pm papillate glandular. Leaves elliptic, margins serrate-glandular; upper sessile semimplexicaul, base auricled, apex acuminate-acute; lower long petiolate, obtuse-acute, 11-15 \times 3-5 cm. Capitula solitary axillary or solitary terminal, 4-5 cm in diameter. Involucre 1.8-2.0 cm long, bracts 4-seriate, imbricate, outer leafy, lanceolate or oblanceolate, acuminate, hirsute, 18 \times 3 mm; inner membranous, narrower, dorsally glandular with puberulous margins. Marginal florets female, ligulate 2-3 toothed. Central florets hermaphrodite tubular, 5-toothed. Cypselae 3-4 mm long, oblong, quadrangular, glabrous. Pappus bristles biseriate, 30-40 in number, 5 mm long, basally connate, golden yellow.

Specimens examined. – **B-9 Kashmir:** Kanga Nulla, above Kangi, Ladakh, alt. 13.000', 6-9-1931, *Walter Koelz 2827a* (NY); below Kangi, Ladakh, in river bed, alt. 12.500', 5-9-1931, *Walter Koelz 2818* (RAW, NY); Rangdam, Zanskar, on semi-arid slope, alt. 11.000', 12-9-1931, *Walter Koelz 2900a* (KUH, NY).

Distribution. – Known from Ladakh (Kashmir) only.

Ecology. – A plant of very high altitudes, growing on slopes between 3300-3900 m.

Phenology. – September.

2. *Inula royleana* DC., Prodr. 5: 464. 1836.

Type: In India Prov. boreali-occidentalis, detexit, *Royle* (Holo-: G-DC, IDC No.27.908-microfiche!; Iso-: LIV!).

= *I. stoliczkae* C. B. Clarke, Compos. Ind.: 118. 1876.

Syntype: In Kashmir, 7-9000' alt., nempe ad Kishtwar et in Convalli Sind, *Stoliczka* (CAL).

A stout perennial herb, 30-60 cm long. Stem grooved, usually simple, 1-cephalous, lax hirsute rarely glandular. Leaves elliptic-lanceolate, acute, upper sessile, base dilate-auricled, semiamplexicaul, lower long winged petiolate, margins finely dentate, densely tomentose beneath, upper villous, 9-20(-25) × (3-)5-7.6 cm. Capitula solitary terminal, on a stout erect hairy peduncle, 6.3-10.0 cm in diameter. Involucral bracts 5-seriate, imbricate, outer foliaceous, oblong-ovate, acute, 15-20 × 5-10 mm; inner membranous, linear, narrow. Marginal florets, female, ligulate, 2-3-toothed. Central florets hermaphrodite, tubular, 5-toothed. Cypselae 3-4 mm long, glabrous. Pappus bristles uniseriate, 22-40 in number, 7-10 mm long, golden yellow.

Specimens examined. – **A-7 Gilgit Dist.:** Burzil chawki, 11.000', 26-7-1940, *R.R. Stewart 19769* (RAW); **B-7 Kashmir:** Tilel, 11.000', 27-8-1876, *C. B. Clarke 30780C* (BM); Kishenganga valley, alt. 7.000', 17-7-1935, *F. Ludlow & G. Sherriff 1432* (E); Erin valley, 10.500', 24-7-1940, *F. Ludlow & G. Sherriff 7813* (E, BM); **Swat Dist.:** above Sari hut, 9.600', Kaghan, *Y. Nasir & Rubina Akhter 12996* (RAW); **Hazara Dist.:** 18-8-1893, *Duthie s. n.* (K); Changla to Dungla, 8-1880, *A. P. Young s. n.* (BM); Kewai, Kaghan Road, 31-8-1972, *M. Qaiser 5117* (KUH); Thandiani, 20-8-1951, *E. Nasir s. n.* (RAW); near Shaheed Pani Rest House, ± 9.200', N. slope, 29-8-1981, *Y. Nasir & Khan 9663* (RAW); Sari hut to Mt. Makra, ± 10.500', 11-7-1974, *Y. Nasir, E. Nasir & E. J. Ecker 7486* (RAW); Between Sari Rest house & Makra, 15-8-1965, *S. M. A. Kazmi 2212* (M); Chailsar to Ganga Kando, ± 8.500', 17-9-1958, *B. L. Burt 11224* (E); **Muzaffarabad Dist.:** Bathwar Gali, Leepa valley, 10.000-10.050', *M. Qaiser & A. Ghafoor 5094, 5117* (KUH); Between Reshian & Leepa valley, 28-8-1986, *M. Qaiser & Rizwan Y. Hashmi 7868* (KUH); **B-8 Kashmir:** Near Sinthan Pass, Bringhi valley, 11.000', 7-9-1940, *Ludlow & Sheriff 8193* (BM); Butin Pansal, Wangat valley, 11.000', 13-8-1940, *P. M. Punfold 268* (BM); Sonamarg, 9.000', 13-7-77, *J. D. A. Stainton 7933* (E); *ibid.*, 29-8-1876, *C. B. Clarke 30833A* (BM); Catchment area, Khillanmarg, 10.000', 8-1929, *Steane 1* (E); *ibid.*, 15-3-1959, *O. Polunin 147* (B, BM); Pissu Ghati, alpine meadows, 25-8-1939, *Shanti Sarup s. n.* (KUH); Gurais, 1-7-1919, *R. R. & I. D. Stewart 4302* (RAW); beyond Gurais, Neelum valley, 800', 12-7-1939, *D. F. Sanders s. n.* (BM); *ibid.*, 22-7-1876, *C. B. Clarke 29482C* (BM); Shishnag, 8-1938, *Dawarka Nath 29* (KUH); Sangam valley above Lidderwort, 11-12.000', 10-11-1893, *J. F. Duthie 13528* (E, BM); Kolahoi valley, c. 12.000', 27-8-1956, *O. Polunin 581* (E, B, BM); above Gurikot, Kamri, 10-11.000', 26-8-1892, *J. F. Duthie 12569* (E); Allyabad, Pirpanjal, 9-8-1901, *J. F. Duthie 25657* (RAW); **C-8 Kashmir:** Kishtwar near Atholi, 8.000', 22-7-1947, *Ludlow & Sheriff 9208* (BM).

Distribution. – W. Himalayas.

Ecology. – Grows in alpine meadows between 2000-3500 m.

Phenology. – July-November.

Medecinal uses. – Roots are used to control the high blood pressure and peristaltic movement of intestine. Plant is also considered poisonous.

3. *Inula racemosa* Hook. f., Fl. Brit. India 3: 292. 1881.

Syntypes: In Himalaya boreali-occidentali, *Falconer, Brandis & Hay* (K); Piti, alt. 9-10,000 ft., *Thomson* (K).

– *I. royleana* auct. non DC.: C. B. Clarke, Compos. Ind.: 118. 1876.

A stout perennial herb, 30-50 cm long, lax hirsute. Leaves coriaceous, elliptic-lanceolate, acuminate, upper sessile, base dilate, semiamplexicaul, lower long winged petiolate, margin

crenate-dentate, densely tomentose beneath, upper glabrous-scabrid, 16.5-30.5 × 3.8-11.4 cm. Capitula 3.5-5.0 cm in diameter, cymosely arranged. Involucral bracts 5-6 seriate, imbricate, outer foliaceous, ovate, 15-20 × 5-10 mm; inner membranous, linear, narrow. Marginal florets ligulate, 2-3-toothed. Central florets tubular, 5-toothed. Cypselae 3-4 mm long, glabrous. Pappus bristles uniseriate, 22-50 in number, 7-8 mm long, reddish brown.

Specimens examined. – **A-7 Chitral Dist.:** near Madaklash, 8.500', 7-7-1977, *Muqarrab Shah & Dilawar 1878* (ISL); **B-6 Chitral Dist.:** Drosh Gol, 6.200', *A. Bowes Lyon 160* (BM); **B-8 Kashmir:** 7.000', 8-1877, *C. B. Clarke s. n.* (K); *ibid.*, *T. Thomson* (K); Baramula, 5.200', 7-1934, *R. R. Stewart 14052* (KUH); Badwan-Chorwan, 12-7-1946, *R. R. & I. D. Stewart s. n.* (RAW); Kanzalwan to Badwan, Kishenganga valley, ± 7.800', 20-7-1940, *R. R. Stewart 19550* (RAW); Liddar valley, above Pulgam, 8.000', 3-8-1893, *J. F. Duthie 13456* (BM); **C-7 Hazara Dist.:** Haripur, *J. F. Duthie 25657/a* (RAW).

Distribution. – Afghanistan, Himalaya (Chitral to Nepal).

Ecology. – Grows between 1500-2500 m high altitudes.

Phenology. – July.

Vernacular name and medicinal uses. – Rasan. Roots are medicinally important. Seeds are bitter and aphrodisiac, strengthen the hairs and prevent from falling.

4. *Inula stewartii* Abid & Qaiser, *spec. nova* (Fig.1).

Holotype: Kashmir: Wardawan valley, 8-1912, *R. R. Stewart s. n.* (RAW!).

Herba perennis 30 cm alta, superne ramosa, hirsuta et glandulosa. Folia elliptico-lanceolata, acuminato-apiculata, margine leniter dentato; folia superiora sessilia semiamplexicaulia, inferiora basi gradatim attenuata et alato petiolata, 12-16 cm longa, 3.5-4.5 cm lata. Capitula 2-5, in corymbis laxis disposita, 3-3.5 cm diametro. Antherae apicibus acutis usque obtusis, texturae endothecii radiales. Styli pilis antrorse erectopatentibus haud usque ad furcam attingentibus. Lineae stigmaticae apicaliter confluentes sed basilater liberae. Involucrum 2.0 cm longum; bracteae 3-4 seriatas, imbricatae, exteriores foliaceae, lanceolatae, acuminatae, hirsutae glandulosaeque, 18 × 3 mm, interiores membranaceae, angustiores, dorsaliter glandulosae marginibus puberulis. Cypselae 3-4 mm longae, oblongae, quadrangulares, apicaliter puberulae. Pappus aureus, biseriatus, setosus, setae basaliter connatae, numero 36-52, 5 mm longae.

Perennial herb, c. 30 cm tall, branched above, hirsute and glandular. Leaves elliptic-lanceolate, acuminate-apiculate, margin slightly dentate; upper sessile, semiamplexicaul; lower gradually attenuate at base, 12-16 × 3.5-4.5 cm. Capitula 2-5, arranged in lax corymbs, 3-3.5 cm in diameter. Involucre 2.0 cm long; bracts 3-4 seriate, imbricate, outer foliaceous, lanceolate, acuminate, hirsute and glandular, 18 × 3 mm; inner membranous, narrower, dorsally glandular with puberulous margins. Cypselae 3-4 mm long, oblong, quadrangular, apically puberulous. Pappus bristles biseriata, golden yellow, basally connate, 36-52 in number, 5 mm long.

Inula stewartii is related to *I. helenium* L. in having sessile, semiamplexicaul upper and gradually attenuate (winged petiolate) lower leaves; capitula arranged in lax corymbs and quadrangular, apically puberulous and 3-4 mm long cypselae, but it differs by having hirsute and ± glandular hairs; outer involucral bracts lanceolate and upto 3 mm wide. Whereas, in *I. helenium* hairs are ± dense tomentose; outer involucral bracts ovate or lanceolate and 5 mm or more wide. On the other hand the new species also relates with *I. royleana*, *I. racemosa* and *I. koelzii* in having sessile, semiamplexicaul upper and gradually attenuate (winged petiolate) lower leaves; 3-4 mm long cypselae. But it clearly differs from all the three species by having lax corymbose capitula and 1/4 part of cypselae with pubescence. While, in *I. royleana*, *I. racemosa* and *I. koelzii* capitula are not in corymbs and cypselae are glabrous. Furthermore, from all the above mentioned three species, *I. stewartii* is much closer to *I. koelzii* in having biseriata pappus bristles and outer involucral bracts upto 3 mm wide. While, *I. royleana* and *I. racemosa* have uniseriate pappus bristles and outer involucral bracts 5-10 mm wide.

Specimens examined. – **B-9 Kashmir:** Wardawan valley, 8-1912, *R. R. Stewart s. n.* (RAW); Borso valley, alpine, Suru, 8-1912, *R. R. Stewart s. n.* (K).

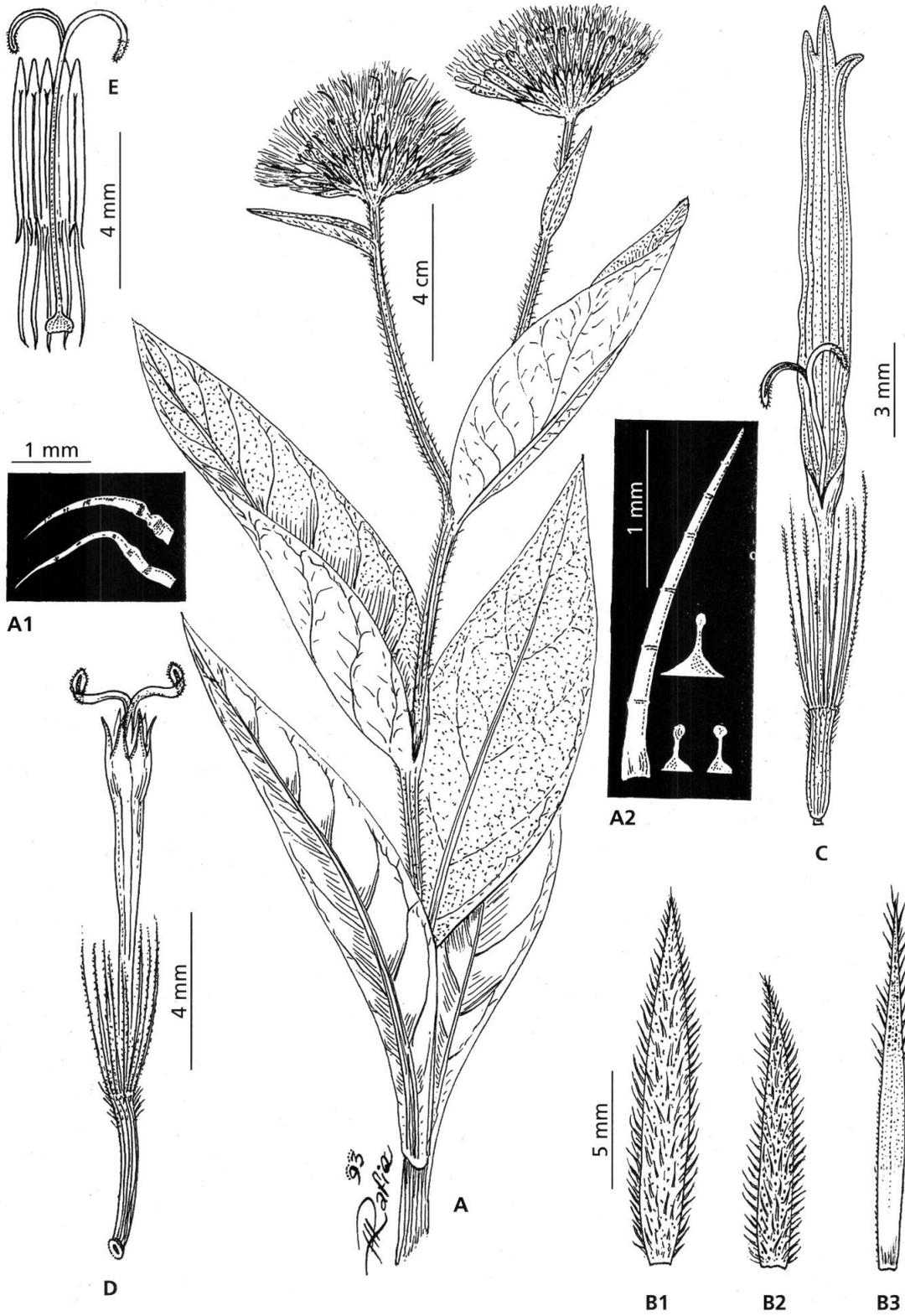


Fig. 1. – *Inula stewartii* Abid & Qaiser: **A**, habit; **A1**, **A2**, indumentum of stem and leaf; **B(1-3)**, involucre bracts (outer to inner); **C**, ray floret; **D**, disc floret; **E**, stamens, stigma and style.

Distribution. – Known from Kashmir only.

Ecology. – A plant of very high altitudes, growing in alpine meadows.

Etymology. – The species is named after the collector, Ralph Randles Stewart, who has collected all the specimens known of this species.

Phenology. – August.

5. *Inula orientalis* Lam., Encycl. 3: 255. 1789.

Type: Dans le Levant, *Tournefort* (Holo-: P-LA 16056; Iso-: BM).

= *I. grandiflora* Willd., Sp. Pl. 3: 2096. 1803.

Type: In Iberia (B, Hb. Willd. 16051, IDC No. 7440.1155-microfiche!).

= *I. barbata* Wall. ex DC., Prodr. 5: 470. 1836.

Type: Ad Srinaghur, *Blindworth* (G-DC, IDC No. 27.913-microfiche!).

Perennial herb, 30-46 cm long. Stem simple, hirsute, leafy throughout. Leaves semi-amplexicaul, elliptic-oblong, serrate-glandular, apex glandulose, upper surface, margins and nerves towards the lower surface long hirsute, 4-8(-10) × 1-2.8 cm. Capitula single terminal, 5-7.6 cm in diameter. Involucre 1.6-2.5 cm long, imbricate, 4-5-seriate, outer bracts herbaceous, linear-lanceolate, ciliate throughout, 25-38 × 3-5 mm; inner membranous, ciliate towards the apex. Marginal florets ligulate, 2.5-2.8 cm long. Central florets tubular, 0.6-0.8 cm long. Cypselae 1.0-2.0 mm long, sparsely hirsute. Pappus bristles 20-24 in number, 5-7 mm long, uniseriate, golden yellow.

Specimens examined. – **B-7 Hazara Dist.:** Kaghan, *s. coll.* 1760 (KUH); between Naran and Kaghan, 6-9-1988, *S. Omer & M. Qaiser* 2734 (KUH); *ibid.*, 8-9-1971, *S. M. A. Kazmi* 3606 (M); 8 miles from Mahandari on way to Kaghan, 31-8-1972, *M. Qaiser & Azmat Ali* 5228 (KUH); near PWD Rest house, Kaghan, 7.000', 11-8-1971, *S. Abedin & M. Qaiser* 8876, 8887 (KUH); Kaghan valley, 3-8-1896, *J. F. Duthie & Inayat* 19734/a (RAW); **Muzaffarabad Dist.:** Leepa valley, 6.600', 31-8-1969, *Jan Mohammad s. n.* (RAW); **Kashmir:** near Shishnag, Lidare valley, 11.000', 16-8-1946, *K. W. Vaid s. n.* (KUH); Sharda, Kishenganga valley, 23-9-1958, *Jan Mohammad* 160 (RAW); below Minimerig by stream, ± 9.000', 31-8-1939, *R. R. & I. D. Stewart* 19231 (RAW); between Sharda & Kail, 23-9-1987, *Tahir Ali, M. Qaiser & M. Ajmal* 534 (KUH); **B-8 Kashmir:** Pahlgam, damp place on 7.200', 20-8-1945, *R. R. & I. D. Stewart s. n.* (RAW); Liddar-wort, 9.500', 25-8-1956, *O. Polunin* 487 (E); Sonamarg, 9.000', 16-8-1921, *R.R. Stewart* 6687 (RAW); Gund, Sind valley, 7.000', 15-8-1940, *Ludlow & Sherriff* 7941 (E); **Tilail Dist.:** Barneinala, 9-10.000', 4-9-1893, *J. F. Duthie* 13969 (E); **N.W. Himalayas:** Chamba state, Pangi, 7-9.000', 5-8-1890, *Lace* 475 (E); *ibid.*, 18-9-1895, *Lace* 1256 (B); *ibid.*, 5-8-1899, *Duthie s. n.* (RAW); **C-8 Kashmir:** c. 30 km from Neelam on way to Sharda near Dosut, 23-9-1987, *Tahir Ali, M. Qaiser & M. Ajmal* 503 (KUH).

Distribution. – N. and E. Anatolia, Caucasus, Pakistan, India, Nepal (Himalayas).

Ecology. – Grows on damp places between 2000-3600 m.

Phenology. – August-September.

Medicinal uses. – Roots are aromatic and used to adulterant the roots of Kuth (*Saussurea lappa* C. B. Clarke).

6. *Inula clarkei* (Hook. f.) R. R. Stewart, Cat. Vasc. Pl. W. Pakistan Kashmir: 753. 1972.

= *I. obtusifolia* var. *clarkei* Hook. f., Fl. Brit. India 3: 294. 1881.

Syntypes: Mustag Pass, Kashmir, 11.500', *Clarke* (K); Lahul, *Jaeschke* (K).

Perennial herb. Stem white tomentose, branched from base. Leaves ovate-elliptic, acuminate-apiculate, entire, sessile, all surface tomentose but beneath more dense, 3-5 × 1-2(-2.5) cm. Capitula solitary terminal, 2.5-4.0 cm in diameter. Involucral bracts 4-5-seriate, outer herbaceous, lanceolate, acute, 8-14 × 2-3 mm; inner membranous, acuminate. Cypselae 2-3 mm long, dense sericeous. Pappus bristles uniseriate, 20-24 in number, 5-7 mm long, golden yellow.

Specimens examined. – **B-8/9** Baltistan: Satpura nullah, ± 9000', 25-6-1955, *E. Nasir & G. L. Webster 5804* (RAW); *ibid.*, 14-7-1892, *J. F. Duthie 12044* (BM); *ibid.*, 6-8-1940, *R. R. Stewart 20459* (RAW); Ashkoley, 11.500', 11-8-1876, *Clarke 30418 C* (K); Karakorum, north of Biafo, Base camp, 11-7-1962, *Hans Hartmann s. n.* (RAW); Gol to Kiris, ± 8000', 28-6-1955, *E. Nasir & G. L. Webster 5877* (RAW); **C-8** **Muzaffarabad Dist.:** Between Neelam & Sharda, Neelam valley, 31-8-1986, *M. Qaiser & Rizwan Y. Hashmi 7961* (KUH).

Distribution. – Pakistan (Himalayas-Karakorum).

Ecology. – Grows between 2400-3500 m.

Phenology. – June-August.

7. *Inula obtusifolia* A. Kern. in Ber. Naturwiss.-Med. Vereins Innsbruck 1: 111. 1870.

Type: In montibus altioribus in ditione Lahul, 13-14.000', *Jaeschke* (WU!).

Perennial herb, many stemmed. Stem green, leafy, very frequently monocephalous, dense papillate-glandular and long pilose. Leaves elliptic-lanceolate, acute-obtuse, entire-obscurely dentate, sessile, 3-7 × (1-)2-2.5(-4) cm. Capitula solitary terminal, 1.5-3.0 cm in diameter. Involucre depressed-semiglobose, bracts 4-5-seriate, regularly imbricate, outer most herbaceous-foliaceous, lanceolate-oblongate, acute-obtuse, 4-6 × 2-3 mm; inner membranous, acuminate. Marginal florets ligulate, 1-2 cm long. Cypselae 2-3 mm long, sericeous-villous. Pappus bristles uniseriate, 20-22 in number, 5-6 mm long, golden yellow.

Specimens examined. – **A-7** **Chitral Dist.:** Shankin nullah to Brir, 28-7-1954, *M. A. Siddiqui & Rahman 26817* (RAW); Shahgrameli hills, ± 10.000', 31-7-1976, *Muqarrab Shah, Dilawar & Ayaz 2389* (ISL); Laspur Gol S.E. of Mastuj, on dry cliffs, 11.000', 11-8-1958, *J. D. A. Stainton 3102* (E, BM); Laspur, 36° 2' N, 72° 27' E, 9.500', 24-7-1958, *S. A. Bowes Lyon 100* (E, BM); **Gilgit:** Between Gupis and Phander, ± 2400 m, 20-7-1990, *M. Qaiser, S. Omer & S. Z. Hus-sain 8414* (KUH); Phander and Pinjal, 5-7-74, *S. M. A. Kazmi 5818, 5866* (M); **A-8** **Gilgit:** Hunza, hot rocks, ± 8000', 12-8-1954, *R. R. Stewart s. n.* (RAW); Bunsar nullah, ± 8000', 4-8-1954, *R. R. Stewart s. n.* (RAW); Naltar, hot rocks, 11.000', 23-7-1954, *R. R. Stewart 26359* (RAW, BM); above Baltil, Hunza, 9.000', 12-8-1954, *R. R. Stewart 26358* (RAW); **B-6** **Swat Dist.:** Mountains W. of Kalam, 25 miles above Bahrein, alt. c. 7.000', 20-8-1952, *R. J. Rodin 5664* (RAW, K); Kalam-Utore, 2-9-1962, *Stewart, Nasir & Siddiqui 1294* (RAW); below Utore, 7-8.000', in rock crevices, 22-7-1953, *R. R. Stewart & A. Rahman 25153* (KUH, BM); Kalam, dry cliffs, 7-8.000', 21-8-1952, *R. R. Stewart 24659* (KUH, BM); **B-7** **Swat Dist.:** Dir, 12-8-1969, *M. Alam Khan 5* (RAW); Ushee valley, Falaksair nullah, 13 miles N. of Matiltan, 9.000-10.500', 3-9-1971, *S. M. A. Kazmi 3592* (M); **Kashmir:** Rawat et Yasin, 2.600-2.900 m, 29-8-1954, *F. Schmid 2372* (RAW, BM); **Hazara Dist.:** Dhirkot, 8.500', 15-6-1976, *Bowes Lyon 8036* (RAW, K); **B-8** **Gilgit Dist.:** Rupal-Gurikot, 22-7-1946, *R. R. & I. D. Stewart 21865* (RAW); **Kashmir:** behind Dal lake, 7.500', 14-8-1917, *R. R. Stewart 3282* (RAW); above Ratlu, upper Astor valley, 9.500', 20-8-1939, *R. R. Stewart 18803* (RAW); *ibid.*, 1880, *Giles s. n.* (K); *ibid.*, 24-7-1892, *Giles s. n.* (BM); **B-9** **Kashmir:** N.W-Karakorum, 1954, *H. K. Paffen 269* (M); above Bagnak, Ladakh on watered slope, alt. 15.000', 31-8-1931, *Walter Koelz 2778* (E, US); Bagicha to Olding, Indus valley, rock crevices, 9.500', 22-8-1940, *R. R. Stewart 21026* (RAW); **Ladakh Dist.:** Upshi, 12-13-8-1933, *Walter Koelz 6408* (US); Siachin glacier, 22-7-1947, *R. C. F. Schomburg 9* (BM); *ibid.*, 18-8-1947, *R. C. F. Schomburg 70* (BM); Henus nullah, Leh, 12.000', 4-7-1941, *Ludlow & Sherriff 8466* (BM); Nurmik, 14.000', 9-9-1947, *R. C. F. Schomburg 84* (BM); Khalse, Indus valley, 2.900', 4-7-1967, *F. Billet & J. Leonard 6809* (K); Kargil, Rabila, 27-28-8-1933, *Walter Koelz 6159* (US); on dry stony ground, 29-7-1937, *C. C. Burt 85* (E); *ibid.*, 12-8-1912-13, *R. R. Stewart s. n.* (KUH); Dras, ± 10.000', 30-8-1922, *R. R. Stewart 7397* (RAW); *ibid.*, 29-8-1940, *R. R. Stewart 21171* (RAW); **Baltistan:** Dras valley, 10-11.000', 22-8-1893, *J. F. Duthie 13694* (E, BM); **C-7** **N.W.Himalayas:** Pangi, Chamba state, 6.500', 9-1897, *Lace s. n.* (E).

Distribution. – Eastern Afghanistan, Pakistan, Kashmir-Nepal (?), China.

Ecology. – Grows in rock crevices, dry cliffs, slopes and stony grounds, 2000-4500 m.

Phenology. – June-August.

8. *Inula britannica* L., Sp. Pl.: 882. 1753.

Lectotype: Herb. Burser XV(1): 41 (UPS) (ANDERBERG, 1998).

Perennial herb, ± adpressed villous and glandular. Stem 22-40 cm long, erect, very frequently corymbose few-headed. Leaves lanceolate, acute-acuminate, base cordate-auricled, sessile, entire-minutely dentate, both surfaces ± villous but less densely so above and sometimes lower surface scarcely glandular, 5.5-9 × 1.5-2.0 cm. Capitula 2-2.5 cm in diameter. Involucral bracts flaccid, 3-4-seriate, outer subfoliaceous, linear-subulate, 8-25 × 2-5 mm, ± villous; inner membranous, puberulous and glandular. Marginal florets ligulate, usually about 10 mm long.

Central florets tubular. Cypselae 1-2.0 mm long, sparsely hirsute. Pappus bristles uniseriate, 20-24 in number, 5-6 mm long, reddish brown-golden.

Specimens examined. – **A-7 Gilgit Dist.:** Barkutti, Yasin area, 10-1956, *S. Ali s. n.* (RAW); **B-8 Kashmir:** Didikot, wet place, 6.000', 8-1939, *R. R. Stewart 54* (RAW); Badwan-Gurais, 7.800', *R. R. Stewart 212613* (RAW); Neelam valley, 8.300', 30-8-1939, *R. R. Stewart 19253* (RAW).

Distribution. – Kashmir, Iran, Turkey, W. Europe eastwards to China.

Ecology. – Grows in wet places, between 1800-2500 m.

Phenology. – February-August.

Medicinal uses. – Leaves and flowers are medicinally important.

9. *Inula acuminata* Royle ex DC., Prodr. 5: 471. 1836.

Type: In Indiae prov. boreali-occident, *Royle* (Holo-: G-DC, IDC No. 27.913-microfiche!; Iso-: LIV!).

Perennial herb, 25.5-46 cm long. Stem erect, lax leafy, corymbosely branched above, glabrous or ± villous-pubescent above. Leaves lanceolate or linear lanceolate, acuminate, base attenuate, otherwise base cordate-auricled, sessile, uppermost leaves narrow lanceolate, lower surface and margins pilose, 3.0-7.5 × 1.0-1.5 cm. Capitula few, 1.5-2.5 cm in diameter. Involucre depressed-semiglobose, outer bracts herbaceous, lanceolate, 5-15 × 1.5-2.0 mm; inner membranous, puberulous, linear, acute or acuminate. Marginal florets ligulate, 1.0-1.5 cm long. Central florets tubular, 5-toothed, ± 0.6 cm long. Cypselae 1.0-1.5 mm long, sparsely hirsute. Pappus bristles uniseriate, 22-28 in number, 5 mm long, golden yellow.

Specimens examined. – **A-7 Chitral:** Golen gol, 36°1'N, 72°10'E, 6.500', 12-7-1958, *S. A. Bowes-Lyon 22* (E, BM); N. of Mastuj, 8.000', 7-8-1958, *J. D. A. Stainton 3077* (RAW, E, BM); **Gilgit:** Chalt-nagar, 6.000', 8-8-1954, *R. R. Stewart 26356* (RAW, BM); **A-8/B-7:** Chalt, damp place, 6.000', 17-7-1954, *R. R. Stewart 26357* (RAW, BM); **Hazara Dist.:** Nathia gali, 12-7-1965, *S. M. A. Kazmi 2050* (M); **B-8 Kashmir:** *Royle 99/80* (LIV); Gurais valley, 8.000', 7-9-1893, *J. F. Duthie 13999* (E, K, BM); *ibid.*, 22-7-1876, *Clarke 29494* (K); *ibid.*, 27-7-1940, *R. R. Stewart 19662* (RAW); Ganderbal, Sindh valley, 5.300', 8-9-1922, *R. R. Stewart 7495* (KUH, RAW); **Baltistan:** Sandus, Skardu, 17-7-1978, *Mir Ajab & Nisar 1856* (ISL); Kalpana lake, Skardu, ± 6.000', 14-9-1976, *Awalbad Shah, Ashraf & Manzoor 289* (ISL); Skardu, 8.000', 25-8-1955, *E. Nasir & G. L. Webster 6566* (RAW, M); Shigar, 7.700', 15-8-1876, *Clarke 30493 A* (K); Opp. Khatphr, 9.000', *E. Nasir & G. L. Webster 6285* (RAW).

Distribution. – Temperate W. Himalayas, Pakistan-Kashmir.

Ecology. – Grows on damp places, between 1600- 2700 m.

Phenology. – July-September.

10. *Inula falconeri* Hook. f., Fl. Brit. India 3: 294. 1881.

Syntypes: Western Tibet, *Falconer 3933* (K!); Iskardo, alt.7-8.000', *Clarke 30027 A* (BM!); *ibid.*, *Clarke 30027 B* (K!); *ibid.*, *Clarke 30498 A* (K!).

Perennial herb, 23-35.5 cm long, glabrous-sparsely pubescent. Stem erect, above corymbosely branched. Leaves linear, acute-acuminate, cordate-auricled, upper surface glabrous, lower surface and margins pilose, veins very obscure, 3.5-6.5 × 0.5-1.5 cm. Capitula 1.5-2.5 cm in diameter. Involucre depressed-semiglobose, bracts 4-seriate, lanceolate or linear, 5-15 × 1.5-2.0 mm, acuminate, margins pubescent, dorsal surface scarcely glandular. Marginal florets ligulate, ± 1.0 cm long. Central florets ± 0.6 cm long, tubular, 5-toothed. Cypselae 1-1.5 mm long, sparsely hirsute. Pappus bristles uniseriate, 22-36 in number, 5 mm long, golden yellow.

This species is closely allied to *I. acuminata*, but differs by having linear, acute-acuminate leaves with very obscure veins below.

Specimens examined. – **B-8 Baltistan:** Kachora lake, Skardu, ± 8.000', 12-9-1976, *Awalbad Shah, Ashraf & Manzoor 199* (ISL); Skardu, 7.650', 4-8-1876, *C. B. Clarke 30027 A* (BM); *ibid.*, *C. B. Clarke 30027 B* (K); *ibid.*, 16-8-1876,

C. B. Clarke 30498 A (K); *ibid.*, 18-8-1966, *M. A. Siddiqi, Y. Nasir & Zaffar 4182* (K, BM); *ibid.*, 7-8-1940, *R. R. Stewart 20484* (KUH, RAW).

Distribution. – Pakistan (Himalayas-Karakorum), W. Tibet.

Ecology. – Grows between 230-2400 m high altitudes.

Phenology. – August.

11. *Inula rhizocephala* Schrenk in Fisch. & C. A. Mey., Enum. Pl. Nov. 1: 51. 1841.

Type: In promontorio montium Tarbagatai, d. 14 Augusti m. lecti, *Schrenk* (LE).

= *I. rhizocephaloides* C. B. Clarke, Compos. Ind.: 124. 1876.

≡ *I. rhizocephala* var. *rhizocephaloides* (C. B. Clarke) Kitam., Pl. W. Pakistan Afghanistan: 150. 1964.

Syntypes: In Dras, Himalayae boreali-occidentalis ad 7.000-9.000 ped; In Ladak, ad 12.000-14.000 ped. leg. *Stoliczka* (CAL).

= *I. rhizocephala* var. *intermedia* Kitam., Pl. W. Pakistan Afghanistan: 150. 1964.

Type: Hindukush, Ghizar, 3.000 m, 29-7-1957, *K. Ogino 280* (KYO).

Stemless, perennial herb. Leaves numerous, all radical, rosulate, oblanceolate-spathulate, obtuse or acute, entire-dentate, towards the base gradually contracted into indistinct petiole, margins and both surfaces ciliate, (2.5-)3.5-5.5(-6.0) × (0.8-)1-1.8(-2.0) cm, including indistinct petiole. Capitula few or numerous, sessile, glomerate in center. Involucre 1.2 cm long, bracts 3-4-seriate, linear, upper half of outer bracts herbaceous, acute, 1-8 × 0.5-1.5 mm; inner narrow, acuminate, ± purplish. Marginal florets ligulate, 3-toothed. Central florets tubular, 5-toothed. Cypselae 1.5-2.0 mm long, glabrous-pubescent. Pappus bristles 2-3-seriate, 20-38 in number, 6-8 mm long, reddish brown-golden.

KITAMURA (1964) recognized *I. rhizocephala* var. *intermedia* Kitam., on the basis of presence of hairs on cypselae. The treatment was also followed by STEWART (1972). The authors has observed numerous specimens which have glabrous-semiglabrous cypselae, thus a continuum is formed, and *I. rhizocephala* var. *intermedia* Kitam. is reduced to the synonymy of *I. rhizocephala* Schrenk.

Specimens examined. – **A-6 Chitral Dist.:** Gazin Gol, 10.500', 18-6-1888, *S. A. Bowes Lyon 946* (BM); Gokshal, 2.420 m, 7-7-1977, *Hakim Khan s. n.* (RAW); **A-7 Chitral Dist.:** Baroghil Pass, 12.500', 24-7-1958, *J. D. A. Stainton 2980* (BM); Barum Gol, 10.000', 29-6-1958, *J. D. A. Stainton 2783* (BM); Barum Gol, Shokor Shal, 3.500 m, 15-7-1950, *Wendelbo s. n.* (BM, K); Shah Janali, 11.000', *Dr. Giles s. n.* (K); **Gilgit Agency:** Nagar state, Minapin glacier, 11.500', 21-8-1961, *Lloyd & Megaw 99* (BM); *ibid.*, 10.000', 1-8-1961, *Lloyd & Megaw 11* (BM); Naltar valley, 28-6-1986, *A. Rashid 1088* (KUH); Mahthanter gah, 11.000', 8-8-1954, *F. Schmid 2207* (RAW, BM); Between Gupis and Phander, ± 2.520 m, 20-7-1990, *M. Qaiser, S. Omer & S. Z. Husain 8420* (KUH); **A-8 Gilgit Dist.:** Gilgit above Baltil, Hunza, 9-10.000', 12-8-1954, *R. R. Stewart 26365* (RAW, BM); **B-6 Chitral Dist.:** Rosh Gol, 22-8-1981, *Kamal A. Malik & S. Nazimuddin 1691* (KUH); Brimbset, 29-7-1954, *M. A. Siddiqi & A. Rahman 26816* (RAW, BM); Bombrait, 23-7-1956, *A. R. Baig 1507* (RAW); **B-7 Chitral Dist.:** Madaglasht, 10.000', 6-1908, *Toppin 1918* (K); **Swat Dist.:** Gabral, 4-8-1970, *F. Grohmain 6314* (RAW); **B-8 Gilgit Dist.:** Rama valley, S. W. Astor, 10.500', 30-7-1967, *T. E. Larkets 1307* (BM); Rama valley, S. W. of Astor between Rama and Rama lake, ± 12.000', 30-8-1988, *S. Omer & M. Qaiser 2391* (KUH); Rama, ± 10,000', 12-8-1955, *E. Nasir & G. L. Webster 6445* (RAW, K); *ibid.*, 30-8-1988, *S. Omer & M. Qaiser 2360* (KUH); Lower Rupal nullah, 8.500', 22-8-1939, *R. R. Stewart 18859* (RAW); **Baltistan Dist.:** Dras, 10.000', 23-8-1893, *Duthie 13716* (K, BM); *ibid.*, 1-9-1922, *R. R. Stewart 1922* (RAW); *ibid.*, 7-9.000', *T. Thomson* (K, BM); **C-8 Kashmir:** Rama, Kishenganga valley and the road to Nangapurbat, 26-7-1946, *R. R. & I. D. Stewart s. n.* (RAW); Zaskar, Ramtasha, 11.500', 21-7-1981, *s. coll. s. n.* (BM); **B-9 Kashmir:** Bragnag-Ladakh, *Walter Koelz A64* (KUH); **Baltistan Dist.:** Thallela, 15-8-1940, *R. R. Stewart 20762* (RAW).

Distribution. – Pakistan, India, Kashmir, Afghanistan, E. Iran and Central Asia.

Ecology. – Grows on very high altitudes between 2100-3800 m.

Phenology. – June-August.

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