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A REVISION OF THE GENUS *GEUM* (ROSACEAE) IN INDIA[1]

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ABSTRACT

The paper presents a revision of the genus *Geum* L. with correct nomenclature, typification, diagnostic key for identification and notes on anatomy, cytology and ecology, as available in respect of the eight taxa occurring in India. Subg. *Geniculohirtistylis* Panigrahi & Purohit (based on *G. macrosepalum* Ludlow) and *G. aequilobatum* Purohit & Panigrahi as additional taxa and *G. aleppicum* Jacq. as a new record for India, are established.

INTRODUCTION

Geum L. (from Greek, *geuo*, to give a relish referring to the roots of *G. urbanum* L.) of the family *Rosaceae*, with five species from Europe and the U. S. A. was described by Linnaeus (1753, 1754). It is lectotypified by *Geum urbanum* L. (Britton and Brown, 1913).

Airy Shaw (1973) adapted the classification proposed by Rocke (1888), but raised two of the six subfamilies viz. *Neuradoideae* (DC.) Focke and *Chrysobalanoideae* (R. Br.) Focke to the status of distinct families viz. *Neuradaceae* J. G. Agardh (1958) and *Chrysobalanaceae* R. Br. (1818) respectively, co-ordinate in rank with the family *Rosaceae* Juss. He included *Geum* L. in the subfamily *Rosoideae* Focke, tribe *Potentilleae* Juss., subtribe *Dryadinae* Focke.

Geum L. *sensu lato* accredited with 60-70 species grouped under eleven subgenera in the world flora (Robertson, 1974) is represented in India by eight taxa assigned to three subgenera viz. (i) subg. *Geum* (ii) subg. *Micracomastylis* (F. Bolle) Robertson and (iii) subg. *Geniculohirtistylis* Panigrahi & Purohit (1981).

SYSTEMATIC ACCOUNT

Geum L. Sp. Pl. **1** : 500. 1753 *et* Gen. Pl. ed. **5** : 220. 1754 ; Jussieu, Gen. Pl.; 374. 1791; Seringe in DC. Prodr. **2** : 550. 1825; J. D. Hooker, Fl. Brit. Ind. **2** : 342. 1878; Focke in Engler & Prantl, Natural. Pflanzenfam. **3**(3) : 36. 1888; Juzepczuk in Komarov, Fl. USSR. **10** : 187 (1941) 1971; Gajewski, Monogr. Bot. **4** : 3-416. 1957 *et* in Tutin *et al.*, Fl. Europ. **2** : 34. 1968; Schonbeck-Temesy in K. H. Rechinger, Fl. Iran. **66** : 116. 1969; Airy Shaw, Willis-Dict. Fl. Pl. & Ferns : 487. 1973; Robertson, J. Arnold Arbor. **55** : 382. 1974. *Lectotype species : Geum urbanum* L. (selected by Britton and Brown, 1913).

Sieversia Willd. Ges. Naturf. Fr. Berlin Mag. **5** : 397-398. 1811. *Lectotype species : Seversia anemonoides* Willd. (selected by Rydberg. 1913).

Acomastylis E. L. Greene, Leaflets Bot.

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Obs. **1** : 174. 1906. *Lectotype species.: Acomastylis rossii* (R. Br.) E. L. Greene (—*Sieversia rossii* R. Br.) (selected by Rydberg *l. c.*)

Herbs perennial with erect or suberect ±prominent caudex. *Radical leaves* ±lyrately pinnate, pinnatifid, or lobed with terminal leaflet rhombicovate, suborbicular or cordate, sub-trilobed and several pairs of small cuneate lateral leaflets interrupted by still smaller leaflets; floral stems ± branched bearing *cauline leaves* which are ternate or 3-5-partite, often simple upward. *Stipules* adnate, persistent. *Inflorescence* of solitary flowers or in corymbi- from cyme (Monochasial cyme-monotelic- Troll 1964, 1969; Panigrahi & Panigrahi 1977) large, pentamerous, generally yellow but sometimes white, red or pinkish to orange-purple. *Hypanthium* saucer-shaped, campanulate or turbinate, generally bearing epicalyx. *Sepals* 5, imbricatevalvate. *Petals* 5, elliptic, spatulate, orbicular, obovate or cuneate, rarely clawed. *Stamens* 20 to many in several series, filaments free, glabrous, rarely pubescent; anthers yellow. *Carpels* several to many in a head, free, glabrous or pubescent; style borne on the top of the ovary, glabrous, entire and wholly persistent or geniculate near, below or above the middle, with distal part hairy and deciduous, proximal part (rostrum) glabrous or plumose below, straight or hooked persistent; stigma punctiform. *Fruit* an aggregate of achenes not enclosed by the hypanthium. *Seeds* unitegmic (Corner, 1976).

T. Kowal and A. Krupinska (1969) classify the fruits *Geum* as a dry drupe rather than an achene, since they exhibit sclerenchymatisation of the endocarp. The species are normally outbreeders but are also self-compatible (Gajewski, 1959).

Cytology : Geum L. represents a polyploid complex with X=7, but no diploid species of Geum with 2n=14 is known as yet. Most of the taxa of the subg. *Geum* investigated so for are hexaploids (2n=42), a few tetraploids (2n=28) and 12-ploid (2n=84) and one 16-ploid (2n= 112), whereas *G. rossii* (R. Br.) is an Octoploid with 2n=56. The chromosomes are mostly small (1.5 μm to 2.5 μm) and uniform in size and shape (Gajewski, 1957, 1959; Love & Love, 1961). None of the Indian species have yet been cytologically studied except *G. aleppicum* which is reported with 2n=42 from Japan (Yamazaki, 1936).

Gajewski (*l. c.*) noted that in spite of great morphological differentiation and several polyploid levels, the crossability between different species is surprisingly high. According to him, *Geum* presents many interesting general problems: the role of geographical and ecological isolation *vis-a-vis* polyploidy and hybridization in the process of speciation.

As the hybrids between some of the species-groups are still partially fertile on account of homology in certain pairs of chromosomes in the genomes brought together, Gajewski (1957) considered it reasonable to keep them together in one genus but subdivided it to many subgenera to discern obscure phylogenetic relationships between related taxa.

Ecology. The genus endures severe frost and cold, generally occurring in mesic habitats, in stony places, pastures, meadows, mountain summits, steppes and open glades of arctic, alpine or subalpine regions.

Distribution. 60-70 species, primarily of the northern temperate zones, with many species of arctic or alpine regions or of moist boreal forests; absent from the tropics; a few species occur in the mountains of South America and in South Africa, Tasmania, New Zealand and the Auckland Islands. In India, six species belonging to three subgenera occur in the

Himalayas.

The subg. *Geum* comprising 25 species has a wider distribution with several species occurring in Europe, North America, Asia (including the Himalayas), and in the Andes of South America with only one species endemic to South Africa.

The subg. *Micracomastylis* comprising ten species has three disjunctive centres of distribution: (a) arctic and subarctic zones on both sides of the Behring strait (2 spp.); (b) the Himalayan region with 2 spp.; (c) the Rocky and the Roan mountains of the U. S. A. (the remaining six spp.).

The monotypic subg. *Geniculohirtistylis* represented by *G. macrosepalum* is endemic to India (Sikkim and Arunachal Pradesh), Bhutan and South-eastern Tibet and probably also Nepal.

Gajewski (1959) would explain such discontinuous distribution of the genus *Geum* L. as resulting from its probable origin in arcto-tertiary forests.

KEY TO THE INFRAGENERIC TAXA

1a. Styles jointed or geniculate, differentiated into a proximal (rostrum) and a distal part, only the latter deciduous; entirely or interruptedly hairy

2a. Styles constricted below the middle, hairy throughout except at the very apex, distal part 3-4 times longer than the rostrum, the latter not hooked at the tip ....subg. *Geniculohirtistylis*

(Petals with a distinct claw and with a praemorsus apex, hairy throughout; stamens up to 1 cm long, filaments hairy; sepals broadly (about 1 cm) ovate)

....*G. macrosepalum* Ludlow

2b. Styles geniculate near or above the middle, rostrum glabrous except at the very base, 2-3 times longer than the distal part and hooked at the tip; the distal part hairy throughout....Subg. *GEUM*

3a. Achenes C. 250 in number; carpel head obovate; petals golden yellow; radical leaves long petioled (up to 9.5 cm) ..*G. aleppicum*

3b. Achenes 70-80 in number ; carpel head spherical; petals pale yellow; radical leaves short-petioled (up to 6 cm)

4a. Terminal leaflet of the radical leaves obovate, ± same size as the lateral ones; stamens c. 110 in number ....*G. aequilobatum*

4b. Terminal leaflet of the radical leaves suborbicular, cordate or rhombic-ovate, distinctly larger than the nearest lateral ones; Stamens 60-80 in number ....*G. roylei*

1b. Styles straight entire, wholly persistent in fruit; glabrous except at the very base ..Subg. *Micracomastylis*

5a. Radical leaves with a large orbicular or cordate terminal lobe, very much exceeding the lateral ones; petals white or pinkish-white, rounded with cuneate base, not much exceeding the calyx lobes; stamens c. 100, filaments hairy ....*G. sikkimense*

5b. Radical leaves with broadly ovate to suborbicular terminal lobe, not much exceeding the lateral ones; petals yellow, obcordate, glabrous, twice the length of the calyx lobes; stamens 50-60, filaments glabrous ....*G. elatum*

6a. Lateral lobes of the radical leaves closely-set (up to 1.5 cm apart), the reduced ones fewer (7 pairs); flowers generally solitary; plants low-growing (up to 35 cm high) .....var. *humile*

6b. Lateral lobes of the radical leaves generally distantly set (2 to 5 cm apart), the reduced ones numerous (7-12) pairs; flowers 2-6 per peduncle; plants tall growing (up to 100 cm high)..var. *elatum*

7a. Petals yellow, filaments white ....forma *elatum*

7b. Petals and filaments red ....forma *rubrum*

I Subg. *GEUM*

Subg. *Eugeum* Torrey & Gray, Fl. N.

Am. **1** : 420. 1840; Focke in Engler and Prantl, Naturl. Pflanzenfam. (3) **3:** 36. 1888; Gajewski, Monogr. Bot. **4:** 11. 1957.

Sect. *Eugeum* Boiss. Fl. Or. **2** : 696. 1872.

Sect. *Geum* proper *sensu* J. D. Hooker, Fl. Brit. Ind. **2** : 342. 1878.

1. *Geum roylei* Wall. ex Bollein Fedde, Repert. Beih. **72** : 66. 1933; Gajewski *L. C.* : 52; Schonbeck-Temesy in K. H. Rechinger, Fl. Iran. **66** : 121. 1969; Stewart, Fl. W. Pak. : 352. 1972. *Type:* North-west temperate Himalayan regions, 1525-2440 m, *Thomson s. n.* (W, K).

G. urbanum sensu J. D. Hooker *l. c.* : 342; *non* L. 1753.

G. roylei Wall. Num. List no. 713. 1829, *nom. nud.*

Although we have not examined the type, the microfiche of *Wallich* 713 (CAL from "Mons chour Dam", *Royle s. n.*, which was named *G. roylei* Wall. and cited as a paratype by Bolle, has been critically studied. Two more sheets representing *Wallich* 713 from Choor and Cashmere are also deposited in Royle herbarium (LIV) (Edmondson, 20 Mar. 1981 *in litt.*)

Ecology. On humus soil, in Oak-*Rhododendron* forest, common near streams, forest edges, shrubby formations.

Distribution : India (Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim), Nepal, Pakistan, Afghanistan and Iran.

Representative specimens examined : JAMMU & KASHMIR : *sine loc*, 1847, *J. E. Winterbottom* 394 (CAL); Lidderwort, 3000 m, 30 Sept. 1961, *B. M. Wadhwa & J. N. Vohra* 291 (CAL): Pirpanjal, 2745 m, 20 Aug. 1891, *G. A. Gammie s. n.* (DD); Dorus, 1525 m, 3 June 1958, *H. D. Thapliyal* 26420 (D); Patani top/Sannasar, 2300-2500 m, 11 Sept. 1958, *T. A. Rao* 7436 (BSD); Pahalgam, 2400 m, 23 Jul. 1966, *N. C. Nair* 36906 (BSD); *sine loc*, Oct. 1953, *Kaul and Party s. n.* (LWG); Khillanmarg, 3355 m, 22 May 1954, *G. S. Srivastava* 10612 (LWG.)

HIMACHAL PRADESH : Pulga, 20 June 1950, *S. K. Jain and R. C. Bharadwaja s. n.* (DD); Thalli Suked nala, 2000 m, 19 June 1974, *B. M. Wadhwa* 53033 (BSD); Dharamsala, 3050 m, 17 Oct. 1874, *C. B. Clarke* 23935 (CAL); Bashahr, Sdeeling, 2745 m, 30 June 1890, *J. H. Lace* 342 (CAL); Simla, 2135 m, 23 June 1877, *J. S. Gamble* 4414B (DD); *ibid.*, May 1917, *H. G. Carter* 1917 (BSIS); *Ibid.*, 2440 m, 16 May 1954, *Ram Singh* 7201 (LWG); Jako Hill, 13 May 1959, *J. G. Srivastava and Party* 59840 (LWG); Sungri, 15 June 1891, *G. Watt* 13553 (BSIS); Chamba, Haola, June 1878, *G. Watt* 1226 (BSIS); Kulu, Parbati valley, Dhara, 2745 m, 19 June 1934, *C. E. Parkinson* 4129 (DD); Lahul, Manali 2592 m, 11 May 1941, *N. L. Bor* 14114 (DD); Kinnaur, Pangi, 2575 m, 5 June, 1962, *N. C. Nair* 22452 (BSD).

UTTAR PRADESH : Rana village, Jamuna valley, 2135 m, 10 June 1951, *D. D. Awasthi* 2546 (LWG); Dhaulivalley, 2745-3050 m, 7 Aug. 1886, *J. F. Duthie* 5496 (DD); Near Mussoorie, 1869, *G. King s. n.* (CAL). Tehri-Garhwal, San chatti, 2000 m, 17 June, 1961, *M. A. Rau* 15802 (CAL); Ghaugarea, 3000 m, 16 Aug. 1963, *U. C. Bhattacharyya* 29387 (BSD); Trijuginarayan, 2500 m, 25 May 1972 *B. D. Naithani* 47974 (BSD); Uttarkashi Forest Division, below Dodital, 2745 m, 26 May 1956, *K. C. Sahni* 24810 (DD); Kumaon; above Namik, 13 May 1848, *R. Strachey and J. E. Winterbottom s.n.* (CAL); Nainital, Laryakanta, 15 May 1954, *S. K. Jain* 9625 (LWG); Bamnaigad, 26 Apr. 1895, *U. N. Kanjilal* 437 (ASSAM).

SIKKIM. Mupurie range, 1869, *G. King s. n.* (CAL); North-western Himalaya, *sine lect, s. n.* (CAL).

2. *Geum aleppicum* Jacq. Ic. Pl. rar. **1** : 10. t. 93. 1786; Juzepczuk in Komarov, Fl. USSR. **10** : 190. 1941 1971; Gajewski l. *c.* : 60 *et* in Fl. Europ. **2** : 36. 1968; Schonbeck-Temesy in K. H. Rechinger, Fl. Iran **66** : 119. 1969. *Lectotype:* Specimen Cult. (W!, selected by Schonbeck-Temesy, 1969).

G. ranunculoides Ser. Mem. Soc. Phys. Genev. **2:** 138. 1824 *et* in DC. Prodr. 2**:** 551. 1825. *Type :* (Unknown (*Patria ign.*) (G-DC, microfiche no. 551. 12-CAL:).

Ecology : Thinned out forest and forest edges, meadows, shrubby slopes, roadsides, residential areas.

Distribution: India (Jammu & Kashmir), Mongolia, China, Japan, Central Europe and North America. A new record for India.

Anatomy : T. S. of Pericarp and of seed-coat show a single layer of stony cells and 2-3 layers of spongy tissue, the former with a cuticular layer (Kowal & Krupinska, 1969, t. 9. fig. 1a, b.).

Cytology : 2n=42 (Yamazaki 1936; Gajewski 1957, 1959; Love and Love, 1961).

Specimen examined : JAMMU & KASHMIR: Pahalgam, 2700 m, July 1956, *T. A. Rao* 505 (BSD); Ibid., 2135 m, 23 Sept. 1961, *B. M. Wadhwa and J. N. Vohra* 183 (CAL); Sind valley, 24 June 1892, *J. F. Duthie* 11452 (CAL,DD); Yarikhal 2220 m, 27 June, 1956, *T. A. Rao* 15 (BSD); Badarkal forest, Kauraj Division, Jhelum valley, 2440-2745 m, 30 June 1906, *Keshavanand* 170 (DD); Tangmarg, Yarikhan farm, 2135 m, 29 June 1955, *Kaul and Party* 23457 (LWG); *Ibid.*, 22 Oct. 1953, *Kaul & Party s. n.* (LWG); Chandigam, Lolab valley, 2000 m, 13 June 1959, *T. A. Rao* 9464 (BSD); Gilgit, 1885, *G. M. Giles s. n.* (CAL); Sanogar, 2300 m, 4 Jul. 1800, *Giles* 393 (DD); Khaipore, Kashmir valley, 2135 m, 17 Jul. 1891, *G. A. Gammie s. n.* (DD).

3. *Geum aequilobatum* Purohit & Panigrahi, Bull. Bot. Surv. Ind. **21** : 205. 1981.

Holotype : INDIA. Uttar Pradesh: Tehri-Garhwal, on the way to Ghuttu, 8 June 1972. *B. D. Naithani* 48206 (CAL; Isotype-BSD!).

Ecology : Common in Oak-*Rhododendron* forest.

Distribution : Known by the type collection only.

II. Subg. *MICRACOMASTYLIS* (F.Bolle) K. R. Robertson, J. Arnold Arbor. **55** : 384. 1974. *Lectotype species : Geum rossii* (R. Br.) Ser. (=*Sieversia rossii* R. Br.) (=*Acomastylis rossii* (R. Br.) Greene) Sect. *Sieversia* (Willd.) Boiss. Fl. Or. **2** : 698. 1872; J. D. Hooker *l. c.* : 343.

Acomastylis E. L. Greene, Leaflets Bot. Obs. **1** : 174. 1906. *Lectotype species : Acomastylis rossii* (R. Br.) Greene (=*Geum rossii* (R. Br.) Ser.) (selected by Rydberg, 1913).

Geum Subg. *Acomastylis* (E. L. Greene) Gajewski ex Schonbeck-Temesy *l. c.* :121, 1969. *nom. Superfl. illegit.*

4. *Geum elatum* Wall. ex G. Don, Gen. Syst. **2** : 526. 1832; J. D. Hooker *l. c.:* 343; Evans, Notes R. B. G. Edinb. **14** : 28, t. 195. 1923; Schonbeck-Temesy *l. c. :* 121; Stewart, Fl. W. Pal.: 352. 1972. *Lectotype :* INDIA. Himachal Pradesh: Sirmore, *Dr. Govan* vide Wall. Num. List no. 711(2). 1829 (K, selected by Evans *l. c.*, Photo-CAL ;).

Sieversia elata Royle, III. Bot. Himal. Mount. **2** : t. 39. fig. 1. 1834 *et l* : 207. 1835. *Type :* INDIA. Uttar Pradesh: Kedarkanta (12.8, 64/30. LIV, Edmondson, 20 Mar. 1981 *in litt.;* Photo-CAL.).

Geum elatum Wall. ex. G. Don var. *leiocarpum* Evans *l. c.:* 29; *Syntypes:* Alpine Himalaya, locality uncertain, Wall. Num. List no. 711, *p. p.* (E); *J. R. Reid s. n.* (E, Photos-CAL;).

Acomsastylis elata (Wall. ex. G. Don)

Bolle in Fedde, Repert. Beih. **72** : 83. 1933.

Geum elatum Wall. Num. List no. 711. 1829, *nom. nud.*

(A) var. *elatum*

(i) forma *elatum*

G. elatum var. *typicum* Evans *l. c.* : 28

G. elatum var. *leiocarpum* Evans *l. c.*: 29.

Ecology : Common on rocky and grassy hill slopes, apline meadows, near glacier base.

Distribution : India (Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim), Nepal, China (Tibet) and Pakistan.

Anatomy : *T. S. of pericarp* shows a single layer of stony cells and a spongy tissue of 4-5 layers of cells, protected by a cuticular layer. *T. S. of seed-coat* reveals a thick spongy tissue with 3-4 layers of cells (Kowal and Krupinska, 1969, t. 9 fig. 10a, b.)

Uses : Root officinal in Kashmir. It is a great remedy for many diseases. Whole plant is used as astringent, tonic, stomachic, also in dysentery, diarrhoea, sore throat and leucorrhoea (Kirtikar and Basu, 1935; Chopra, Nayar and Chopra, 1956).

Representative specimens examined : JAMMU & KASHMIR: Pirpunjal, 3355 m, 6 Jul. 1876, *C. B. Clarke* 28872 (CAL): *sine loc*, 20 June, 1847, *J. E. Winterbottom* 488 (CAL); Chilas, 3355 m, 24 Aug. 1962, *B. N. Wadhwa and J. N. Vohra* 613 (CAL); Apharwat, 3965 m, 11 Sept. 1929, *Div. Forest Officer* 118 (DD); *Ibid.*, Aug. 1956, *G. Saran and Party* 31697 (LWG); Khilan marg, 3800 m, 22 June 1959, *T. A. Rao* 9626 (BSD); *sine loc*, 1955, *Kaul and Party s. n.* (LWG); Bhutunali, above Badgaun 3660-3965 m, 12 Sept. 1909, *Keshavanand* 1497(DD); Seshnag, 3600m, 2 Sept. 1972 *M. A. Rau* 50304 (CAL); *Ibid.*, 25 Jul. 1966, *N. C. Nair* 36966 (BSD).

HIMACHAL PRADESH : Dharamsala, 3055 m, 18 Oct. 1874, *C. B. Clarke* 2449 (CAL); Sach pass, 3050-3060 m, 6 Sept. 1895, *J. H. Lace* 1233 (CAL, BSIS); Lahul, Rohtang pass, 4425 m, 16 Sept. 1961, *N. C. Nair* 17075 (BSD); *Ibid.*, 30 June 1962, *N. P. Singh* 22928 (CAL); Khote, 3660 m, 31 May 1941, *M. L. Bor* 14507 (DD); Chotadorni, 3600 m 19 Jul. 1972, *U. C. Bhattacharyya* 48752 (BSD); beyond Simla, on morarle, 2745-3355 m, 5 June 1888, *C. R. Browne* 7278 (DD); Pangi, Kilar, Aug. 1878, *G. King s. n.* (BSIS); Kangra valley, Choota Bangahal, 3965 m, 9 Sept. 1955, *K. M. Vaid* 24269 (DD).

UTTAR PRADESH : Lowarpiass, 2745 m, June *W. Gatson* 17166 (DD); Kogal near Chur, 20 Jul. 1853, *Jameson s. n.* (DD); Tehri-Garhwal, 1864, *Falconer* 387 (CAL); Ganges valley, ridge above Jhala, 3660 m, 29 June 1883, *J. F. Duthie* 1066 (CAL); Jumnotri, 3200 m, 15 June 1961, *M. A. Rau* 15752 (CAL, BSD); Kauri pass, 3965 m, 8 Sept. 1880, *J. F. Duthie* 3970 (DD); Kedarkanta, 3202 m, 6 Sept. 1955, *K. C. Sahni* 29171 (DD); near Bander Punch, 3660 m, 9 June 1960, *K. C. Sahni* 24912 (DD); Rambra-Kedarnath, 3000 m, 13 Aug. 1978, *M. A. Rau* 38732 (BSD); Duthi, above Jumnotri, 3812-3965 m, 22 June 1951, *D. D. Awasthi*-2522 (LWG); on way to Lokpal, 4270 m, 24 Sept. 1955, *B. N. Ghildyal s. n.* (LWG); Kumaon, Tejum, 4300 m, 11 Aug. 1972, *C. M. Arora* 49834 (CAL); Bhatia khan, 3900-4000 m, 9 Aug. 1972, *C. M. Arora* 49751 (BSD).

SIKKIM : Bijan, 1888, *King's collector s. n.* (CAL); Betechuppa, 3355 m, 10 June 1886, *E. R. Johnson s. n.* (CAL); Phedap, Oct. 1908, *Ribu* 293 (CAL); Tsomgo, 3660 m, 9 Aug. 1945, *Bor's collector* 287 (D.D); Gamothang, 3965 m, 12

Aug. 1913, *sine lect.* 1065 (DJ*); Sherathang, 3355 m, 24 Oct. 1916, *G. H. Cave s. n.* (DJ).

After critical examination of the specimens of *G. elatum* in BM, Ludlow (1976) refuted Evans's (1923) arguments and merged var. *leiocarpum* Evans in var. *elatum* and stated that the hispid or glabrous nature of the achenes in *G. elatum* complex is not mutually exclusive for varietal distinctions, some biotypes showing achenes, which are neither hispid nor completely glabrous but show a limited amount of hairiness at the apex, a view with which we agree.

(ii) forma *rubrum* Ludlow, Bull Brit. Mus. N. H. **5**(5) : 276, t. 30. 1976.

Holotype : NEPAL. Hills south of Jumla, 3500 m, 2 Jul. 1952, *Polunin, Sykes and Williams* 4419 (BM, Iconotype-Ludlow l. *c. t.* 308).

Ecology : Grows abundatly on marshy grounds on grassy slopes and open moorland above tree level between 3500 and 4250 m.

Distribution : India (Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh) and Nepal.

Specimens examined : JAMMU & KASHMIR. Tutmari pass, Mawar basin Jhelum valley, 2745-3660 m, 8 Jul. 1906, *Keshavanand* 194 (DD).

HIMACHAL PRADESH : *sine loc, G. Watt* 1583 (CAL).

UTTAR PRADESH : Kumaon, Pindari, 3050 m, 24 June 1882, *H. Collett* 66 (CAL).

(B) Var. *humile* (Royle) J. D. Hooker, Fl.Brit.Ind.**2:** 343.1878; Evans *l. c.:* 28. t. 196; Kitamura in Kihara, Faun. Fl. Nepal Himal. **1** : 149. 1955. *Sieversia elata* var. *humile* Royle, Ill. Bot. Himal. Mount. **1:**207. 1835. *Type:* North-western Himalaya, Shalma, *Royle s. n.* (LIV, Edmondson, 20 Mar. 1981 *in* litt.).

Potentilla adnata Wall. ex Lehm. Nov. et Minus Cognit. Stirp, Pugill. **9 :** 9. 1851, *et* Revis. Potent.; 47. t. 17. 1856. *Type locality :* "India Orientali".

Acomastylis elata (Wall *ex* G. Don) F. Bolle var. *humilis* (Royle) F.Bolle in Fedde, Repert. Beih. **72 :** 84. 1933.

Geum adnatum Wall. Num. List no. 712. 1829, *nom. nud.*

Distribution : India (Uttar Pradesh, Sikkim) and Nepal.

Notes : J. E. Dandy of EM in his letter no. JED/SB dated 10 April 1958 addressed to H. Stansfield, writes, "..The sheet from Shalma (which Royle doubtfully compared with *Geum montanum,* and then gave to it the Mss. name *Geum auriculatum,* and which he finally designated *As Sieversia*) is probably the type of his var. *humile* "caule unifloro, follisque minore" (Ill. Bot. Himal. Mts., p. 207).

Unfortunately, this gathering is in a very imperfect state. Originally there was a single flower-head but this has been broken off and apparently lost, and the flowering stem and a basal leaf have also become detached from the parent plant. I thought at one time that the lost flower-head might have been placed by mistake in the paper capsule accompanying his No. 64/30, but a careful examination of the contents of this packet shows that this is not the case, and that its contents belong entirely to the Kedarkanta gathering. There remains the mysterious pencil-drawing of an achene with a looped style on the label of this Shalma gathering. This most certainly does not represent the style of either *Geum elatum* or its variety *humile,* but rather that of *Geum urbanum* (*G. roylei* Wall. 713). How this sketch came to appear on this Shalma label I cannot possibly say, and it is not much use to suggest that it was made on this label in

*DJ is abbreviated here for the herbarium of Lloyd Bot. Garden, Darjeeling.

mistake for one of the *Geum urbanum* (*G. roylei*) lebels for this is pure conjecture. What is clear is that the foliage and flowering stem of this Shalma gathering are those of *Geum elatum*, and that the size of the leaves and the flowering stem all seem to indicate that this is the plant Royle had before him when he described var. *humile*."

Specimens examined : SIKKIM: Above changu, 3965 m, 6 Jul. 1910, *W. W. Smith* 3174, 3089 (CAL, DD); Singalelah range, 3965 m, 15 June 1891, *G. A. Gammie s. n.* (CAL); *ibid.*, 3872 m, 17 June 1891, *G. A. Gammie* 125 (CAL); *sine loc*, 1887, *King's collector s. n.* (CAL); Tankra, 4575 m, 4 Aug. 1891, *G. A. Gammie* 563 (CAL); *ibid.*, 30 Aug. 1892, *G. A. Gammie s. n.* (CAL); Migoural, 3660 m, Jul. 1888, *King's collector s. n.* (CAL); Joo-koo-la, 14 Jul. 1877, *G. King* 4337 (CAL); Cho'la, Jul. 1882, *G. King's collector s. n.* (CAL); *sine loc*, 1892, *G. A. Gammie s. n.* (CAL); Patang la, 17 Jul. 1877, *G. King* 4393 (CAL); *ibid.*, 18 Jul. 1877, *G. King* 4392 (CAL); *sine loc, Basil Gould* 1081, 1145 (DD); *sine loc*, 4575 m, *J. D. Hooker s. n.* (K, Photo-CAL); *sine loc*, labelled *Geum adnatum* Wall. (K, Photo-CAL, BSI Neg. No. 4078 A;); Jongri, 3965 m, 4 June 1954, *S. N. Mitra* 9584 (CAL); Onglathang near Jongri, 1888, *King's collector s. n.* (CAL); Megu, 3965 m, Sept. 1905, *G. H. Cave s. n.* (DJ).

5. *Geum sikkimense* Prain, Journ. Asiat. Soc. Beng. **73**(2) : 200, t. 7. 1904; Evans, Notes R. B. G. Edinb. **14** : 195, t. 27. 1923; Ludlow, Bull Brit. Mus. N. H. **5**(5) : 272. 1976, *descr. emend. Lectotype :* INDIA. Sikkim: Onglathang near Jongri, June 1887 *King's collector s. n.* (K, selected by Ludlow, 1976; Isolectotype-CAL);.

Acomastylis sikkimensis (Prain) F. Bolle in Fedde, Repert. Beih. **72** : 83. 1933; Hara & Ohashi in Hara, Fl. E. Himal. : 118. 1966.

Geum versipatella Marquand in Curtis, Bot. Mag. **157:** t. 9344. 1934.

Type locality : Nepal. Iconotype-Marquand l. *c.* t. 9344.

Ecology : On grassy hill sides.

Distribution : India (Sikkim), Nepal and Bhutan.

Specimens examined : SIKKIM: Onglathang, June 1887, *King's collector s. n.* (CAL); *sine loc*, 1887, *King's collector s. n.* (CAL); Olakthang, Oct. 1908, *Ribu* 55 (CAL); Above Bhoubhanjan, 3660 m, June 1906, *G. H. Cave s. n.* (DJ).

III. Subg. *GENICULOHIRTISTYLIS* Panigrahi & Purohit, Bull. Bot. Surv. Ind. **21** : 128. 1981

Type species : Geum macrosepalum Ludlow.

6. *Geum macaosepalum* Ludlow, Bull. Brit. Mus. (N. H.) **5** (5) : 271, t. 30A. 1976.

Holotype : BHUTAN : Pangothang, Tsampa, 4200 m, *Ludlow, Sheriff & Hicks* 19171 (BM, Photo-CAL :).

Ecology : Common on open grassy hill sides.

Distribution : India (Sikkim, Arunachal Pradesh), Bhutan and China (South-eastern Tibet).

Specimens examined : SIKKIM : Hewalungi, Sept. 1901, *Prain's collector* 204 (CAL); Bijan, 1888, *King's collector s. n.* (CAL); *sine loc*, 1905, *Prain's collector* 937 (CAL); Megu, 3965 m, Sept. 1905, *G. H. Cave s. n.* (DJ).

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