

FARMACOGNOSTIC STUDY OF LEAF OF HYPTIS SUAVEOLENS L.**S. JELANI AND M. PRABHAKAR***Department of Botany, Osmaniya University, Hyderabad – 500 007, India.***Received: 29 May, 1991****Accepted: 15 June, 1991**

ABSTRACT: This paper deals with the pharmacognosy of *Hyptis suaveolens* leaf including its morphological, anatomical, chemical constituents and powder analysis. Contrary to earlier reports, the leaves are amphistomatic. Stomata are diacytic, a few being isotricytic and anisotricytic. Four types of trichomes have been noted. The venation is semicraspidodromous. Midrib consists of one large moon shaped and petiole with four wedge-shaped vascular bundles. Powder microscopy revealed fragments of epidermis, mesophyll, trichomes and tracheary elements. Positive tests for glycosides, polyphenolases, flavones and juglones are also recorded.

INTRODUCTION

The leaves of **Hyptis suaveolens** are considered to be a stimulant, carminative, sudorific and lactagogue. Infusion of the plant is used in catarrhal conditions, affections of the uterus and parasitical cutaneous diseases. The **munda** tribe uses the plant for headache and as snuff to stop bleeding of the nose (1), (2).

The leaves are used as green manure in certain parts of Indian west coast. The shoot tips along with leaves are edible and are sometimes used for flavouring. They are also used as an adulterant for **Patchouli (Pogostemon)** leaves. An infusion of leaves is taken as beverage. In Java, the plant is used as cattle fodder (3). No detailed information is available on the morphology, anatomy and pharmacognosy (3 – 6) and hence the present study is taken up.

MATERIALS AND METHODS

Twigs of **Hyptis suaveolens** were collected from plants growing in Osmania University campus, Hyderabad, Andhra Pradesh. The methodology and terms used for after Prabhakar and Ramayya (7), Prabhakar **et al** (8), Leelavathi **et al** (9), Prabhakar and Leelavathi (10).

Abbreviations used in the text are: Ab: abaxial surface of the organ, Ad: adaxial surface of the organ, D: diameter, Dist: distribution, E. C. F. epidermal cell frequency, L|W: length | width, S|F: Stomatal frequency.

Observations and Discussion

Hyptis is a cosmopolitan genus represented by 400 species (11) of which **H. suaveolens** is reputed for its medicinal uses and is widely distributed having been recorded throughout India, ascending from Himalayas upto 6000 feet and Ceylon, Thwaites,

Malaya islands to Australia, West Asia and Arabia (2).

Vernacular names:

BENGAL : **Billati tulsi**, BIHAR : **Bhusri, Dimbubha, Gusumpuru**, HINDI : **Wilayati tulasi**, ORIYA : **Ganga tulsi** (1), (2), (3).

Morphology:

Habit: Annual, erect, branched, hirsute, glandular – pubescent, aromatic herb, upto 2m high. **Root :** Tap root, **Stem :** Green quadrangular, hairy, woody below. **Leaf :** Simple, opposite, cordate with rounded or subcordate base, pubescent. Margin serrate, apex acute, 7 x 6.5 cm. **Petiole:** 3.5 cm, long slender, hairy. **Inflorescence:** axillary cymes, pubescent, few-flowered, peduncle 1.5 cm. **Flower:** Blue, complete, zygomorphic, pedicillate, pedicels longer than calyx, bracteolate, **Bract:** subulate, 2mm long, **Bracteoles:** 2, bract-like 1 – 1.5 mm. **Calyx :** some what bilabiate; tube 5 – 6 mm; lobes subequal, subulate, 2mm. **Corolla:** Bilabiate, pubescent; tube 9 – 10 mm; lower lip saccate, upper rounded. **Androecium:** stamens four, exerted, didynamous, inserted below the throat, declinate; filaments and attachment densely villous, longer filaments 3 mm; anther-lobes confluent, 0.75 mm. **Ovary:** deeply 4 – lobed with a single basal ovule in each lobe, 0.5 mm; style gynobasic, 4 mm; stigma bifid. **Fruit:** aggregate of 4 mules. **Flowering and Fruiting:** October to December.

Microscopic Characters:

Surface view of leaf: Anticlinal walls of laminar epidermal cells were described to be wavy to sinuate in the subtribe Hyptidinae (13). In the present taxon, the epidermal

cells are polygonal anisodiametric and rarely polygonal liner. Anticlinal walls are sinuate, sinuses being ‘U’ – and ‘V’ – shaped. Walls are slightly thick and surface is smooth. Cytoplasmic contents are scanty. Cells are irregularly arranged and variously oriented. **Dist:** All over the leaf lamina except on veins (Plate I. 1,2).

Foliar costal cells and stomatal distribution patterns were considered to be of identification value (9). Unlike in other angiospermous taxa presently it is observed that the costal cells are mostly polygonal anisodiametric and rarely linear in shape, with scanty cytoplasmic contents. Anticlinal walls are straight to curved, and slightly thick. They are parallel oriented and irregularly arranged. **Dist:** Present on all grades of veins.

Type of the stomata in **H. suaveolens** was reported to be diacytic (13), (14), which is presently confirmed besides, their association with isotricytic and anisotricytic stomata and all are monocyclic (Plate I. 1,2). Shape of the guard cells are elliptic and flushed with epidermal cells. Size of the stomata on adaxial and abaxial surface is 23 – 20 – 15 μ m (length) and 19 – 15 – 11 μ m (width). Subsidiaries are mostly of ‘a’ type rarely of ‘f’ type, and are indistinct from epidermal cells (Plate I. 1,2). **Dist:** The leaves were reported to be hypostomatic (14). However presently they are observed to be amphistomatic and distributed all over the leaf lamina except on veins of both the surfaces (Plate I. 1, 2).

In the past, glandular (uni or bicelled head) and non glandular (uniseriate and multicellular) trichomes were reported (13), (15), (16), (17). However presently in **H. suaveolens** four types of trichomes, distributed all over except on margin are observed which are described below:

Uniseriate conical hair: **Foot:** one celled; embedded or slightly projected above the epidermis, indistinct, contents scanty; walls thin. **Body:** conical, 2 to 5 – celled in length; cells longer than broad; contents scanty; walls thin; surface smooth (Fig. 4).

Uniseriate capitate hair: **Foot:** one celled, embedded or slightly projected above the epidermis indistinct; usually broader than long; contents slightly dense; walls thin. **Stalk:** one – celled; broader than long; contents slightly dense; walls thin; surface smooth. **Head:** globose, 1-celled, contents dense, walls thin, surface smooth (Fig. 6).

Uniseriate pelate hairs: **Foot:** one-celled, embedded or slightly projected above the epidermis indistinct; broader than long; contents scanty; walls thin. **Stalk:** One – celled broader than long; contents scanty; walls thin surface smooth. **Head:** two or four-celled, cells longer than broad; contents dense; walls thin; surface smooth (Fig. 7).

Uniseriate vesicular peltate hairs: Similar to peltate hairs, but the head is enclosed by a thin cuticular vesicle (Fig. 7).

Foliar venation as a taxonomic tool has been since long time in use (7), which is equally important in pharmacognostic studies (18). In *H. suaveolens* the venation was reported to be semi-craspidodromous in which a branch of secondary vein is joining the superadjacent secondaries forming a loop while the others terminating in the margin (Rudal, 1980) which is presently confirmed (Fig. 5). Tertiaries are percurrent and their angle of origin is acute; right angle (AR). The relationship of the tertiaries to midvein are oblique throughout but perpendicular distally and their course is straight to retroflexed and predominantly opposite.

Higher order is observed upto 5⁰; Areoles are polygonal, regular in orientation and 9mm²; veinlets simple curved, branched once, 0-1 | areole and 6 | mm².

Sectional view of leaf: In transaction, leaf lamina is ribbed abaxially at primary, secondary, tertiary and alveolar veins but adaxially only at primary vein (Plate I. 3). Epidermal cells are circular to oval shaped, abaxial ones smaller in size (lamina Ad: L|W: 31 – 21 – 15 – | 15 – 12 – 11; Ab: L|W: 19 – 15 – 11 | 15 – 10 – 08; midrib: L|W: 23 – 15 – 11 | 15 – 11- 8 µm;) with thin cuticle and scanty contents. Outer wall of the guard cells are ledged. Palisade cells are irregular in shape (L | W 57 – 42 – 30 | 11 – 9 – 8 µm) with large intercellular spaces. Spongy mesophyll cells are also irregular in shape (D = 19 – 11- 8 µm). Near midvein and major lateral veins on both sides, hypodermis is compactly arranged 1 to 3 layered angular collenchyma (D – 16 – 12 – 11 µm) and rest of the ground tissue is parenchymatous. Parenchyma 5 to 6 – layered; cells are polygonal in shape (D = 49 – 38 – 19 µm) Midvein consists of central large collateral lunar shaped vascular bundle which is aprocyclic (Plate I. 3). Tracheary elements are polygonal to circular (D = 19 – 12 – 8 µm) numerous in midvein and secondary veins, few in others, arranged in rows. Secondary wall thickenings annular (free), helical (helices single or double). Perforation plate is simple (Figs. 11 – 13).

In transaction the petiole is semi circular and adaxially grooved with lateral ridges (Plate I. 4). Epidermal cells are circular to oval in shape (D = 15 – 12 – 11 µm). Ground tissue is heterogenous with 3 to 5 – layered compactly arranged collenchymatous hypodermis; cells being circular to polygonal (D = 19 – 17 – 15 µm) with scanty contents. Rest of the ground tissue is

5 to 8 layered parenchymatous. Cells are polygonal ($D = 68 - 43 - 30 \mu\text{m}$) with thin walls and scanty contents. Vascular bundles are four wedge shaped. Adaxial two bundles are larger compared to the two abaxial ones. Tracheary elements are polygonal, few circular ($D = 23 - 16 - 11 \mu\text{m}$) arranged in rows. Secondary wall thickenings are annular (free), helical (helices single or double) with simple perforations.

Powder study

The powder is brown aromatic. Microscopic examination of the powder revealed the following elements. 1) Fragments of epidermis with sinuate anticlinal walls and diacytic stomata (Fig. 1, 2); 2) Fragments of castae or petiole showing small polygonal epidermal cells without stomata (Fig. 3); 3) Full or bits of uniseriate conical, capitate, peltate and vesicular peltate hairs (Fig. 4 – 7); 4) Groups or isolated palisade, spongy and ground parenchyma and collenchymas (Fig 8 – 10). 6) Bits of vessels with annular and helical thickenings (Figs. 12 – 13).

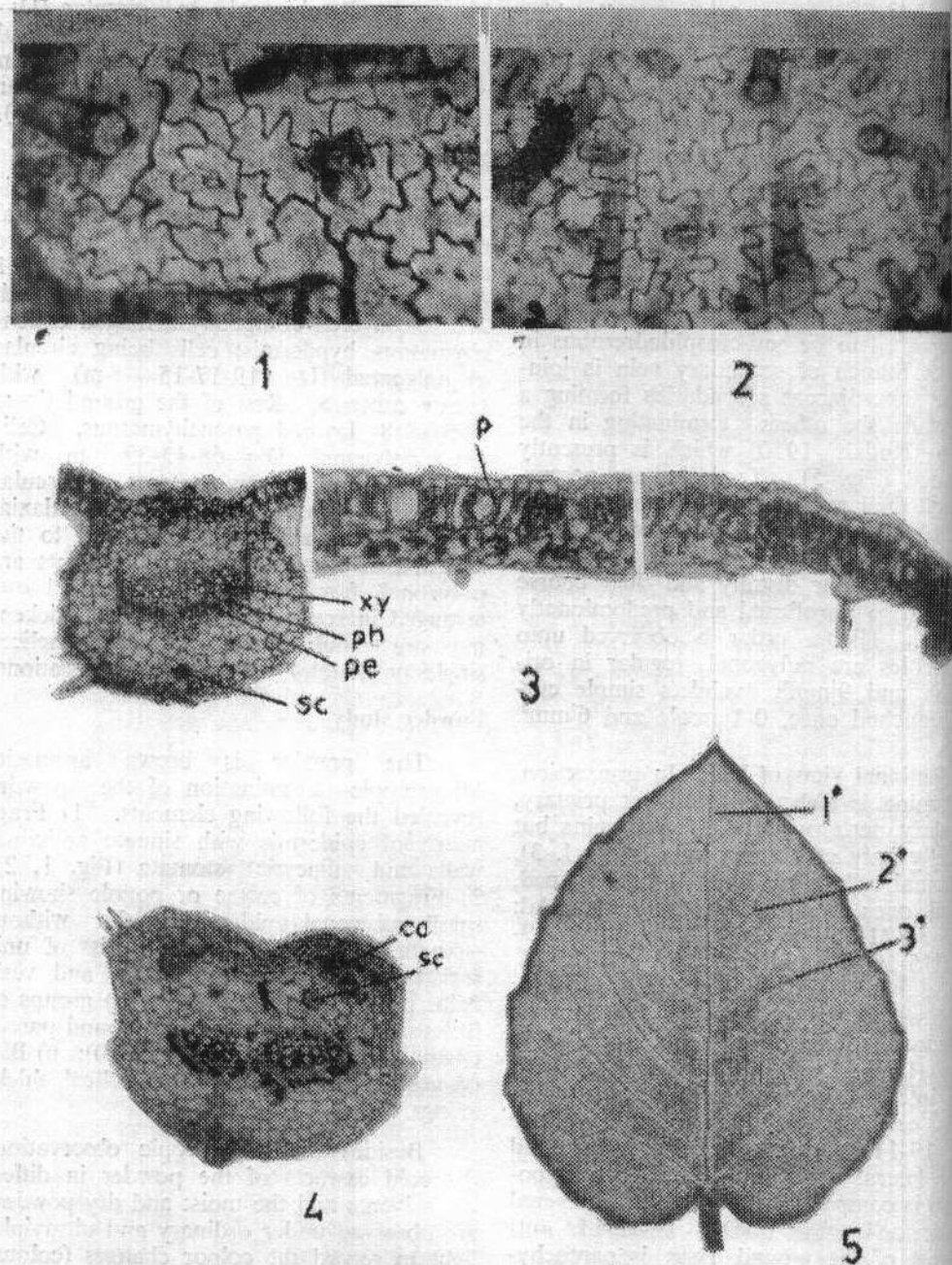
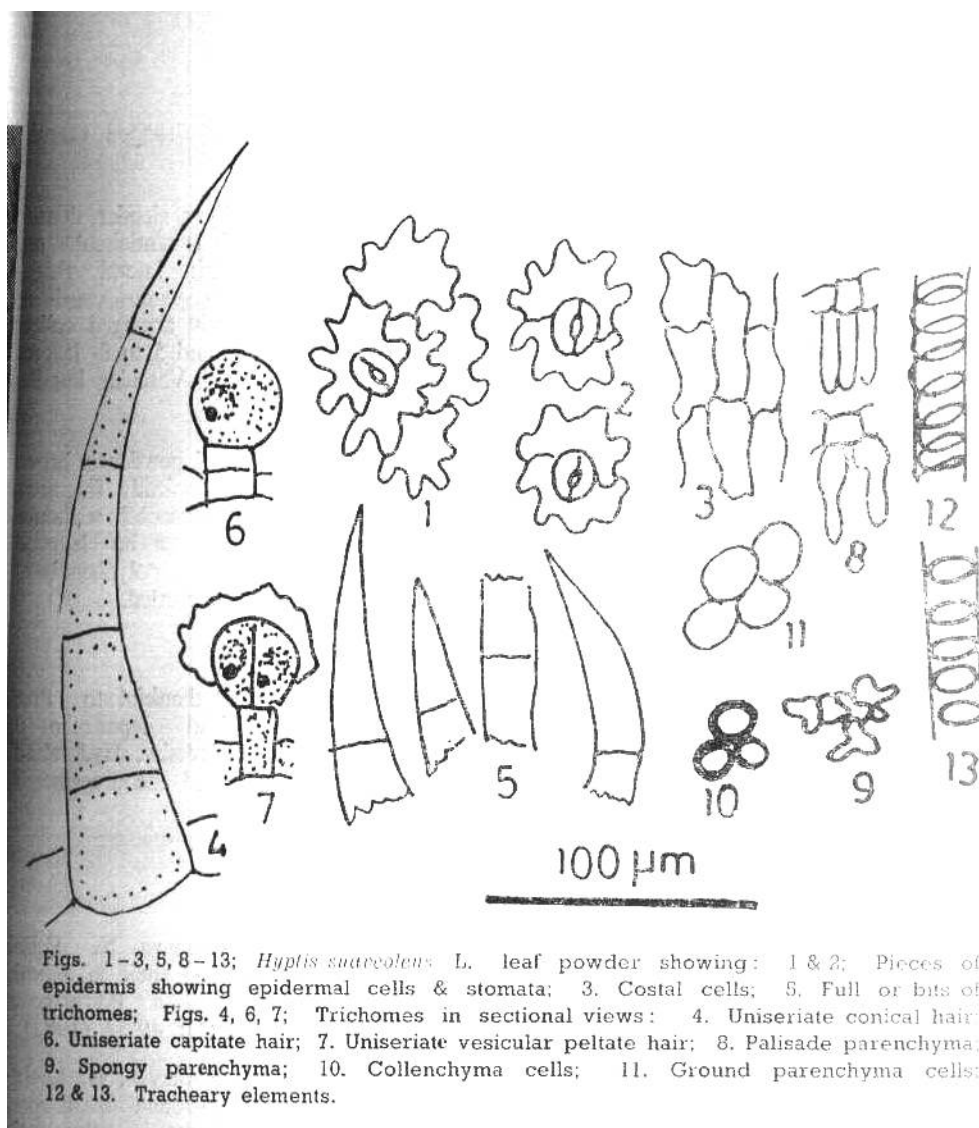


Plate. 1. *Hyptis suaveolens* L. Fig. 1 & 2. Adaxial and abaxial epidermis of leaf lamina (x 440); 3. Transection of leaf lamina from midrib (x 52), lamina (x 96) and margin (x 102); 4. Sectional view of petiole (x 75); 5. Venation pattern of leaf lamina. (Co. Collenchyma, Pe. Phloem parenchyma; Ph, Phloem; SC. Secretory cell; X. xylem; 1°. Primary vein; 2°. Secondary vein 3°. Tertiary vein).



Besides the microscopic observations the cold extracts of the powder in different solvents and the moist and dry powders are observed under ordinary and ultraviolet light to record the colour changes (colours were compared with colour index (19) and details are given in table 1.

Following the simple phytochemical test recommended by Gibbs, (20) for identification of chemical constituents in the

fresh dried leaf powder. Positive tests were recorded for glycosides, polyphenolases, flavones, juglones and negative tests for saponins, syringins, aucubins, aurones, and leucoanthocynins, which will be much helpful in identification of the taxa in powder form.

In the light of the present investigation the salient features of the drug which would be

useful in identification in its different states are as follows:

Lamina: Leaves are ovate, base subcordate apex acute; margin serrate hairy, dark green 7 x 6.5 cm with unicostate reticulate semicraspidodromous venation. Secondary veins 9 – 10 pairs. Epidermal cells mostly polygonal anisodimetric sides are sinuate on both adaxial and abaxial. Costal cells

distinct on all veins. Leaves anphistomatic, stomata mostly diacytic, with a few isotricytic and anisotricytic, monocyclic. Uniseriate conial, capitate, peltate and vesicular peltate hairs present all over except on margins. In the transverse section, leaf is bifacial, with one layered palisade and 5 – 6 layers of spongy mesophyll. Midvein with single large lunar shaped vascular bundle.

TABLE 1

Observations of leaf powder under ordinary and U. V. Light

Sl. No.	Powders	Ordinary Light	Ultraviolet Light
1	Dry Powder	BB*	DP
2	Aqueous extract	GB	DB
3	Aqueous residue	DB	DB
4	Alcoholic extract	DB	BB
5	Alcoholic residue	BB	DB
6	Chloroform extract	DB	DB
7	Chloroform residue	BB	GP

**BB. Brown black; DB: Dark brown; DP: Dull brown; GB: Gold brown; GP: Greenish brown.

Petiole: 3.5 cm long, slender, densely hairy. In transverse section it is semicircular and adaxially grooved with lateral ridges. Ground tissue is heterogeneous consisting of 3 – 5 layered compactly arranged collenchymatous hypodermis and 5 to 8 – layered parenchymatous tissue. Vascular bundles are 4 wedge shaped.

Leaf powder: Leaf powder is brown and aromatic: Microscopically fragments of

epidermis, stomata, mesophyll, trichomes and tracheary elements can be observed. Positive tests for glycosides, polyphenolases, flavones, juglones are recorded.

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