Epidermal studies of *Parthenium hysterophorus* Linn. from Saurashtra

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Epidermal structure and ontogeny of stomata and trichomes in vegetative and floral organs of *Parthenium hysterophorus* is presented. Mature stomata are anomocytic and perigenous in development. Some of the mature stomata simulate with anisocytic and paracytic depending on the place where the meristemoids are cut off. Abnormalities such as cytoplasmic connection and degeneration of one of the guard cells are seen. Organographic distribution of stomata, trichomes, frequency of stomata, epidermal cells, stomatal index per unit area and size of guard and epidermal cells are charted.

Key-words - Epidermal structure, trichomes.

INTRODUCTION

PARTHENIUM HYSTEROPHORUS Linn. is fast migrating troublesome exotic noxious weed. It has been reported from different parts of our country. It migrates along railway lines and road ways. Metcalfe and Chalk (1950, 1979) recorded glandular and eglandular trichomes and ranunculous stomata in the family Asteraceae (Compositae). Ramayya (1962a-1962b) studied the trichomes of some Asteraceae. The structure and ontogeny of stomata in 48 species of Asteraceae are studied by Bhatt and Inamdar (1975). The present investigation describes the stomata and trichomes in vegetative and floral organs of *Parthenium hysterophorus* L.

MATERIAL AND METHOD

For dermal study plant material was collected from the various fields. The organs studied are lamina, stem, involucral bracts, palea calyx, corolla, anther, style, stigma and ovary wall (outer) of disc florets and ray florets. Camera lucida drawings were made from epidermal peels taken from the fresh material, stained in Delafield's haematoxylin and mounted in glycerin. Mean values of 10 observations showing the frequency of stomata, epidermal cells are charted in table 1. Organographic distribution of stomata and trichomes are also given in table 1.

OBSERVATION

Mature epidermis : The epidermal cells are tetragonal or polygonal with either straight, arched, sinuous or articulated anticlinal walls (Figs 1-16). In foliar organs the epidermal cells are elongated in various directions and irregularly arranged while in cauline organs they are elongated parallel to the longitudinal axes of the organs. Lamina is amphistomatic, involucral bract and palea are hypostomatic, stem and inflorescence axis are stomatic while corolla, anther, style and ovary (outer wall) are astomatic. In some cases, cuticular striations radiating from guard cells (Fig.3) are noticed.

Mature stomata : The great majority of stomata are anomocytic (Figs 1-5). The anomocytic stomatal apparatus is surrounded by 3-5 ordinary epidermal cells (Figs1-5). However, there are some stomata which appear paracytic being flanked by two ordinary epidermal cells (Figs. 2, 3-marked with double arrows) or anisocytic being surrounded by three unequal ordinary epidermal cells (Figs 1-3-marked with single arrow).

Trichomes : Only eglandular trichomes are observed: (a) Simple conicle (Fig. 18); (b) flagellate filiform (Fig. 19); (c) capitate eglandular with unicellular head (Figs 20,21). In addition to these, (d) papillate unicellular hairs are also observed on stigma and corolla (Fig. 22).

Table 1 : Showing the organographic distribution of trichomes, stomata; Frequency of epidermal cells (EF), stomata (SF), stomatal index per mm^2; size of guard & epidermal cells in μ

Organs Studied.	Trichomes	Stomata	SF	Stomatal index	Size of Guard cells		EF	Size of epidermal cells	
					L	B		L	E
Lamina (L)	CCAA	P	272	20	21	6	1188	43	3
Lamina (U)	CCAA	P	240	18	18	6	1136	37	27
Stem	CCAA	P	192	17	22	6	944	60	17
Inflorescence	CCAA	P	208	17	22	7	1024	45	17
Involucral bract	CCAA	P	—	—	19	6	—	38	21
Palea	ACCA	P	—	—	16	5	—	34	21
Calyx	ACCA	A	—	—	—	—	—	—	—
Corolla	ARCC	A	—	—	—	—	—	—	—
Anther	AAAA	A	—	—	—	—	—	—	—
Style	AAAA	A	—	—	—	—	—	—	—
Stigma	AAAA	A	—	—	—	—	—	—	—
Ovary (outerwall)	AAAA	A	—	—	—	—	—	—	—

C= Common; A= Absent; R = Rare; L =Length; B = breadth, P = present; a^0, b^0, c^0, d^0 are the trichome types mentioned in the text.

Abnormalities : Abnormalities such as cytoplasmic connection between nearby stomata and degeneration of one of the guard cells (Fig. 1) are noticed.

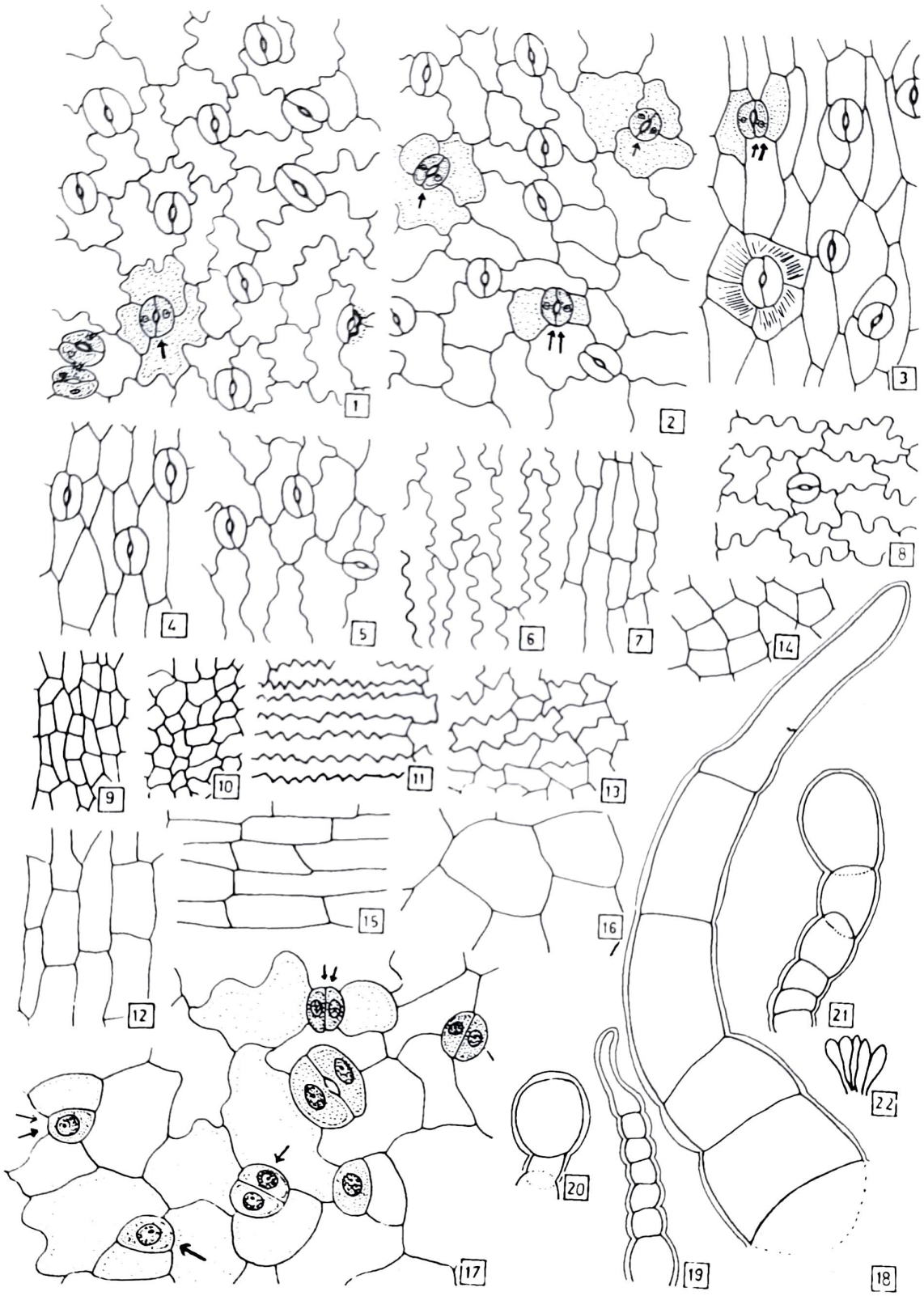
Development of stomata : Young protoderm cells are isodiametric, polygonal and uninucleate with uniform staining. Meristemoids are cut off either in corners or on one side of protoderm cells. Meristemoids can be easily distinguished by their smaller size, dense staining properties and prominent nuclei. The meristemoid directly functions as guard mother cell without cutting off any subsidiary cells, divides to form a pair of guard cells (Fig. 17). Later, a lenticular pore develops in between the two guard cells. The resulting stomatal apparatus becomes anomocytic. There are stomata which are surrounded by three unequal ordinary epidermal cells. The mature stomatal apparatus appears anisocytic. There are some stomata which are flanked by two ordinary epidermal cells which look-like paracytic. These appearance depend upon the place where the meristemoid are cut off: (I) if the meristemoid is cut off in a corner of three protodermal cells (marked with single arrow), the resulting stomatal apparatus appears anisocytic (Fig. 17), (II) if the meristemoid is cut off parallel in between the two protoderm cells (marked with two arrows), the resulting stomatal apparatus becomes paracytic (Fig. 17). The ontogeny of stomata conforms to the perigenous types of Pant (1965).

DISCUSSION

According to Metcalfe and Chalk (1950, 1979) the stomata in the family Asteraceae are mostly anomocytic. Ramayya (1962a) described 35 types of eglandular trichomes. Pant and Verma (1963) reported mesogenous anisocytic stomata in the leaves of *Notonia grandiflora* while in *Tagetes patula* Ramayya and Rao (1968) have described mesogenous, mesoperigenous and perigenous stomata. Bhatt and Inamdar (1975) reported anomocytic, anisocytic, paracytic, diacytic and stoma with a single subsidiary cell. The trichomes and stomata of *Parthenium hysterophorus* are not studied by earlier workers. During the course of present study simple conicle eglandular, capitate, eglandular with unicellular head, flagellate filiform eglandular trichomes are observed which conforms to type 7, type 10, and type 4 of Ramayya (1962 a). In addition to these, unicellular papillate eglandular trichomes are also noticed which are not reported in the member of Asteraceae studied by Ramayya (1962a).

Anomocytic stomata are noticed in the present investigation. However, a few mature stomata appear anisocytic and paracytic. There appearances depend upon the places where the meristemoids are cut off. The development of stomata conforms to the perigenous type of Pant (1965).

According to Tognini (1967), "Various modes of



Epidermal peels showing either mature stomata or developing stages and trichomes.

Fig. 1-22 = x 400. 1. Leaf lower, 2. Leaf upper, 3. Stem, 4. Inflorescence axis, 5. Involucre bract lower, 6. Involucre bract upper, 7. Palea lower, 8. Palea upper, 9. Anther, 10. Ovary (Outer well), 11. Corolla lower (ray floret), 12. Corolla upper (ray floret), 13. Corolla lower (disc floret), 14. Corolla upper (disc floret), 15. Style, 16. Stigma, 17. Leaf lower, 18. Simple conical eglandular hair, 19. Flagellate fillform eglandular hair, 20-21. Capitate eglandular with Unicellular head, 22. Papillate unicellular eglandular hairs.
(Note :- Single arrow = Anisocytic stoma, Double arrow = Paracytic stoma).

stomata development occur in different organs of the same plant." While, Stebbins and Khush (1961) suggested that, "the developmental modes are constant, even in minute details, from organ to organ within the same plant". Our observations agree with that of Stebbins and Khush (1961).

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