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PHARMACOGNOSTIC STUDIES ON STEM AND LEAVES OF *MIRABILIS JALAPA* LINN.

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ABSTRACT

Microscopical studies in terms of qualitative and quantitative characterisation of various tissues organised in stems & leaves of most valued plant *Mirabilis Jalapa* have been undertaken. It involves to evolve the specific parameters to determine the purity and quality of the basic drug material before preparation of medicine.

INTRODUCTION

Mirabilis Jalapa Linn. vern. name Gulabbas of family Nyctaginaceae is perennial herb or undershrub, native of America, grown for ornamental purpose throughout India. The tuberous roots of the plant are mild purgative and used as a substitute or adulterant of true Jalap obtained from tuber of *Exogonium purga* (Wenderoth) Benth. The leaves and stems are used as tonic. Bruished leaves are employed for poulticing abscesses and boils. Juice expressed from leaves is used as an application to wounds, bruises and allaying etching in urticaria (Anonymous 1962, 1986). Powdered root has numbing sensation in the mouth and a sialagogue in action (Youngken 1950). In Yunani, root is aphrodisiac and good for syphilitic fever (Kirtikar & Basu 1935). The plant contains resin, trigonelline and a carbohydrate yielding galactose and arabinose on hydrolysis (Anonymous 1962). On review of the literature, Anatomical studies on roots of the plants are well evident (Youngken 1950, Gupta et. al. 1999) but no much is mentioned on stem and leaf of the *Mirabilis Jalapa*.

Since plant is widely used in various ailments and also as a substitute & adulteration of Jalapa, an official drug in H.P.I. (Anonymous 1974). The Standardisation studies on the raw drug were also assigned by the Council which may be helpful in case of introduction of new drug *Mirabilis Jalapa* in Homoeopathy. Hence it is worthy to determine the standards for maintaining the quality of raw drug.

MATERIALS & METHODS

Two samples viz. Coonoor (T.N.) and Lucknow local were collected for the studies. Former was identified & supplied by S.M.P.C.U., Ooty while later was collected & identified with the help of Local Herbarium and Flora (Varma, 1981). Microtomed sections of stem and leaf at 15-20 microns and free hand sections are employed for microscopical studies as pwer schedule of Johansen, 1940. Powder studies, linear measurement of tissue and quantitative microscopical constants are determined as per method recommended in Trease & Evans (1978). Qualitative and quantitative microscopical observations are documented with the help of Camera Lucida and Olympus PM - 6 Camera (Japan).

RESULT AND DISCUSSION

I. Macroscopy

STEM :

Erect, branched, cylindrical to angular, soft, solid, pubescent, green but pinkish at node.

Node somewhat swollen, stem 3-7 mm. wide or 12 mm. in case of old; length of internodes 23-55 mm.

LEAVES:

Simple petiolate, dark green opposite, ovate to cordate. Leaf lamina 5.5 to 12 cm. x 3-5.5 cm. (at base) margin entire to sinuate, base cordate, unequal sometimes, Apex acuminate, surface pubescent, Dried leaves papery; Venation reticulate; petiole 2.7 to 5 cm. in length.

II. Qualitative Microscopy :

(i) Transactions studies (Fig. 1, 2, 3)

STEM :

Transection shows outermost single layered cuticularised epidermis, having many uniseriate, multicellular trichomes. Epidermis is followed by 6-8 celled thick collenchyma and 5-6 celled parenchyma with intercellular spaces and intracellular grains. Vascular tissue is conjoint, collateral, open forming separate circular zone of phloem, cambium and xylem. Vessels are endarch, radically arranged in thick walled, 15-17 celled conjunctive tissue. Many medullary bundles are observed in parenchymatous pith. Raphides are present in spindle or oval shaped groups, scattered in

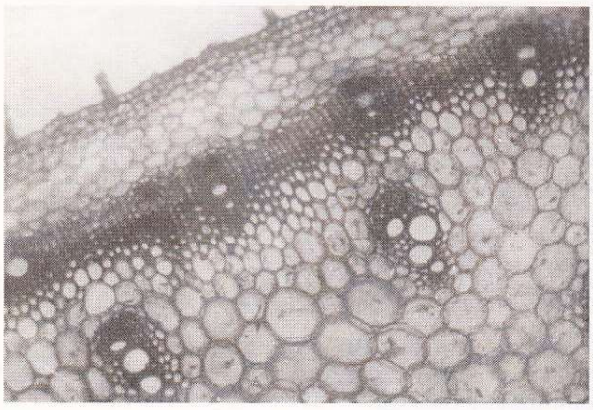

Fig. 1

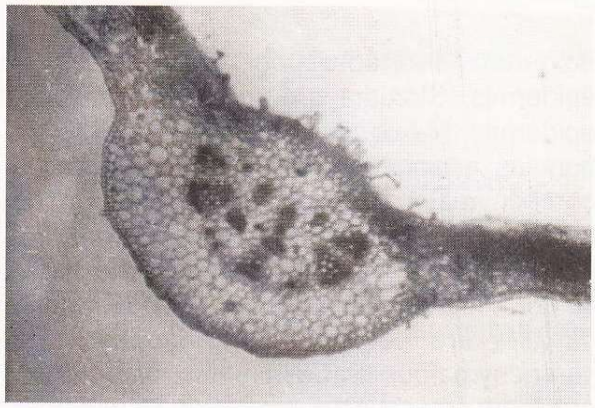

Fig. 2

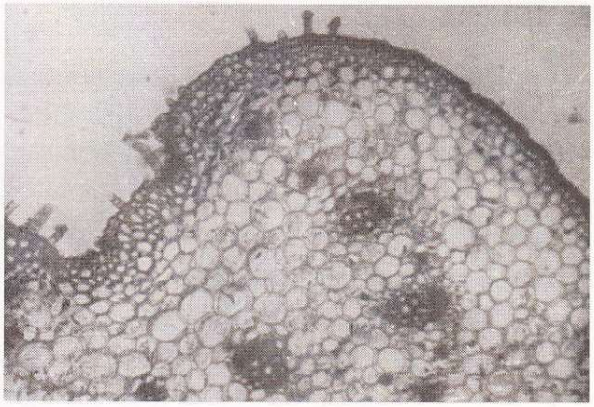

Fig. 3

phloem and pith. Pith parenchyma is showing intercellular spaces. Xylem of medullary bundles are directed towards center. The presence of secondary thickening in the form of succession or rings of vascular bundles exhibits anamolous structure.

LEAF:

The leaf is dorsiventral having one layer of columnar palisade cells just below upper epidermis except midrib region. Spongy parenchyma is located below the palisade layer and above the lower epidermis. Midrib region is protuberated adaxially and abaxially. It shows 2-3 celled thick collenchyma at both sides in proximity with both epidermis. Uniseriate, multicellular, straight to curved trichomes are

more common on adaxial epidermis than abaxial epidermis. Stomata are confined to abaxial epidermis. Many conjoint, collateral vascular bundles arranged in arc are present in the parenchymatous central portion of midrib. The size of vascular bundle decreases from abaxial to adaxial side. Xylem is directed towards the center. Raphides enclosed in spindle shaped cavities are scattered in mesophyll and parenchymatous tissue in midrib. Intracellular grains are present in the parenchymatous tissue.

PETIOLE :

It is thallus like in outline. Outermost layer is one celled thick, cuticularised epidermis bearing uniseriate, multicelluar trichomes. Trichomes are predominantly observed on adaxial side. Epidermis is followed by 4-5 celled thick collenchyma. Ground tissue is parenchymatous having intercellular spaces, granular mass and raphides. 8-10 conjoint, collateral vascular bundles, forming lunar are and 2-3 vascular bundles in middle are observed in ground tissue. Vascular bundles show parenchymatous sheath and phloem towards outer side. Size of vascular bundles decreases while reaching to adaxial surface in arc.

(ii) Powder studies :– (Fig. 4)

Macerated tissue shows following diagnostic characters.

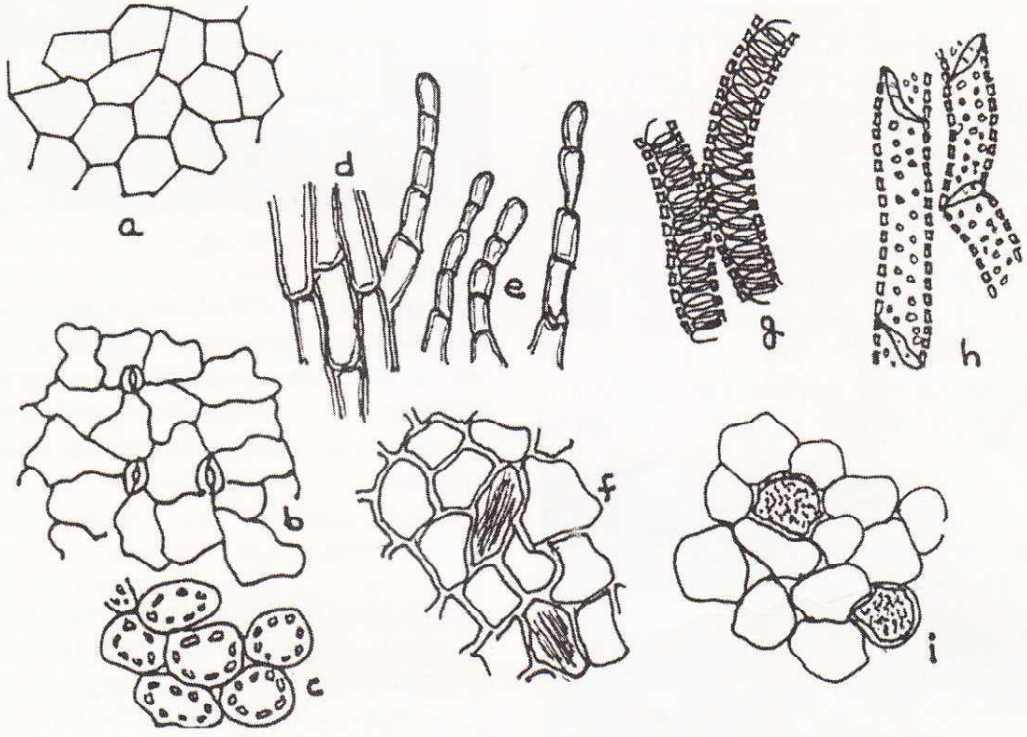

Fig. 4 Mirabilis jalapa – Powder studies on stem and leaves.

(a) Upper epidermal cells
(b) Lower epidermal cells with stomata
(c) Palisade cells
(d) Costal epidermal cells
(e) Trichomes
(f) Raphides in pellicles
(g) Spiral vessels
(h) Pitted vessels
(i) Secretion cells.

Upper epidermal cells of leaf.	:	Polygonal, thin walled, bearing trichomes occasionally with stomata.
Lower epidermal cells of leaf.	:	Sinuate, thin walled with frequent stomata.
Stomata	:	Mostly anomocytic, sometimes anisocytic, surrounded by 3-5 subsidiary cells.
Trichomes	:	Uniseriate, multicellular 3-15 celled, straight to curved, apical cells somewhat swollen. Trichomal cells have cellular contents. Sometimes trichomes are constructed between two adjacent cells.
Palisade cells	:	Round to oval but columnar in surface view, having discord chloroplasts.
Secretion cells	:	Round to oval containing granular mass.
Raphides	:	Acicular crystals of calcium oxalate in groups which are enclosed by spindle to oval shaped pellicle.
Epidermal cells of midrib	:	Thick walled, parenchymatous, elongated, rectangular without stomata but trichomes are frequent.
Vessels	:	Fragments of spiral and pitted vessels are observed.

Untreated coarse powder shows slightly acrid in taste, henna like odour and dull green in colour.

(iii) Micrometry :

The tissue/cells/cell contents are measured in microns.

1.	Epidermal cells	:	L = 29.4 – 58.8 W = 20.58 – 44.1
2.	Stomata	:	L = 23.52 – 44.1 W = 14.7 – 29.4
3.	Palisade	:	D = 8.82 – 20.58
4.	Raphides (in single)	:	L = 44.1 – 117.6 W = 0.735
5.	Secretion cells	:	D = 29.4 – 44.1
6.	Trichomes	:	L = 100 – 550 W = 20 – 35.28
7.	Vessels		
	(A) Spiral vessel	:	W = 8.82 - 50
	(B) Pitted vessel	:	W = 20 – 30
8.	Raphides pellicle	:	L = 120 – 170 W = 25 – 30

N.B. :— L = Length, W = Width, D = Diameter.

III. QUANTITATIVE MICROSCOPY :

S.No	Constants	Range	Average
1.	Epidermal cells frequency (E.C.F.) (Upper epidermis)	750-1000 per sq. mm.	841.66 per sq. mm.
2.	E.C.F. (Lower epidermis)	950-1175 per sq. mm.	1062.50 per sq. mm.
3.	Stomatal No. (Lower epidermis)	175-225 per sq. mm.	195.83 per sq. mm.
4.	Stomatal index (Lower epidermis)	12.96-19.14	15.58
5.	Vein termination No.	6-8 per sq. mm.	6.83 per sq. mm.
6.	Palisade ratio	4.5-6.75	5.53

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REFERENCES

Anonymous, 1962. The Wealth of India – Raw Materials vol. VI : 392 Publication and Information Directorate (C.S.I.R.), New Delhi.

Anonymous, 1974. Homoeopathic Pharmacopoeia of India Vol. 2.82, Controller of Publications, New Delhi.

Anonymous, 1986. The useful plants of India, Publication and Information Directorate (C.S.I.R.), New Delhi.

Gupta. H.C., Kumar S. and Rastogi D.P., 1999 : Comparative Morphohistological studies on two Jalapas, Jour, Econ, Taxo. Bot. Jodhpur (Accepted for publication Ist proof 16-9-99).

Johansen, D.A., 1940. Plant Microtechnique, McGraw Hill Book Co. New York.

Kirtikar, K.R. and Basu, B.D., 1935. Indian Medicinal Plants Vol. III : 2050. L.M. Basu, Allahabad.

Trease, G.E. and Evans, W.C., 1978, Pharmacognosy 11th Ed. Bailliere Tindall, London.

Varma, S.K. 1981. Flora of Bhagalpur (For Dicotyledons) Today and Tomorrow's printer and publication, New Delhi. P. 319.

Youngken, H.W. 1950. Text Book of Pharmacognosy 6th Ed., Blakiston Co., Philadelphia.