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CHARACTERISATION OF ANATOIMICAL AND BIOCHEMICAL CHARACTERS OF *EUPHORBIA ANTISYPYLITICA*: A PLANT OF TRADITIONAL MEDICINAL VALUE

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ABSTRACT

Laticifers are highly specialized internal secretory system present in primitive and advanced taxa of angiosperms. These occur in the families Euphorbiaceae, Asclepiadaceae, Convolvulaceae, Moraceae, Sapotaceae etc. In the family Euphorbiaceae Acalyphae, Crotonae, Euphorbieae, Hippomanae are important tribes, possessing laticifers. Two different types of laticifers have been reported in the family Euphorbiaceae - articulated and non-articulated. Both articulated and non-articulated laticifer types may be anastomosing (branched) or non-anastomosing (unbranched). Articulated laticifers are multicellular in origin whereas non-articulated laticifers are unicellular in origin Articulated laticifers have been reported from phloem of stems and leaves of *Hevea* and *Manihot.* They have also been reported in the mesophyll, palisade and also in the cortical region of stem. Laticifers in the *Ficus carica* L. are of the branched non-articulated type. Present studies were conducted on characterization of *Euphorbia antisyphilitica* a plants of traditional value.

KEYWORDS: Euphorbia, Laticifers, Hydrocarbons, Traditional medicines, bio crude.

1. INTRODUCTION

Latex is an emulsion of oil and water, roughly one third oil in water viz. 30 percent of the weight of the latex is oil (Shukla and Crishna-Murti, 1971; Calvin, 1984). *Euphorbia* latex has received increasing attention because it contains a mixture of light hydrocarbons which have a molecular weight of the order of 20,000 instead of 2 million. Hence after the removal

of water from the latex, the resulting material is liquid oil. The hydrocarbons from *Euphorbia* are primarily a blend of C_{15}, C_{20} or C_{30} compounds (Nielsen *et al.*, 1977, 1979) that, when subjected to catalytic cracking yield various products virtually identical to those obtained by cracking naphtha (Maugh, 1979), a high quality petroleum fraction that is one of the principal raw materials used in the chemical industries.

Studies have been performed to find out the influence of environment (Nemethy *et al.*, 1981b; Vasudevan and Giridhar, 1986), water stress (Sachs *et al.*, 1981 a; Kingsolver, 1982), nutritional factor (Sachs *et al.*, 1981 a; Kingsolver, 1982; Tenorio *et al.*, 1984; Kumar and Kumar, 1985) and hormonal influence (Garg and Kumar, 1987a) on *E. lathyris.* Environmental influence has also been studied on *C. procera* (Rani *et al.*, 1989). Besides, studies on the effect of soil type (Johari *et al.*, 1989; Roy, 1989) and salinity (Garg, 1987; Garg and Kumar, 1989b) have also been reported on various members of Euphorbiaceae.

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2. MATERIAL AND METHODS

A 5 hectare petro crop farm was raised in the University of Rajasthan, Jaipur, under the DNES project. Initial cuttings of *Euphorbia antisyphilitica* Zucc. plants, obtained from National Botanical Research Institute, Lucknow, were used to raise stock plants. Plants were multiplied by cuttings raised at close spacing of 2.5 cm x 4 cm in beds, and separately in polythene bags (Fig. 1). Sprouting began after 10-15 days. Experiments were performed in pots (Fig. 1) as well as in beds starting with two-month old plants. Plants were irrigated at weekly intervals. At the time of harvest entire plants were harvested by uprooting. They were washed with tap-water to remove adhering soil to the roots and dried between two layers of blotting paper to remove excess of water. Finally, the plants were cut into aboveground and underground parts which were weighed separately on a sensitive electrical balance (K. Roy). The length and fresh weight were determined for aboveground as well as underground parts separately. These plant parts were dried separately in an incubator at 55^0C for 3-4 days, till

their weights became constant. Dry weights were determined on an electrical balance (Modern).

Fig 1: Experiments were conducted in pots as well as field conditions.

3. RESULTS

Hydrocarbon yield of different laticifers was determined as given in table no. 1.

Table 1: Hydrocarbon yield of aboveground parts of different *Euphorbia* species.

Name of the plant	Dry Wt. (%)	Acetone Ex. (%)	Benzene Ex. (%)	Acetone + Benzene Ex. (%)	Hexane Ex. (%)	Methanol Ex. (%)	Hexane + Methanol Ex. (%)
E. antisyphilitica	10.00	11.53	1.32	12.85	7.00	11.50	18.50
E. lathyris	22.63	9.45	0.49	9.94	5.57	21.56	27.13
E. tirucalli	8.80	4.85	0.91	5.76	3.48	6.31	9.79
E. caducifolia	13.31	8.83	0.98	9.81	6.60	11.36	17.96
E. nivulia	11.30	8.61	0.55	9.16	6.40	12.00	18.40
E. neriifolia	11.59	10.82	0.65	11.47	6.31	7.13	13.44
E. hirta	20.00	4.75	0.17	4.92	2.12	4.50	6.62

Ex. = Extractables

4. GENERAL DESCRIPTION OF SELECTED PLANT

***E. antisyphillitica* Zucc.** (Syn: *Tricherostigma antisyphilitica* Klotzsch and Garcke : *E. certifera* Alcocer).

E. antisyphilitica is native of Chihuahuan desert of Mexico. Mean atmospheric temperature of Mexican desert remains 30 to 48^{0}C in summers and 25 to 30^{0}C in winter months. Annual rainfall is less than 20 mm and sand is a dominant soil type. Common name of this plant is

Candellila. Besides the rich latex contents, it possesses a thick cuticle of wax throughout the surface of stem and therefore, this plant has long been harvested for its quality wax (Campos-Lopez and Roman-Alemany, 1980). In our earlier studies we have conducted studies on its growth and improvement (Johari and Kumar 2013a and 2013 b ; Kumar et al 2013; Kumar 2020; Kumar et al 2018;2020).

Refined wax is used in polishes, creams, leatherware, furniture varnishes, scaling waxes and chewing gums. This plant has been successfully introduced in arid and semi-arid conditions of Rajasthan. Although it does not grow wild in India but, it has been raised under cultivation in Central Arid Zone Research Institute, Jodhpur: National Botanical Research Institute (NBRI), Lucknow and Forest Research Institute, Dehradun. It does not grow wild in nature in India and is multiplied through vegetative cutting. Wax contents vary from 2 to 5 percent (Paroda *et al.*, 1986). Chloroform and ethyl alcohol extractables have been reported 10.8 and 9.2 percent respectively in *E. antisyphilitica* (McLaughlin and Hoffmann, 1982) 12.5 dry t ha^{-1} yr^{-1} has been obtained by Srivastava (1986).

5. ANATOMY OF STEM

General anatomy of stem was of typical dicotyledons type. Single layered epidermis was covered by a thick cuticle of wax. Cortical region in the stem was parenchymatous in nature but exhibited stone cells at some places. In mature stems, the cortical region was largely occupied by secondary vascular tissue. Endodermis was not clearly distinguishable in mature stem. Vascular bundles were conjoint and collateral, having sclerenchymatous bundle sheath (Fig. 4.2). Latex cells were distributed on either side of the vascular region, including interfascicular region also. Hard bast patches could be seen in mature stem, just above the secondary phloem. Latex cells were seen clearly in young as well as mature stem (Fig.2 and 3). In mature stem they were seen also in association with secondary phloem cells. In older stem, the laticifers were abundant in perixylary region up to the level of secondary phloem on outer side and in the medullary region on inner side . Variation in the thickness of the walls of laticifers was observed.

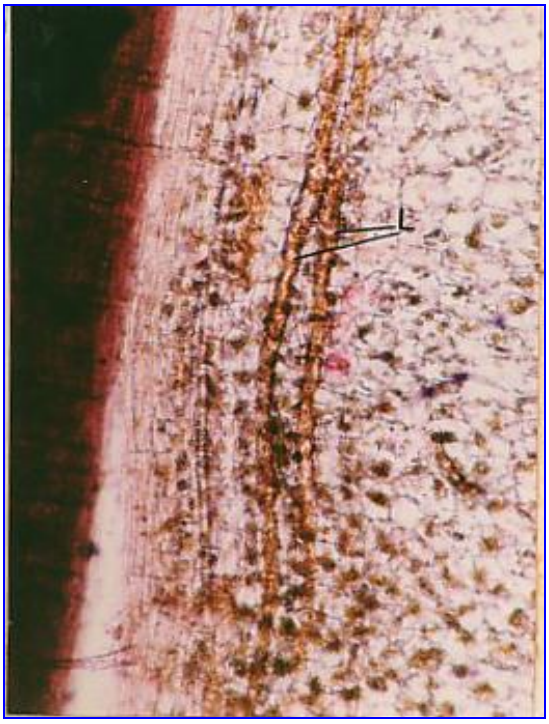

Fig. 2: Longitudinal section of stem showing longitudinally running two laticifers in close proximity to each-other (X 100).

L= Laticifer.

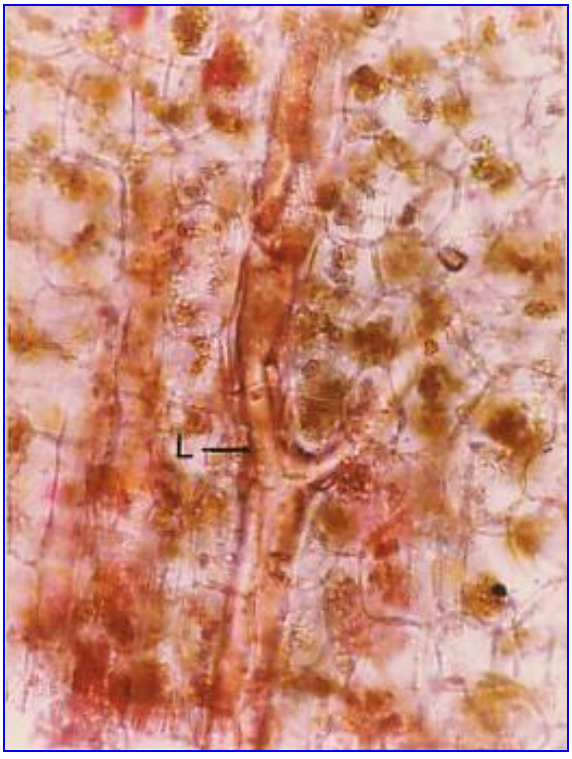

Fig. 3: Longitudinal section of stem exhibiting longitudinally running sparingly branched laticifers (x 100, x 400 respectively).

L = Laticifer.

The laticifers in *E. antisyphilifica* were of articulated type. The articulation of two cells forming one vessel is clearly visible (Fig 2 and 3). In vertical section of the stem, longitudinally running individual laticiferous tubes were seen in close proximity to each other. They were sparingly branched (Fig. 4.7 and 4.8). Laticifers were also seen in pith of the stem. However, these laticifers in pith could rarely be seen in older stems examined during the course of investigation. Laticifers exhibited broad lumen, thick walls and marks of articulation. A close association between laticifer and hard bast could be observed. Probably they provide mechanical strength to laticifers.

6. DISCUSSION

Latex cells occur in majority of Euphorbiaceae and in the Urticaceae, Apocynaceae and Asclepiadaceae. Anatomical studies of *E. antisyphilitica* revealed that the laticifers were well distributed in root, stem and leaves, in the vicinity of vascular system. In younger stems, latex cells were seen in interfascicular region also. In mature stems, these were seen to occur just above secondary phloem, i.e., in the inner cortical region. Laticifers in this plant, were of articulated type, extending vertically and branching at some places. Laticiferous tubes were also seen in pith region of young stems. A close association has also been observed between latex and stone cells. These latter cells may function to provide mechanical strength to the laticiferous tubes. In root, latex cells were seen in inner cortical region. Latex is milky white, yellow, yellow brown, orange or colourless fluid found in diversity of plants and is produced by specialized secretory cells or group of cells, known as laticifers (Fahn, 1988). Latex of *E. antisyphilitica* is milky white and thin in consistency.

7. CONCLUSION

Anatomical studies revealed latex cells in young as well as mature stem in the vicinity of vascular system. Laticifers were seen in close association with stone cells and with secondary phloem. In longitudinal section laticifers were running mainly parallel with the longitudinal axis of the stem. Branching was also observed, with branches forming an acute angle with main branch. Laticifers were also seen in pith region of young stem but in mature stem, laticifers were rarely seen in pith region. Laticifers in *E.* antisyphilitica were articulated and anastomosing with thick walls and wide lumen. Besides, stone cells were seen to be well distributed in the cortical region of stem. In leaf also, the laticiferous cells were present near vascular bundles. Stone cells could also be observed in ground tissue of midrib region. In the

laminar portion, very few laticifers were seen. However, laticifers were abundant in inner cortical region of the root.

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