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COMPARATIVE ANATOMICAL AND HISTOCHEMICAL STUDIES OF *EUPHORBIA HIRTA* L. AND *EUPHORBIA THYMIFOLIA* L. (STEM)

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ABSTRACT: *Dugdhika* is one of the important raw drug used in *Ayurveda. E. thymifolia* is used as the genuine source plant of drug *Dugdhika*, it posses properties like, used for skin disorders, sexual disorders, effective drug for asthma., diarrhoea, dysentery. The present study deals with the comparative study of morphological, anatomical, histochemical characters of *E. hirta* and *E. thymifolia*. Two plants show similarities and differences between them at morphological, anatomical and histochemical levels. Morphologically these two plants show differences in many characters. But histological studies of both plants are almost similar. The histochemical study of both plants shows differences. This study helps to identify the genuine plants of the drug *Dugdhika* for the preparation of Ayurvedic medicine.

INTRODUCTION: Medicinal and aromatic plants form a numerically large group of economically important plant which provides basic raw materials for medicines, perfumes, flavours and cosmetics. These plants and their products not only serve as valuable source of income for small holders and entrepreneurs but also help the country to earn valuable foreign exchange by way of export. Medicinal plants are those plants which are rich in secondary metabolites and are potential source of drugs. Medicinal plants are renewable natural resources and therefore, their conservation and sustainable utilization must necessarily involve a long term, integrated, scientifically-oriented holistic action programme.

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With this background the comparative histological and histochemical work was undertaken in two important Ayurvedic medicinal plants.

The selected plants are *E. hirta* and *E. thymifolia. E. hirta* belongs to the family Euphorbiaceae and genus *Euphorbia.* It is slender stemmed annual hairy plant with many branches from the base to top. Leaves are opposite, elliptic- oblong-lanceolate, acute or sub acute. *E. thymifolia* is a member of the Euphorbiaceae family. It is a monocious, prostrate, annual herb. The stem is with white latex. The leaves are opposite, simple, blade ovate. Inflorescence is in the form of terminal or axillary clusters of flower called cyathium.

MATERIALS AND METHODS:

The present study was designed to compare two medicinal plants *E. hirta* and *E. thymifolia* belongs to the family Euphorbiaceae. The useful parts of the plants were collected and preserved in FAA (Formaldehyde Acetic acid alcohol mixture) for the anatomical and fresh materials used for histochemical studies.

E. HIRTA

E. THYMIFOLIA

TABLE 1: COMPARATIVE ANATOMICAL CHARACTERS OF STEM

S. No	Characters	*E. hirta*	*E. thymifolia*
1	Shape of the stem	Almost circular	Almost circular
2	Nature of cuticle	Thick cuticle bearing long hairs	Thick cuticle with hairs.
3	Nature of epidermis	Epidermal cells are elongated, compactely arranged, bearing unicellular and multi cellular trichomes (Fig. 1 A).	Epidermal cells are elongated, compactely arranged, bearing comparatively more number of trichomes which are unicellular (Fig.3 A).
4	Nature of cortex	10-12 layered paranchymatous and chlorenchymatous cortex (Fig. 1 C & D).	8-10 layered paranchymatous and chlorenchymatous cortex (Fig.3 C & D).
5	Nature of inclusions	Large number of reddish orange oleoresin containing cells are present in the epidermal cells, cortex region and in the pith (Fig.2 B). Plenty of starch grains are present in the cortex and pith, which are oval to round in shape (Fig. 2 C & E). Lignified cells are present (Fig. 2 A,).	Oleoresin containing cell are present. (Fig. 4D) Starch grains are comparatively lesser than E. hirta (Fig.4 B & C). Lignified cells are present (Fig.4 A).
6	Nature of phloem	4-6 narrow parenchymatous phloem (Fig. 1 D).	6-8 narrow, parenchymatous, phloems (Fig. 3 D).
7	Nature of xylem	Composed of radially running vessel of various sizes, associated with trachieds, parenchyma and fibres. Medullary rays are uni seriate, lignified (Fig. 1 E).	Radially arranged xylem vessel associated with fibres and tracheids; medullary rays are uni-biseriate, lignified (Fig. 3 C).
8	Nature of primary xylem	Numarous primary xylem groups are seen towards the pith region (Fig. 1 E).	Numarous primary xylem groups are seen towards the pith region (Fig. 3 C).
9	Nature of pith	Parenchymatous pith (Fig. 1 F).	Pith is parenchymatous and starch grains are present in the pith region (Fig. 3 D).

TABLE 2: COMPARATIVE HISTOCHEMICAL CHARACTERS OF STEM

S.l no	*E.hirta*	*E. thymifolia*
Starch	+	+
Oil	+	+
Lignin	+	+
Tannin	-	-

+ Indicate the presence.
- Indicate the absence.

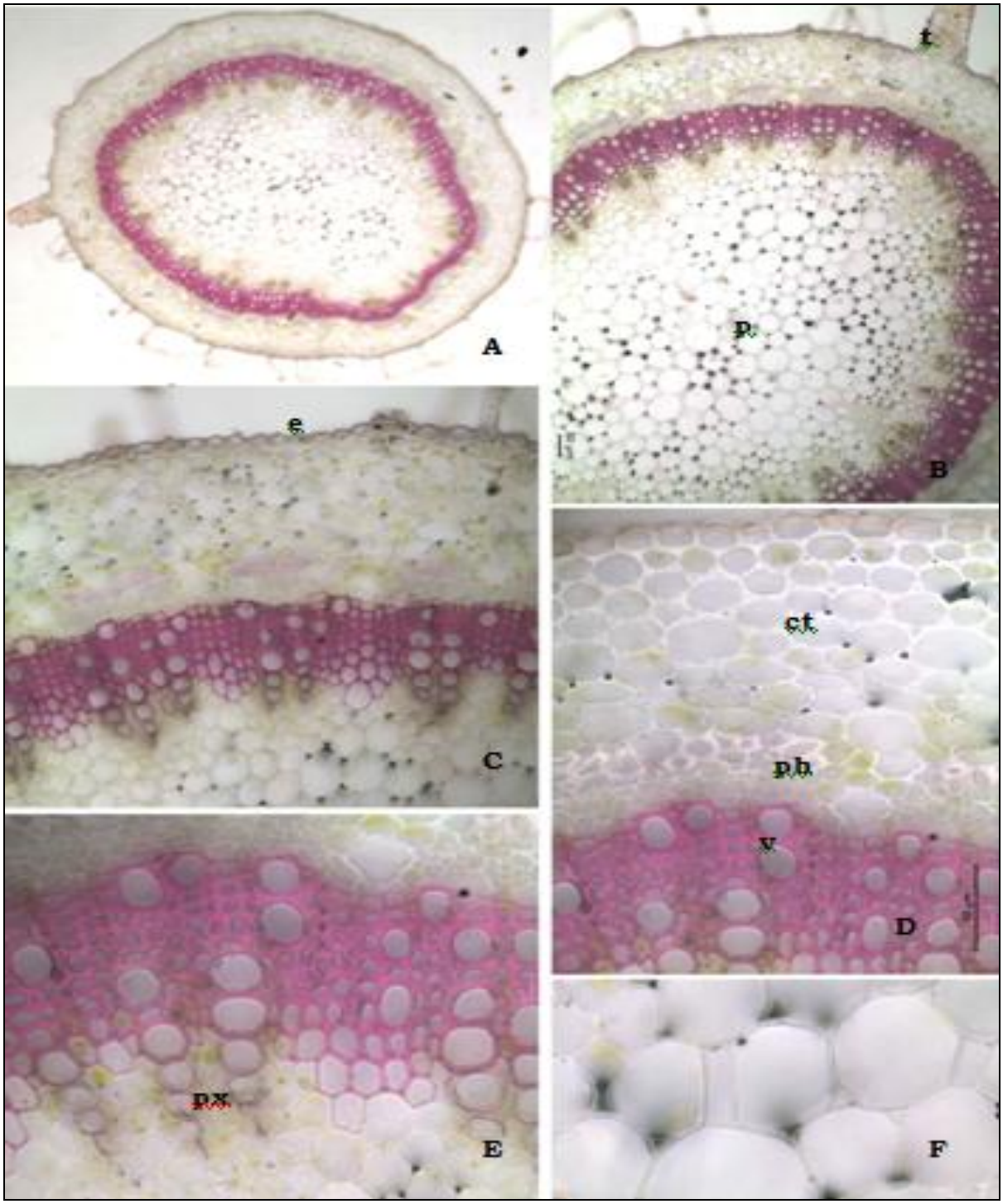

FIGURE 1: MICROSCOPY OF *EUPHORBIA HIRTA* STEM. A, TS OF STEM GROUND PLAN x 200. B, ONE PORTION ENLARGED x 400. C & D, CORTICAL REGION ENLARGED x 400. E, VASCULAR REGION SHOWING PROTOXYLEM x 600. F, ENLARGED VIEW OF PITH REGION x 400. CT, CORTEX; E, EPIDERMIS; P, PITH REGION; Ph, PHLOEM; Px, PROTOXYLEM; T, TRICHOME; V, VESSEL.

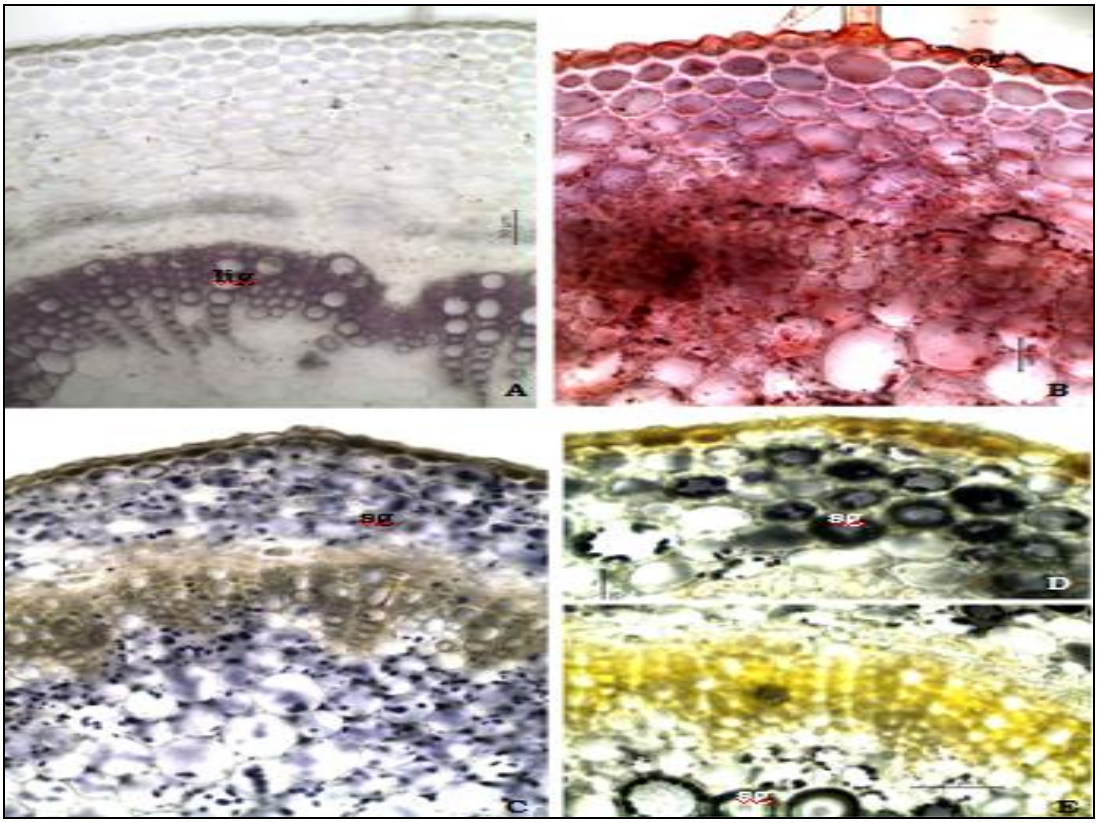

FIGURE 2: HISTOCHEMICAL STUDIES OF *EUPHORBIA HIRTA* STEM. A, HISTOCHEMICAL STAINING FOR LIGNIN x 200. B, HISTOCHEMICAL STAINING FOR OIL GLOBULES X 200. C-E, HISTOCHEMICAL STAINING FOR STARCH GRAINS x 200. Lig, LIGNIN; Og, OIL GLOBULES; S, STARCH GRAINS.

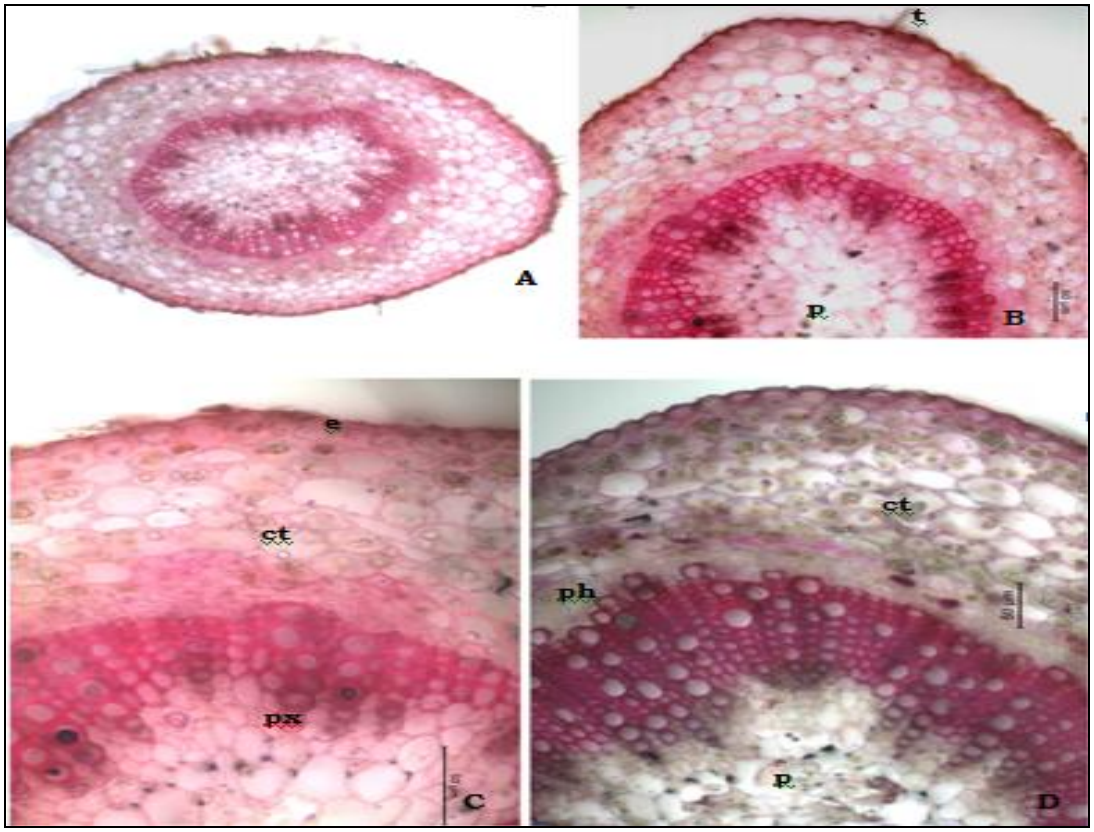

FIGURE 3 MICROSCOPY OF *EUPHORBIA THYMIFOLIA* STEM. A, T.S OF STEM GROUND PLAN x 200. B, ONE PORTION ENLARGED x 400. C & D, CORTICAL AND VASCULAR REGION ENLARGED x 400. CT, CORTEX; E, EPIDERMIS; P, PITH REGION; Ph, PHLOEM; Px, PROTOXYLEM; T, TRICHOME; V, VESSEL.

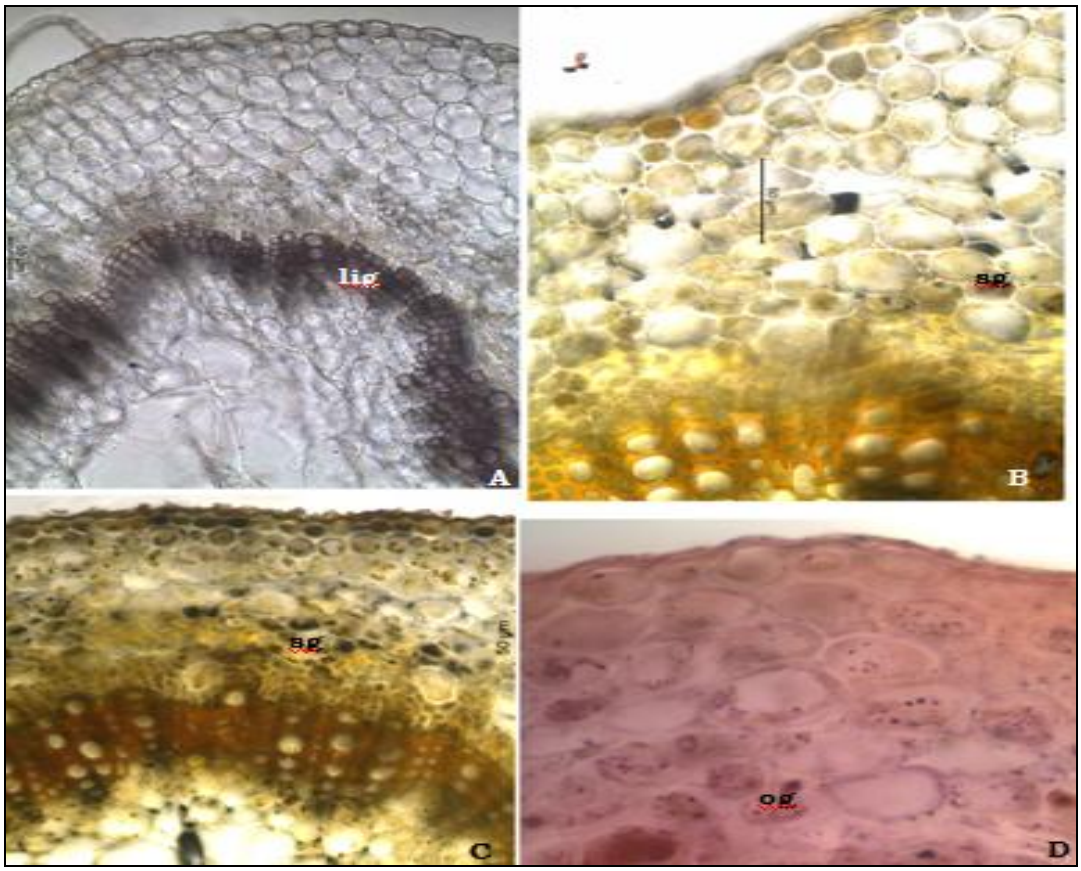

FIGURE 4: HISTOCHEMICAL STUDIES OF *EUPHORBIA THYMIFOLIA* STEM. A, HISTOCHEMICAL STAINING FOR LIGNIN x 200. B & C, HISTOCHEMICAL STAINING FOR STARCH GRAINSX 200, D, HISTOCHEMICAL STAINING FOR OIL GLOBULESx 200. Lig, LIGNIN; Og, OIL GLOBULES; Sg, STARCH GRAINS.

For the present study two important plants, *E. hirta* and *E. thymifolia* are coming under the family Euphorbiacea under the raw drug *Dhuktika* were selected. The major criteria selected for the study involves cellular structures and their histochemical constituants. The pharmacognostic parameters studied may be used as tool for the correct identification of the plants and also to test the genuinity [9]. Morphological studies of *E. hirta* were reported by [4]. Anatomical studies of *E. hirta*, *E. heterophylla* and *E. milli* reported by Essiett et al (2012). But the comparative anatomical and histochemical studies of these two plants are meager as envisaged in the present study.

In the present study the author made an attempt to study the anatomical and histochemical details of *E. hirta* and *E. thymifolia* are reported. Morphologically both the plant shows differences in the size, shape, size of the leaves, nature of stem etc. In *E.hirta* the colour of the stem is hairy and yellowish in colour, but in the case of *E. thymifolia* the stem is creamish brown in colour. The leaves of *E. hirta* Simple, opposite, elliptic to lanceolate, acute to subacute, serrulate to minutely dentate, asymmetrical, veins more prominent, petioleate, stipules dark green in colour. In *E. thymifolia* leaves are Green to purplish red in colour, opposite, oblong, petiole short, stipules fimbriate with pointed tip. The root of *E. hirta* is cylindrical, pubescent with long hispid hair, older pieces compressed, nodes prominent, surface longitudinally striated; hollow in centre, yellowish colour. The root of *E. thymifolia* is slender, branched.

The stem anatomy of both the plants shows similarities in epidermis, cortex region, nature of phloem etc. In both the plants parenchymatous and chlorenchymatous cortex, narrow parenchymatous phloem, Parenchymatous pith are present. At the same time plants shows differences also. In the case of *E. hirta* the uni and multi cellular trichomes are present. But in *E. thymifolia* only uni cellular trichomes are seen. The medullary rays are uni

seriate in *E. hirta* but in *E. thymifolia* uni and biseriate medullary rays are present.

The histochemical comparison of stem shows similarities and differences. In both the plants lignin is present. Which is stained by phloroglucinol. Starch grains are present in both plants, but it is plenty in *E. hirta* than *E. thymifolia*. Oil deposits are present in both plants.

CONCLUSION: The present study revealed that *E. hirta* and *E. thymifolia* show similarities and differences between them at morphological, anatomical and histochemical levels. Morphological, Anatomical and Histochemical markers were identified for comparing the source plants (*E. hirta and E. thymifolia*) for the drugs *Dugdhika*. These features helps to distinguish the plants conveniently and coming to a conclusion that there is variation in the anatomical and histochemical constituents in these two species. This method can be used for the identification of raw drugs from their substitutes. It is possible to identify the dried raw drug samples of species using these markers. This method can be used for authentication of the drugs used in *Ayurveda* and other herbal systems of medicine. This is an easy and effective method for the correct identification of genuine herbs from adulterants.

The raw drug being sold in the market in the form of dried and broken pieces. Hence it is difficult to identify taxonomically. In this context anatomy and histochemistry are more reliable. So the comparative anatomical and histochemical studies are the reliable source to identify the genuine raw drug from their adulterants.

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