



Floral phenology of *Artemisia sieversiana* Ehrh. ex Willd.: a temperate species

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Artemisia L. is an important genus of family Asteraceae having a large number of taxa with both economic and ecological importance. Many species of the genus are very abundant and significant in a wide range of habitats. Almost every species of the genus *Artemisia* finds use as a source of medicine, food, forage or other useful products in one way or other. *Artemisia sieversiana* Ehrh. ex Willd. is one among these. The decoction of leaves and flowers of this species acts as wormicide and it is also a source of 'siersin' and 'sieversinin' having antimicrobial properties (Nazarenko and Leont'eva 1966). The chemical composition of *Artemisia sieversiana* essential oil has also been studied (Suleimenov *et al.* 2009).

In India, the species abounds the Himalayan belt including the state of Jammu and Kashmir, where it is reported from Leh district and adjoining areas. The present study is based on the plants collected and studied from Leh district of Ladakh. The wild populations of the species were tagged at Sakti, Kharu and Hemis regions in Leh at altitudinal ranges of 3258-3835 masl. The region is characterized by harsh climatic conditions and very complex soil formation patterns. The plant inhabits rocky areas and dry slopes of these regions.

Plants of *Artemisia sieversiana* Ehrh. ex Willd. are strongly aromatic, annual herbs. Stem is tall, ribbed and branched above (Fig.1A). Leaves are petiolate, broadly ovate with pinnatisect segments and hairy on both the surfaces. Flowers are borne on hemispherical capitula arranged on a spike (Fig.1B). The average size of individual capitulum is $0.3 \pm 0.02 \times 0.43 \pm 0.03$ cms and its circumference averages 1.48 ± 0.01 cms. Each capitulum is heterogamous consisting of central hermaphrodite disc florets and peripheral female ray florets. Number of florets per capitulum is high averaging 121.9 with the disc florets outnumbering the ray florets (100: 21.9) in great numbers.

The plants of *Artemisia sieversiana* come into flowering in the month of July and remain in flowering till mid September. Average temperature during these months ranges between 27 - 32°C (Ladakh Autonomous Hill Development Council, 2013). Anthesis in this plant species is marked by the opening of peripheral ray florets and the emergence of its style along with adpressed stigmatic lobes (Fig.1C a). After a gap of one or two days, the disc florets also initiate opening by the formation of small slit towards the apical portion of the corolla tube (Fig.1D). Disc florets are protandrous with anther dehiscence preceding stigma receptivity by a minimum of two days. Stigma receptivity in the species is retained for a long time. As the style grows out of the floral tube, the stigmatic lobes start opening and then divert to the opposite directions (Fig.1C b-d). These curvings expose the inner stigmatic portion (which is its receptive part) to the outside (Fig.1C e). These events take 2-3 days, thereafter the stigma both on ray and disc florets remains in the receptive condition for 6-7 days, then it dries up and shrivelles.

Fruit set is complete in the month of October. Fruit is a cypsela as in other composites (Fig.1E). By the end of October and starting November, the seeds are dispersed and the above ground part of the plant dries up. During the winter months of December to March, when there is heavy snowfall and temperature in the area drops to minimum of -12.4°C, the species survives by an underground rhizome which sprouts in the month of April when the snow melts.

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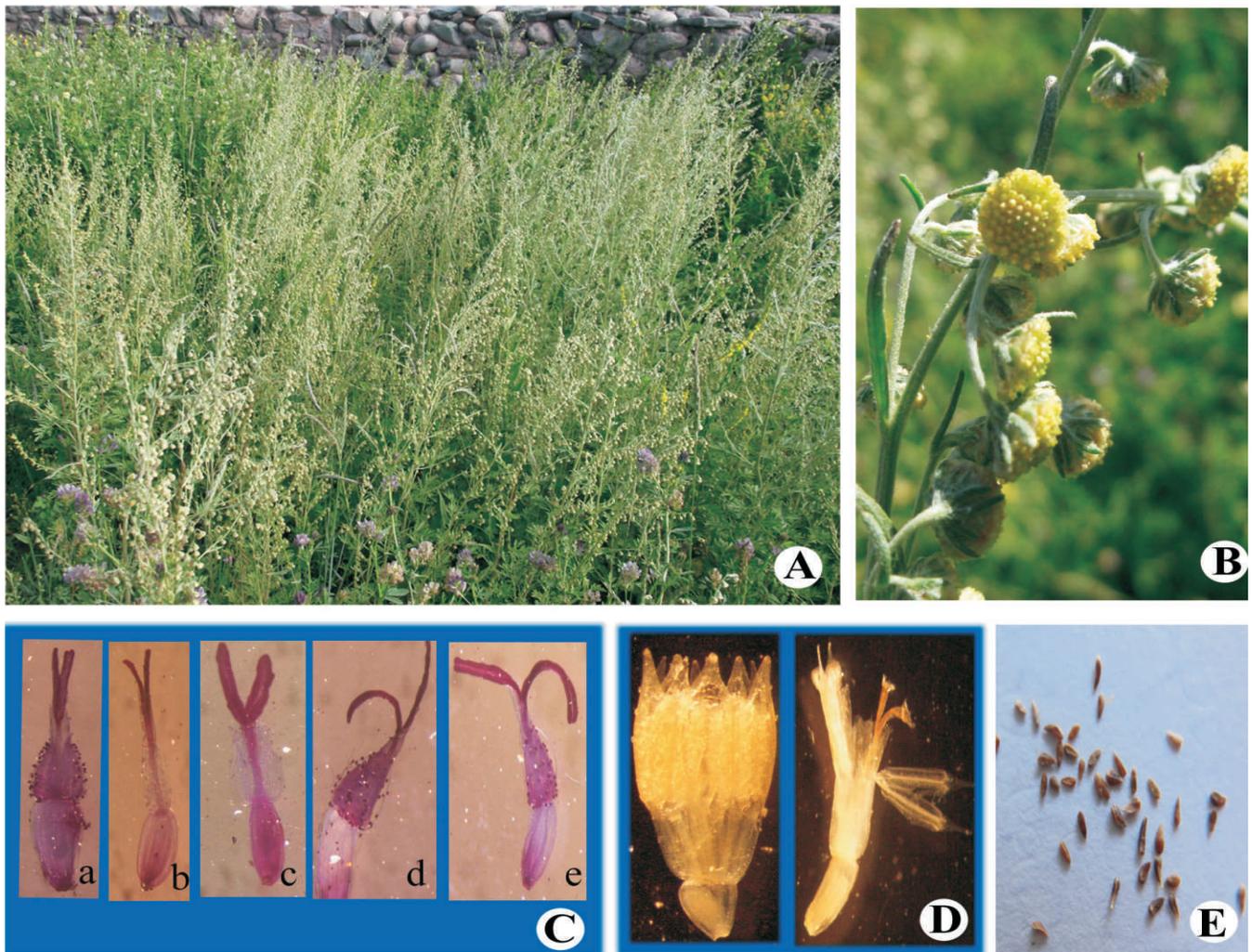


Fig. 1— *Artemisia sieversiana* plants and floral parts. A. Wild plants growing at Kharu, Leh; B. Floral heads; C. a, b, c, d & e. Stigmas of ray florets showing curvature; D. Disc florets; E. Seeds.