

TABLE I  
Number of flowers emasculated and pod set in different stages

Emasculation timings		Pollination timings							
		Morning				Evening			
		Bud stage at pollination time							
		Close	Open	Drop	Total	Close	Open	Drop	Total
Morning	Flowers emasculated	..	81	..	81	33	47	6	86
	Pod set	..	5	..	5	0	11	0	11
Evening	Flowers emasculated	31	54	17	102	..	90	..	90
	Pod set	0	17	0	17	..	5	..	5

of emasculatation, pollination and the selection of proper bud stage.

This investigation was conducted using two newly developed strains of mungbean, namely, ML1 and ML4. ML1 was used as female parent and ML4 as male parent. Two different times of emasculatation and pollination, viz., morning from 8.00 to 11.00 a.m. and evening from 4.00 to 6.30 p.m.; were chosen. This resulted in four combinations, namely: (i) morning emasculatation, morning pollination, (ii) morning emasculatation, evening pollination, (iii) evening emasculatation, evening pollination and (iv) evening emasculatation followed by pollination next morning. Buds of three different stages recognised by the colour, viz., green, yellowish green, and greenish yellow were emasculated. The emasculatation and pollination of flower buds were done as suggested by Boiling *et al.* (1961). At the time of pollination the emasculated buds were observed to be closed, opened and dropped. It was noted that emasculated buds of green colour either dropped before pollination or during pollination. Yellowish green emasculated buds were fully blossomed (open stage), while greenish yellow emasculated buds were observed to be closed at the time of pollination. Therefore, only the last two categories of buds were pollinated.

The emasculated buds were pollinated according to the schedule. The data regarding the flowers emasculated and the pod setting in different flower stages are presented in Table I.

It is clear from Table I that evening emasculatation followed by next morning pollination gave the highest pod setting of 17 pods out of 102 buds emasculated (17%) and the next in order was the morning emasculatation followed by evening pollination resulting in 11 pods out of 86 buds emasculated (13%). Based on number of pollinations made the per cent pod setting was 20% and 14% respectively. Furthermore, it was noted that simultaneous emasculatation and pollination either in the morning or evening gave very low pod set, viz., 5-6%.

It was very much interesting to note that the flowers that remained closed at pollination time did not set any pod, while whole of the pod setting was observed in those buds which blossomed (remained open) at the pollination time. Non-setting of pods in the flowers that were closed at pollination time may be due to the fact that the female was no more receptive.

It is, therefore, suggested from the present study that high percentage of pod setting in *Phaseolus aureus* can be obtained by following emasculatation of yellowish green (open) stage) buds in the evening (4.00 p.m. to 6.30 p.m.) and pollination of only blossomed flowers in the next morning (8.00 a.m. to 11.00 a.m.). The applicability of these findings were also tested in interspecific hybridization between *Phaseolus aureus* and *Phaseolus mungo* and a pod setting up to 34% has been achieved.

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Ludhiana, January 1, 1974.

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#### ONTOGENY, STRUCTURE AND DISTRIBUTION OF TRICHOMES ON THE FLORAL PARTS OF *CELSIA COROMANDELIANA* VAHL.

VARIOUS types of trichome occur on plants and their taxonomic significance has been emphasized by several workers especially in respect of the families Compositae (Carlquist<sup>2-4</sup>, Ramayya<sup>9</sup>); Icacinaceae (Heintzelman and Howard<sup>6</sup>); Labiatae (Mathur<sup>8</sup>); Lentibulariaceae (Farooq and Siddiqui<sup>3</sup>) and Scrophulariaceae (Kaur<sup>7</sup>). Bachmann<sup>1</sup> investigated the structure of hairs in many angiosperm taxa and presented a key for their identification.

The present note deals with the ontogeny, structure and distribution of trichomes on the floral parts of *Celsia coromandeliana*. The buds and flowers were collected from the bank of river

Yamuna, Delhi, and were fixed in formalin-acetic-alcohol. Conventional methods of dehydration, infiltration and embedding were followed. Sections were cut at a thickness of 5–8 microns and stained either in safranin or iron-alum haematoxylin with fast green as counterstain.

**Trichomes on Bracts and Sepals.**—The trichome is initiated as a protuberance from any epidermal cell which is distinguishable by its dense cytoplasm and conspicuous nucleus (Fig. 1 A). This cell elongates and divides transversely to form a terminal and a basal cell (Fig. 1 B). Further divisions are confined to the terminal cell whereas the basal cell

functions as the foot (Fig. 1 B–F). The derivatives of the terminal cell lead to the formation of a file of two (Fig. 1 C), three (Fig. 1 D) and four cells (Fig. 1 E). Further divisions in the apical cell of the file, however, are vertical and result in the formation of head (Fig. 1 F–H). In its final structure the multicellular trichome can be divided into three regions: (a) Foot, (b) Stalk, made up of 3 or 4 septate, highly vacuolated cells, with meagre cytoplasm and (c) Head, comprising 4 to 8 cells with dense cytoplasm and prominent nuclei. Trichomes of this type occur abundantly on bracts and sepals, are absent from the petals and sporadically occur on the pistil.

**Trichomes on Stamens.**—The trichomes on the basal part of the filament are long, unicellular and non-septate. An epidermal cell destined to develop as a trichome elongates to form a long, unicellular structure (Fig. 1 I–M). The nucleus, which is initially situated at the base (Fig. 1 J), migrates towards the tip as the hair matures (Fig. 1 M).

Studies on the ontogeny, structure and distribution of the epidermal appendages of the floral parts of *Verbascum thapsus* (unpublished observations) show that they are characterised by the presence of highly branched trichomes on the bracts and sepals. The pistil is also heavily clothed with numerous branched hairs. *Celsia coromandeliana* differs from *Verbascum thapsus* in having uniseriate trichomes on bracts and sepals and very few trichomes on the pistil. The present study indicates that *C. coromandeliana* is not *pro parte V. thapsus* and supports their status as independent taxa.

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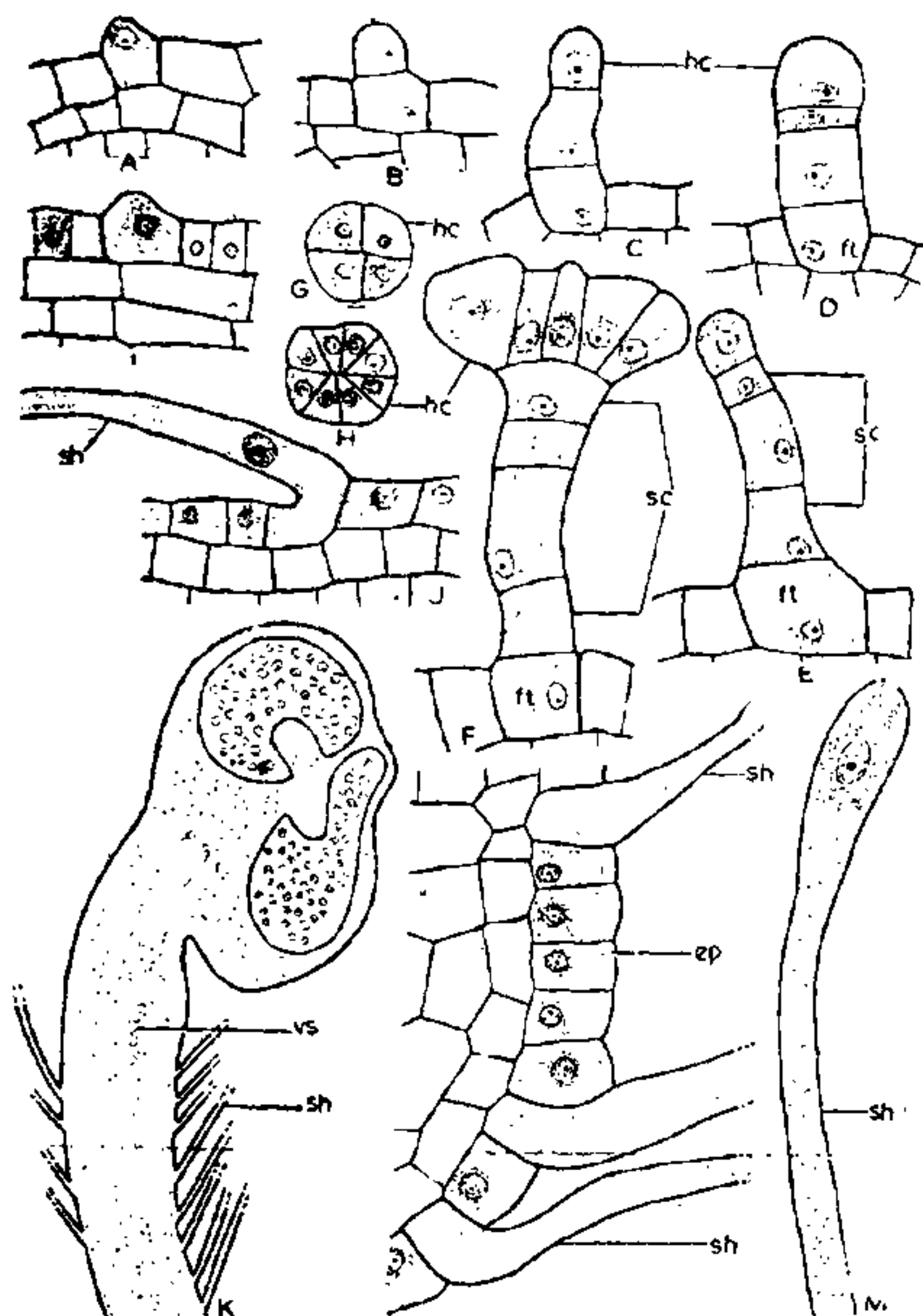


FIG. 1. A–M. Ontogeny of trichomes in *Celsia coromandeliana*. A. Hair initial,  $\times 342$ ; B–E. Two, three, four and five-celled stages of trichomes respectively,  $\times 342$ ; F. Trichome with a head,  $\times 342$ ; G, H. Transections through four- and eight-celled head of trichome,  $\times 342$ ; I, J. Portions of staminal filaments showing elongation of epidermal cells to form unicellular hairs,  $\times 342$ ; K. Longitudinal section of stamen (diagrammatic) to show the distribution of trichomes on the filament,  $\times 342$ ; L. Portion of filament to show details of the basal part of the trichomes,  $\times 342$ ; M. Mature hair showing a terminally situated nucleus,  $\times 142$ . (ep, epidermis; ft, foot cell; hc, head cell; sc, stalk cells; sh, staminal hair; vs, vascular strand.)

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9. Ramayya, N., *Ibid.*, 1963, 32, 27.

\*Not seen in original.