SECTION III

ECOLOGY OF *EUPHORBIA GENICULATA* ORTEG.

CHAPTER 7

TAXONOMY, DISTRIBUTION AND MORPHOLOGY

7.1. Systematic Position

Euphorbia geniculata Orteg. is a member of the family Euphorbiaceae.

7.2. Distribution

The distribution of E. geniculata in India and other countries according to the various authors is presented in Table 7.1.

As it has been already pointed out in Chapter 1, this plant is abundant in certain parts of the University campus, viz., Wire House compound, Arts Faculty area, University Library area, Bhukhi Nala etc. at Baroda. It is also found in cultivated areas in L. V. Palace compound. The present author has observed it growing abundantly in a private orchard and Cotton Farm at Surat, and also in the Science College campus at Valsad.

7.3. Habit and Habitat

It is a stout, annual, erect herb upto 75 cm to 1 m in height, with white latex.
Plates 11, 12 and 13.

It usually grows in moist, shaded localities, in gardens,

wastelands, cultivated fields, often along the sides of irrigation channels.

7.4. Morphology

Root - It is a tap root system with much-branched lateral roots most of which are of fibrous nature.

Stem - It is greenish or with reddish tinge, hairy when young glabrescent when old, terete, somewhat sulcate when dry; internodes hollow, gradually shortening towards apex, with a pair of branches coming from the axil of opposite leaves.

Leaves - They are simple, variable in shape, elliptic, oblong, obovate, oblanceolate; alternate at lower nodes, opposite at the upper; upto 13 cm long and 9 cm broad, acute, cuneate at the base, gradually tapering to a slightly flattened and adaxially grooved petiole which is upto 3 cm long, thinly puberulent and paler beneath and glabrous above; margins entire or obsoletely dentate or serrate; lateral nerves 12-18 pairs, fine but distinct; stipules scaly, broadly ovate with a dorsal gland, caducous; stipular glands 3-5.

Inflorescences - They are cyathia in terminal cymose or denser corymbose clusters, greenish, stalked; stalk upto 2.5 mm long; involucres 5-lobed, campanulate, upto 3 mm long; lobes triangular with scarious, hairy, lobulate margins; glands one, substipitate, flesh coloured; floral leaves narrow, green towards the apex and almost white or pale near the base.

Male flowers - They are many, without bracteoles, 2-3.5 mm long; stalk jointed above the middle, whitish; anthers broadly oblong, reddish, dehiscing longitudinally.

Female flowers - Ovary upto 4.5 mm long, 6 mm broad, glabrous, tricarpellary, trilocular; single ovule in each loculus; placentation axile; styles 3, shortly connate, bifid towards the tip, erect with subulate stigmas.

Fruit - It is a capsule, 3-lobed, 3-celled, rarely 2-celled, 5-6 mm in diameter, glabrous.

Seeds - They are black, brown, mottled or dark grey in colour, trigonous, angular on the outer face, truncate at the base, abruptly tapering towards the tip, faces irregularly wrinkled and with warty surface, upto 3.5 mm long, 2.5 mm broad The endosperm occupies the greater part of the mature seed. The embryo is thin and elongate and occupies the centre of the seed.

Field Note - E. geniculata is similar to E. heterophylla, but differs in being coarser; leaf not panduriform (i.e. fiddle-shaped), entire or obsoletely dentate; floral leaves not purple coloured; seeds angular and on outer face carinate (i.e. with keel, like a boat).

7.5. Economic Importance

The plant is used as fodder which is said to be very

good for milk-yielding cattle (Oommachan, 1977).

7.6. Phenology

The seedlings of E. geniculata come up in nature after the first few showers in the later part of June. The plants start flowering and fruiting by the middle of August and continue doing so till the middle of September. The fruits mature and start dehiscing by the middle of September. The plants begin to wither and gradually dry away by the middle or end of October. The seeds of E. geniculata have no dormancy period and so in places where favourable conditions for germination and growth are available, new seedlings may come up and the cycle of vegetative and reproductive growth may start during any season of the year. The plant completes its life cycle within four months.

7.7. Anatomy

The important anatomical features of the root, stem, petiole and leaf of E. geniculata, and the ecological adaptations therein are as follows :-

Root :- Epidermis - one-layered, replaced very early by phellem. Phellogen - arises in the outer cortex. Cork - few-layered. Secondary cortex - 2-4 layers of parenchymatous cells. Cortex - narrow, few layers of parenchyma, cells containing starch grains. Secondary phloem - continuous

narrow band. Secondary xylem - extensively developed, largely consisting of fibres and parenchyma, regular radial arrangement of the cells, vessels few and scattered, rays uni- or bi-seriate. Primary xylem - tetrarch.

Plate - 14.

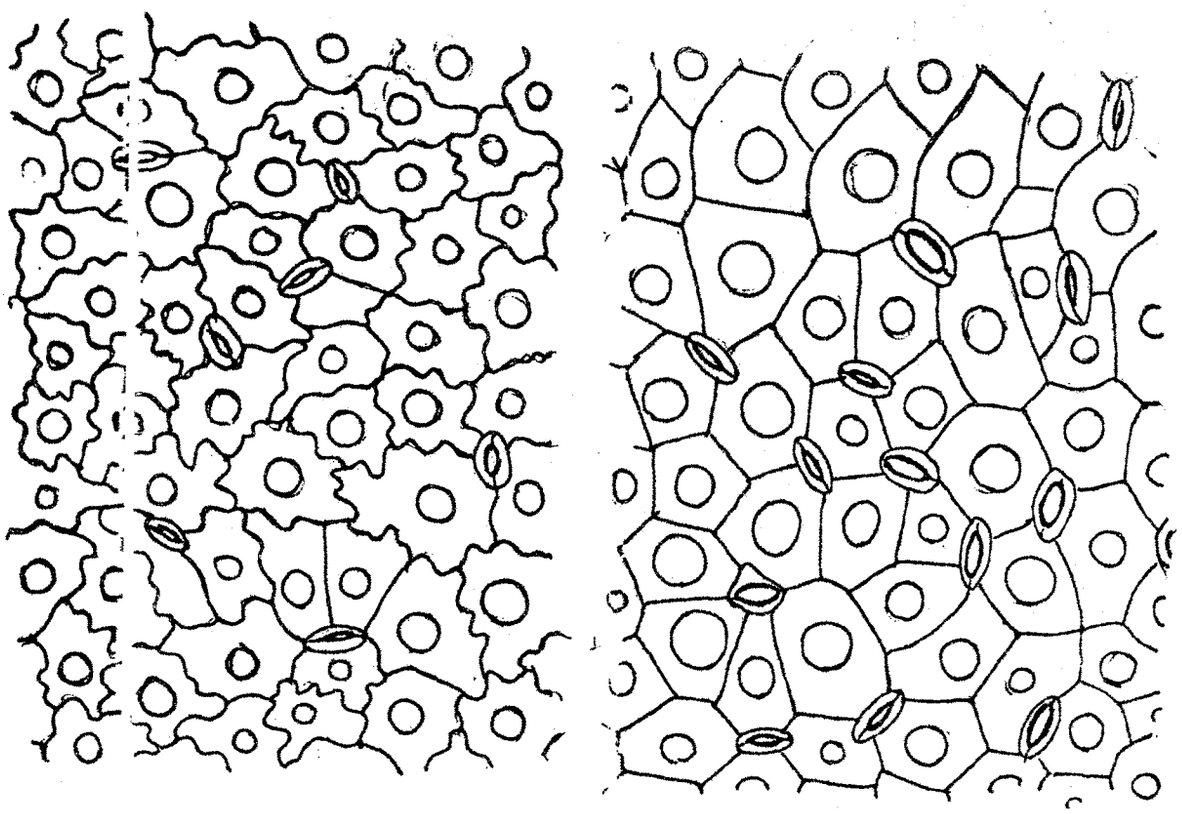
Stem :- The stem is hollow. Epidermis - outermost layer, outer walls with a thin layer of cuticle, stomata present. Hypodermis - Collenchymatous, 2-3-layered. Cortex - narrow, several layers thick, outer 2-3 layers chlorenchymatous, inner layers parenchymatous, cells containing starch grains, presence of patches of collenchyma at regular intervals towards inner side of the cortical region; laticiferous cells - thick-walled, solitary, at regular intervals in the inner cortex. Endodermis - not well-defined. Secondary phloem - continuous narrow band. Secondary xylem - comparatively a broad zone, regular radial arrangement of cells; vessels few, widely spaced; rays uniseriate. Primary xylem - endarch, tracheal elements arranged in radial rows separated by xylem parenchyma. Pith - centre occupied by a large cavity surrounded by several layers of parenchymatous cells in the peripheral region, cells large and thin-walled, and containing starch grains, the laticiferous cells occasionally met with in the peripheral region.

Plate - 14.

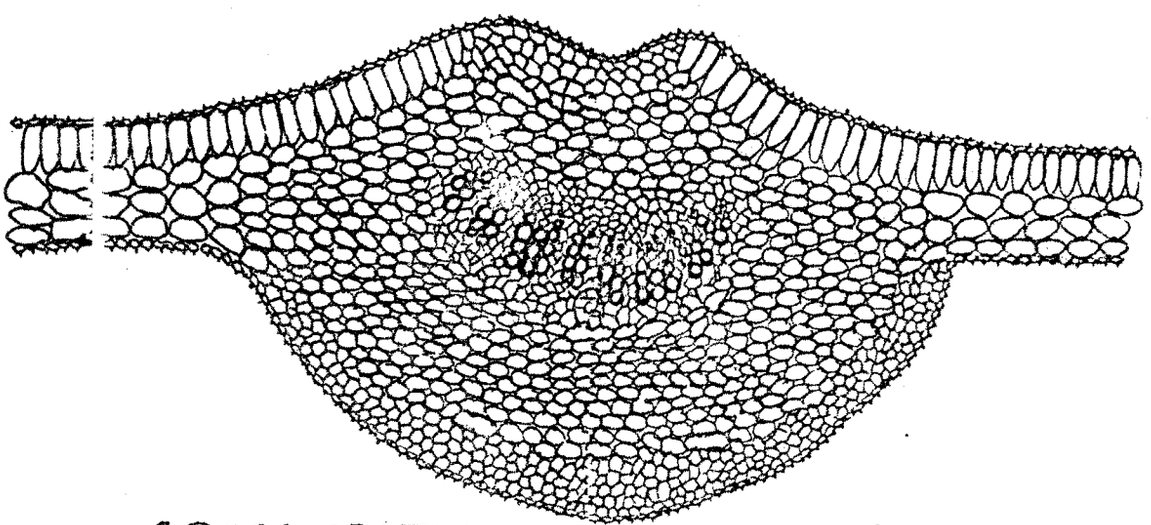
Petiole :- Epidermis - outermost layer, outer walls with a thin cuticle, stomata present. Hypodermis - 1-3-layered, collenchymatous. Ground tissue - parenchymatous. Vascular bundles - 3 in number, arranged in an arc.

Plate 15.

Leaf :- The leaf is dorsiventral. Epidermis - one-layered on both surfaces, outer walls of the epidermal cells with thin cuticle and bearing short papilla-like projections on both surfaces; cells on the upper surface irregular in shape with undulating outline in surface view; cells on the lower surface less irregular in shape with less undulating outline in surface view; stomata present on both surfaces, in general level with the epidermal cells, dispersed irregularly, of ranunculaceous (anomocytic) type. In surface view of the epidermal cells a rounded structure is seen in each cell, which is due to the papilla-like projections on the outer walls of the cells. Palisade tissue - one-layered, extending partly in the midrib region also. Spongy tissue - 3-4 layers, cells loosely arranged. Mid-rib region - Hypodermis - Collenchymatous, 2-3 layers towards both surfaces. Ground tissue - parenchymatous, presence of laticiferous cells in the outer region of the ground tissue towards both surfaces, but more in number towards the lower surface. Vascular bundles - One large bundle formed by the fusion of 2-3 small bundles, xylem consisting of tracheal



UPPER LOWER
EPIDERMIS IN SURFACE VIEW (X 675)



CROSS-SECTION OF LEAF (X100)

E. GENICULATA PLATE 16

elements arranged in radial rows, separated by xylem parenchyma, phloem poorly developed.

Plates 15 and 16.

The important ecological adaptations in the anatomical features, suggesting the sciophytic nature of the plant are as follows :-

(i) Thin cuticle, (ii) stomata in general level with the epidermal cells, (iii) one layered palisade tissue, and (iv) poorly developed mechanical tissue system.

7.8. Stomatal Index

The stomatal frequency and index of a mature leaf of E. geniculata growing in the usual shaded locality (shade plant) as well as that growing in partly exposed locality (sun plant from Surat orchard) were determined and are given below :-

Region of leaf	Average number of stomata/sq. mm	Average number of epi.cells/ sq. mm	Stomatal Index
(A) Leaf from shaded locality (Wire house compound)			
Upper Epidermis			
Apical	252.63	1771.93	12.48
Middle	294.74	1947.37	13.15
Basal	261.40	2087.72	12.52

Region of leaf	Average number of stomata/sq. mm.	Average number of epi.cells/sq. mm	Stomatal Index
Lower Epidermis			
Apical	335.09	1263.16	20.97
Middle	378.95	1329.82	22.18
Basal	408.77	1389.47	22.73
(B) Leaf from partly exposed locality (Surat orchard)			
Upper Epidermis			
Apical	321.05	1645.61	16.33
Middle	343.86	1471.93	18.94
Basal	268.42	1591.23	14.43
Lower Epidermis			
Apical	415.79	1366.67	23.33
Middle	417.54	1343.86	23.71
Basal	387.72	1352.63	22.28

The data indicate that - (i) the stomatal frequency and index are higher in the leaf of sun plant as compared to those in the leaf of shade plant, (ii) the stomatal frequency and index are higher on the lower surface than on the upper surface, (iii) the values of these two parameters are not constant in the entire region of the leaf, but exhibit variation in the apical, middle and basal regions, maximum values being observed in the middle region in all cases, except the lower epidermis in the leaf of shade plant, where

the maximum values are observed in the basal region.

7.9. Chromosome Numbers

The diploid chromosome number for E. geniculata Orteg. as reported by Moyer (1934), Perry (1943), Datta (1967) and Mehra and Choda (1978) is 2n = 28. This number was confirmed by the present author from his study of the rot-tip material.

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