Since the water of the springs which is emanating from within the area is not stagnant, therefore, the chances of its mineral dissolving potentialities from terrestrial system is considerably reduced. But whatever amount of minerals is present in the waters, calcium is prominent within cations and bicarbonate is dominant within anions. Carbonate ions are conspicuously absent. From the same table it is also apparent that each cation and anion has insignificant variation within their ionic parameters. The pH values clearly reveal that waters are almost neutral in reaction except water sample-1 which is feebly acidic in nature. The soluble sodium percentage is varying from 15.05 in water sample-1 to 20.0 in water sample-3. The residual carbonate is present only in two water samples 1 and 2, whereas remaining two are free from such content. The waters have also an insignificant variation within the values of sodium adsorption ratio which are ranging from 0.16 in the water sample-1 to 0.22 in the water sample-3.

From the above discussions it is amply indicated that water regime in the system is deficient with respect to mineral status. But our simultaneous work on soils and forage grasses of the same area clearly suggests that they contain adequate mineral reserves. These mineral rich forage grasses may surely be compensating mineral deficiency caused due to water in herbivorous animals which otherwise may be lacking in the case of carnivorous animals. To compensate such mineral deficiencies specially in carnivorous animals, it is suggested, therefore, that salt licks having sufficient minerals may be placed in the entire reserve for proper management of the wildlife.

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GNAPHALIUM COARCTATUM WILLD.—A SOUTH AMERICAN TAXON NATURALISED IN CHAMBA DISTRICT (HIMACHAL PRADESH), INDIA

Ever since May 1983, the authors are engaged in the systematic studies on the flora of Chamba district of Himachal Pradesh (Western Himalaya). A species of *Gnaphalium* Linn. (family Asteraceae) was collected on four different occasions which after prolonged investigations and subsequent confirmation at Kew Herbarium was identified as G. *coarctatum* Willd. (Plate I). This is a South American species (Grierson 1980 as 'Spicatum', Hilliard 1983) and has not been reported earlier from India by Hooker (1881) or in the subsequent compilatory lists of new records to Indian flora (Calder *et al.* 1926, Razi 1959, Nayar & Ramamurthy 1973, Nayar and Karthikeyan 1981). According to Santapau & Henry (1973), in India the genus *Gnaphalium* is represented by eight species, the same number as reported by Hooker (1881). Apparently G. *coarctatum*

Willd. is a new introduction to the Indian flora. Some relevant information regarding the species is given below :

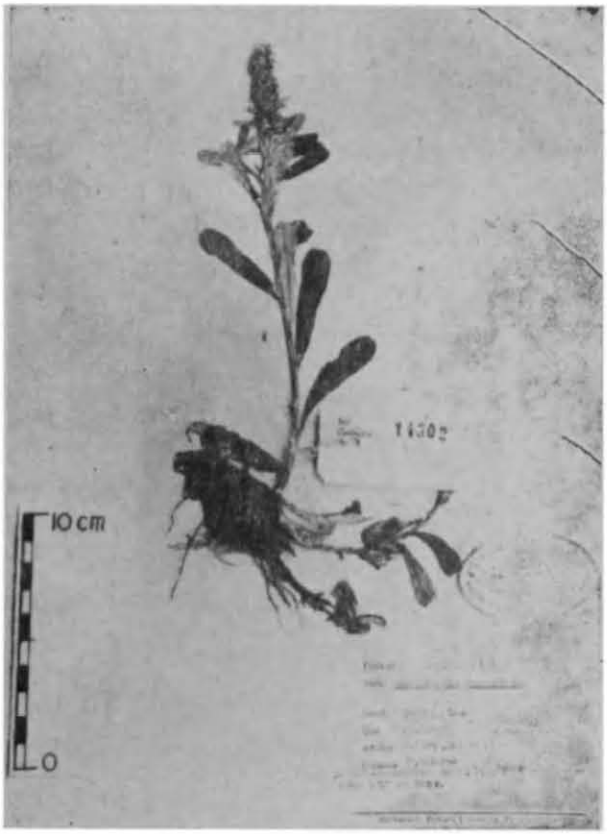


Plate I. *Gnaphalium coarctatum* Willd. A plant showing habit and discolorous leaves.

Gnaphalium coarctatum Willd. Sp. Pl. 3 : 1886. 1804 ; Hilliard in Leistner, Fl. S. Afr. 33 (Pt. 7, fasc. 2) : 28. 1983. *G. spicatum* Lam. Encycl. 2 : 757. 1788, non Mill. 1768 ; Grierson, Notes Royal Bot. Gard. Edinb. 31 : 138. 1971 ; in Dassanayake and Fosberg, Rev. Handb. Fl. Ceylon 1 : 197. 1980. *Gamochaeta spicata* (Lam.) Cabrera, Bol. Soc. Argent. Bot. 9 : 380. 1961 ; Fl. Prov. Buenos Aires 174. 1963.

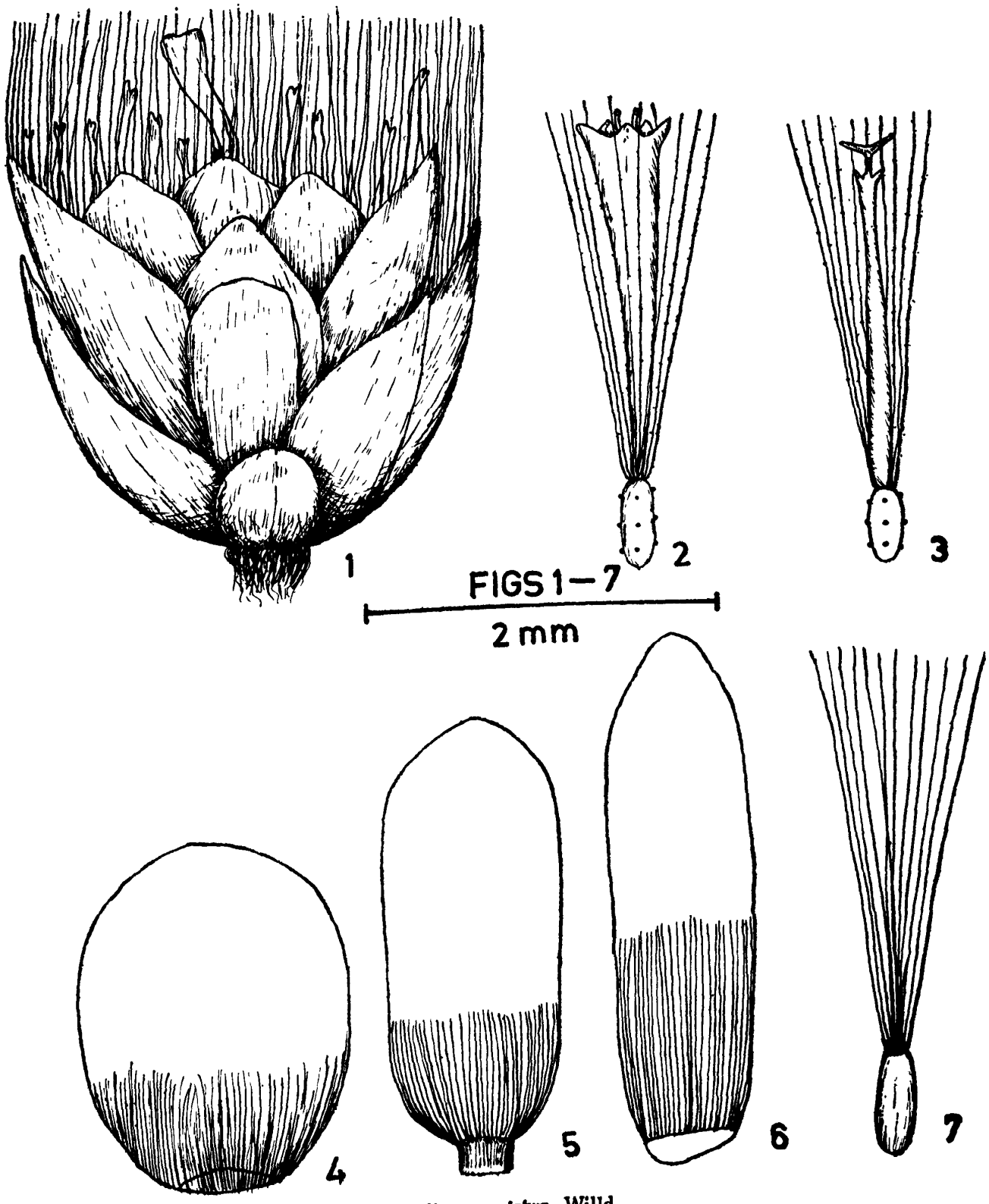
An annual-perennial herb, simple or branched from the base. Stems 9-30 cm long, erect or decumbent, appressed whitish tomentose. Leaves in a basal rosette and cauline, becoming progressively smaller upwards and passing into inflorescence bracts (0.5-2 cm long), 2-7.5 × 0.4-2 cm oblanceolate or spathulate, entire but with somewhat crisped margins, obtuse or subacute, apiculate, noticeably discolorous, green (often drying brownish) and glabrous or very sparsely araneose on the upper surface, appressed whitish tomentose beneath. Capitula 2.5-3 × 2-2.5 mm campanulate or somewhat urceolate, heterogamous, discoid, numerous in short axillary clusters forming a more or less interrupted spicate inflorescence. Involucral bracts 3-seriate ; outer bracts 1.5-2 mm long, ovate-elliptic, araneose only at the base, otherwise glabrous ; innermost bracts about equalling the florets, oblong or oblong-lanceolate, tips reddish-purple at first, later golden brown, araneose at base. Florets 2-2.5 mm long, whitish tipped reddish-purple ; females 50-70, bisexuals 2-3. Corolla of female florets filiform, 3-4-toothed ; those of bisexual florets narrowly tubular, dilated upwards, 5-toothed. Achenes 0.4-0.5 mm long, oblong, minutely glandular. Pappus hairs whitish, ±2.5 mm long, scabrid, bases fused in a smooth ring, deciduous.

Specimens described : Chamba 915 m, Nainikhud 985 m ; *Harinder Singh* 13992, 14501 (PUN). Panjpula Dalhousie 2000 m, Bathri Dalhousie 1200 m ; *M. Sharma* 14267, 14302 (PUN).

Fls. & Frts. : March-October.

Distribution : Native of South America.

Though we have collected the specimens on four different occasions, nowhere the plants were found to be common. In the area under survey, the plants were growing in waste places, preferably on rocky grounds between 900-2,000 m. This species has been variously described as annual or biennial (Hilliard 1983) or perennial herb (Grierson 1980). In fact, the latter author has used this as a 'key' character. Field and herbarium studies have indicated that the plants show annual to (generally) perennial habit,



Gnaphalium coarctatum Willd.

Figs. 1-7. 1. A capitulum. 2. A bisexual floret. 3. A female floret. 4-6. Involucral bracts. 7. An achene.

The plants start appearing during February at lower elevations where flowering starts during March-April. At higher elevations, however, the radical rosette of leaves appears later from rootstock when the temperature starts rising or the snow melts completely. During winter aerial parts die down. This species is likely to be confused with another superficially similar looking and widely naturalized North American species in India, *viz. G. pensylvanicum* Willd. (Syn. *G. peregrinum* Fern., *G. purpureum auct. pl.* non Linn.). In the field the latter species can be easily recognized because of leaves (1.5-5.5 cm long) subtending the capitula so that the inflorescence is conspicuously leafy. In *G. coarctatum,* on the other hand, these leaves are short (0.5-2 cm long) and may remain almost hidden by the clusters of capitula in the younger inflorescence. Consequently, the inflorescence is not prominently leafy or appears to be almost leafless. Besides, the present taxon has markedly discolorous leaves. In the 'discolorous leaves' character, *G. hypoleucum* DC., common in Western Himalaya including Chamba district, is the only Indian species that approaches the present taxon. However, *G. hypoleucum* is characterized by linear, acuminate leaves and yellowish or golden, glistening capitula in corymbose, leafless clusters.

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