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PHARMACOGNOSTIC STUDIES ON *TRIDAX PROCUMBENS* L. (ASTERACEAE)

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Tridax procumbens L. (Asteraceae) is known for several potential therapeutic activities like antiviral, antibiotic efficacies, wound healing activity, insecticidal and anti-inflammatory activity. The present paper highlights the exomorphology and histomorphology of leaf, petiole, internode, root, physicochemical evaluation and preliminary phyto chemical study of the whole plant. These observations will enable to standardize the botanical identity of the drug in crude form.

Keywords : Asteraceae; Pharmacognosy; *Tridax procumbens* L.

Introduction

Asteraceae is the most successfully evolved taxon among angiosperms. The members of the family exhibit a wide spectrum of habit and habitat. Apart from the biological interest, Asteraceae includes many economically valuable plants, especially many medicinal plants reputed for their pharmaceutical applications. Endowed with high efficiency of dispersal mechanism, the plants of Asteraceae grow abundantly in waste places, which are considered as weeds. *Tridax procumbens L.* is one such weed growing in abundance in waste lands. The folklore claims attribute many promising medicinal properities which seems to possess some scientific background. This fact coupled with sustainable availability of the raw drug prompted to undertake the pharmacognostic analysis of *T. procumbens L.* Previous work is lacking with reference to the proposed objectives of the study.

T. procumbens L., (Asteraceae) known as Vettukaya Thalai in Tamil is a hirsute herb used for variety of ailments [1-3]. The leaves are reported to be employed in bronchial catarrh, dysentery and diarrhoea and for restoring hair. The leaf juice possesses antiseptic, insecticidal and antiparasite properties. It is used to check hemorrhage from cuts, bruises and wounds. An aqueous extract of the plant produced reflex tachycardia and showed a transient hypotensive effect on the normal blood pressure of dogs; it had also a marked depressant action on the respiration. Petroleum ether extract of the floral heads is toxic to webbing cloth-moth and larvae of black carpet beetle. The plant yielded interesting compounds like luteolin, β-amyrin, β-amyron, lupeol, triacontanol, fucosterol, campasterol stigmasterol besides arachidic acid lauric acid and palmatic acid[4-6].

Materials and Methods

The present study involves anatomical as well as preliminary phytochemical standardization of *T. procumbens* L. For anatomical investigation customary techniques of microtomy were followed[7]. Paraffin sections of 10μm thick were stained with safranin-fast green. Photomicrographs were prepared with NIKON Lab phot-2 microscope unit. Physical constant behavior of powder with chemical reagent and preliminary phytochemical tests were carried out[2,8].

Observation

Exomorphology

The plant is a decumbent herb with yellow heterogamous capitulum (Fig. 1,2,3) and soft epidermal trichome. The leaves are simple, opposite, lanceolate to ovate with pinnatisect lamina; leaf margins are coarsely serrate; petiole is 0.5-1 cm long, capitulum is borne on long peduncle; it is heterogamous with female, yellow ligulate ray florets and bisexual tubular disc florets,

Fig. 1-3. *Tridax procumbens* L.
1. A shoot bearing a terminal head inflorescence and persistent involucres;
2. A bisexual disc-floret;
3. Female ray-floret.

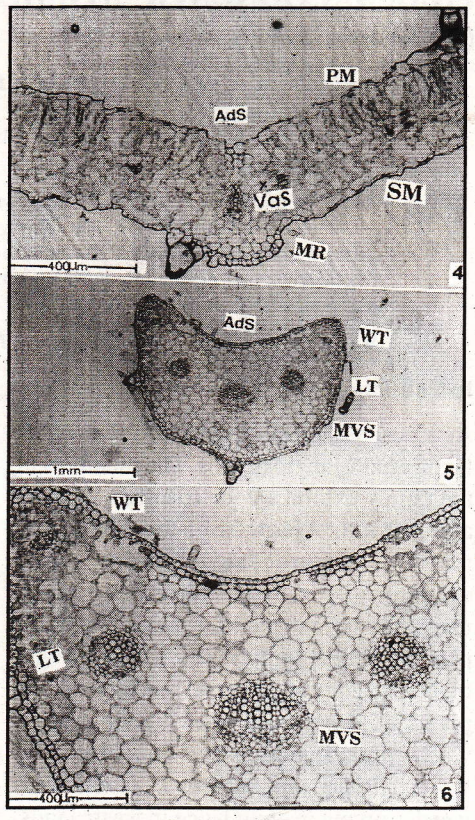

Fig. 4-6. *Tridax procumbens* L.
4. Transection of a leaf passing through the midrib;
5. Transection of petiole;
6. A sector of T.S. of petiole enlarged.

corolla yellow, pappus slender, setose, hairy, palea oblong, linear scarious, acute; fruits one seeded achene, narrowly obconical, minutely hairy, black with a tuft of feathery pappus.

Microscopic features

Leaf : The leaf exhibits mesomorphic features and dorsiventral organizatin. The lamina is amphistomatic with anomocytic stomatal type and wavy thin anticlinal walls of the epidermal cells (Fig. 7,8,9). Epidermal trichomes are 'covering type', multicellular, uniseriate, unbranched with thin cuticle (Fig. 13). The trichomes arise from a rosette of epidermal cells (Fig.10). Mesophyll is differentiated into one two layers of adaxial palisade cells and 3 or 4 layers of lobed spongy cells (Fig. 4). The petiole is concavoconvex in sectional view with shallow concavity on the adaxial side. The vascular strands consist of a median strad, two lateral strands and one wing-strand on either end of the petiole (Fig. 5,6). The midrib of the lamina has a single collateral strand with parenchymatous sheath and abaxial and adaxial extensions (Fig. 4).

Internode : The young internode in primary state of growth is circular in transectional profile with intact epidermal layer, two layers of subepidermal collenchyma cells and 4 or 5 layers of compact parenchyma cells (Fig. 14). The pith is wide and

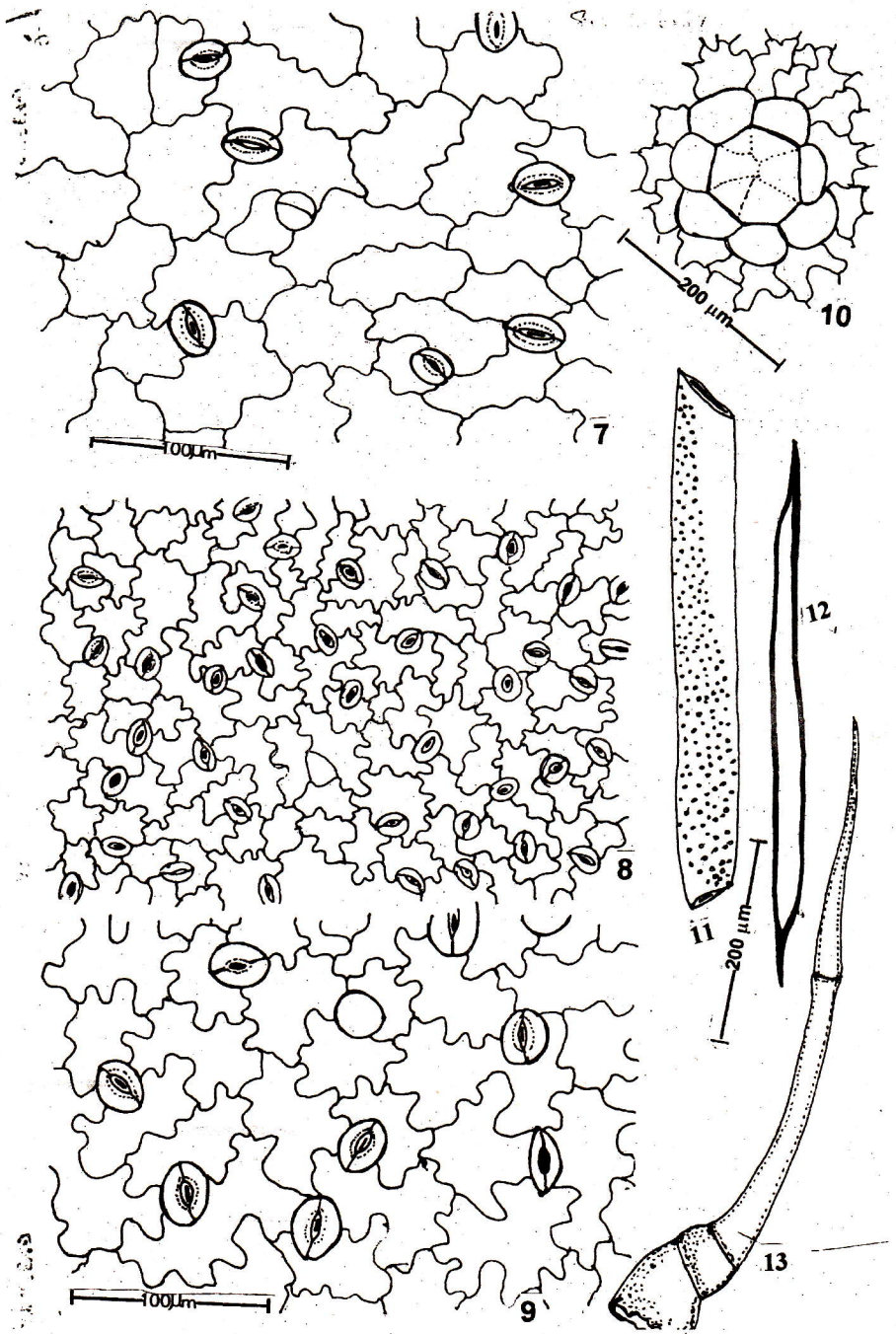

Fig. 7-13. *Tridax procumbens* L.

7. Adaxial epidermis showing epidermal morphology; 8. Abaxial epidermis showing stomatal density and epidermis wall characters; 9. Abaxial epidermis showing stomatal density and epidermal wall characters; 10. Surface view of basal rosette of epidermal cells of the trichome; 11. A vessel element with simple oblique perforation-plate; 12. A libriform fiber; 13. An epidermal trichome.

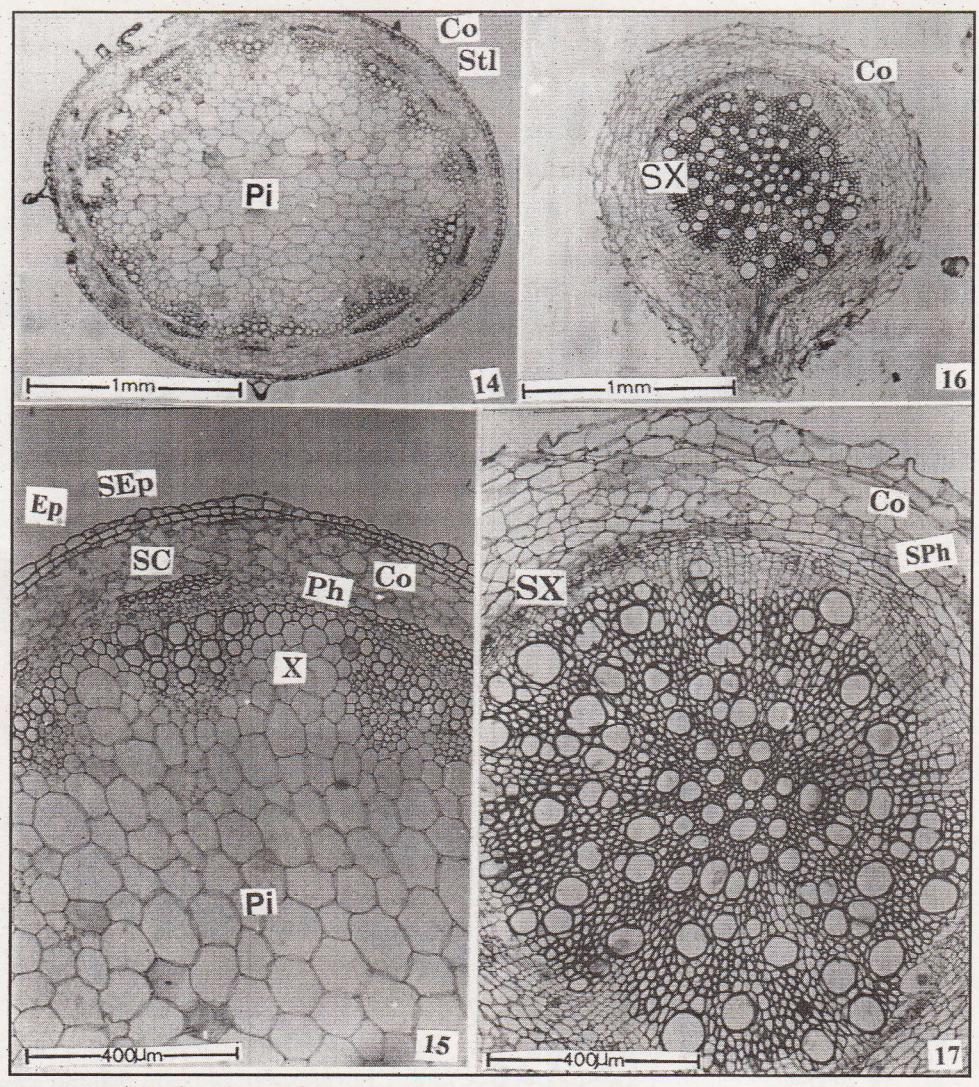

Fig. 14-17. *Tridax procumbens* L.
14. T.S. of young internode; 15. Above figure, a sector enlarged; 16. T.S. of old tap-root; 17. Vascular cylinder of the root enlarged.

(AdS - Adaxial side ; Co-Cortex; Ep - Epidermis ; In-Involucres; LT - Lateral Trace; Mr - Midrib ; MVS - Median Vascular Strand; Pi - Pith ; Ph - Phloem ; PM - Palisade Mesophyll : SC - Sclerenchyma Cap; SEp - Sub Epidermal layer ; SM-Spongy Mesophyll; Stl - Stele ; SPh - Secondary Phloem ; SX - Secondary Xylem; VaS - Vascular Strand of the midrib ; WT - Wing Trace ; X - Xylem).

parenchymatous. The vascular cylinder consists of a ring of wedge shaped collateral vascular bundles, each bundle being caped externally by a thin patch of sclerenchyma cells (Fig. 14, 15).

Roots (Fig. 16, 17): Both taproot and lateral root exhibit secondary growth. Epidermal layer is broken and remains as small fragments. The cortex is parenchymatous and the cells are tangentially stretched. Secondary phloem occurs as continuous broad zone around the secondary xylem cylinder. Xylem tissue consists of libriform fibers and thick walled, angular vessels. The

Table 1. Quantitative microscopic data.

Parameter	Value
Stomatal number	
Adaxial epidermis	16 - 17.5/mm²
Abaxial epidermis	28.5 - 31.25/mm²
Stomatal Index	
Adaxial epidermis	31.78 - 39.74/mm²
Abaxial epidermis	25.71 - 27.78/mm²
Palisade Ratio	4.5 - 6
Vein islet number	12.5 - 14/mm²
Vein termination number	19 - 21.5/mm²

Table 2. Physico - chemical constants.

Parameter	Value % W/W
Total Ash content %	14.88
Water Soluble Ash %	3.99
Alkalinity of water soluble ash (0.1 n HCl)	0.25 ml
Acid insoluble Ash %	10.448
Moisture content %	6.321
Successive Extractive Values %	
Hexane	1.5300
Benzene	0.3251
Chloroform	0.456
Solubility %	
Alcohol	7.251
Water	17.335

Table 3. Behaviour of drug powder with various chemical reagents.

Test for	Reagent	Reaction	Result
Gum	Powder + drop pf water	No reaction	-
Saponin	Water shake	No reaction	-
Protein	Picric acid	Yellow	+
Tannin	Lead acetate solution	No white ppt	-
Sterol	Acetic anhydride + H_2SO_4	Green	+
Terpenes	Tin + Thionylchloride	Pink	+
Sugar	Conc. H_2SO_4 + Anthrone	Green	+
Phenol	5% $FeCl_3$	Light green	+
Flavonoid	10% NaOH (or) Mgbits+HCl)	Magenta colour	+
Anthraquinone	5% KOH	Red	-
Furan	Alcohol + Ehrlich's reagent	No reaction	-
Alkaloid	Dragendroff's reagent	No reaction	-

Table 4. Preliminary phytochemical test for extracts.

Test	Hexane	Benzene	Chloroform	Alcohol
Steroid	+	+	+	+
Terpenes	-	-	+	+
Sugar	-	-	+	+
Alkaloid	-	-	-	-
Phenol	-	-	-	-
Flavonoid	+	-	+	-
Furan	-	-	-	-
Acid	+	-	+	-
Tannin	-	-	-	-
Saponin	-	-	-	-
Quinone	-	-	-	-

Table 5. Fluorescence analysis of drug powder.

Treatment	Day light	UV light
Drug powder	Green	Pale green
Drug powder + aq. 1N NaOH	Greenish yellow	Dark green
Drug powder + alc.. 1N NaOH	Dark green	Dark green
Drug powder + 1N HCl	Brown	Dark green
Drug powder + 50% H_2SO_4	Reddish brown	Yellowish brown

Fluorescence analysis of extracts (254 nm).

Treatment	Day light	UV light
Hexane	Yellowish green	Pale green
Benzene	Dark green with yellow tinge	Dark green
Chloroform	Dark green with yellow tinge	Dark green
Alcohol	Dark green	Dark green
Water	Pale brown	Pale brown
Acetone	Dark green	Dark green
Ethyl acetate	Dark green	Dark green

vessel elements are cylindrical with simple oblique perforations (Fig. 11, 12).

Quantitative microscopical data pertaining to stomatal frequency, palisade ratios and veination features are given in Table 1.

Physico-chemical constants

The whole plant powder was studied for their physico-chemical constant. The higher hexane extractive value reflexes the significant amount of waxy materials (Table 2).

Behavior of powder with different chemical reagents

Except for gums, saponins, alkaloids and furans, the drug powder reacted positively for protein, tannin, sterols, terpenes, sugars, flavonoids, quinines and phenols

(Table 3).

Preliminary phyto - chemical test

Preliminary phyto chemical tests for hexane, benzene, chloroform and alcohol extracts or various types of phyto chemicals were carried out. Steroids and terpenes were present in all the extracts, sugars, phenols, flavonoids and quinines were present in both chloroform and alcohol extract where as in alcohol extract tannins and saponins were also observed (Table 4).

Fluorescence analysis of extract and drug powder

Fluorescence analysis of drug powder and its various extracts treated with acids and alkali was studied, and the observations were recorded (Table 5).

Discussion

Pharmacognostic studies on *T. procumbens* L, have brought into light certain microscopic features as well as preliminary phytochemical data of diagnostic values. In the absence of the capitulum, the macroscopic features of the vegetative parts of *T. procumbens* seems to be less helpful in botanical identity of the drug. Collective microscopic data of all organs have proved to be simple technique of identification. Bilateral symmetry of the lamina with anomocytic stomata and long, simple multicellular covering trichomes with rosettes of basal cells are characteristic of the leaf of the drug. Concavo-convex transectional outline of the petiole with an arc of three vascular bundles and wing traces distinguish the petiole of *T. procumbens* from other coexisting weeds. Young internode and old taproot and lateral roots exhibit typical dicot type of structural features and these organs may add merely additional characteristics.

Quantitative macroscopic data such as stomatal number, stomatal index, palisade ratio, vein islet number and vein termination number have been highly relied upon by pioneer pharmacogonsists[8]. It is believed that these features are constant for a given species and can be employed for inter specific identity of drugs. Physicochemical constants such as solubility, successive extractive values and other parameters of the ash of the drug are corroborative evidences in drug standardizations. The drug powder usually exhibits specific color reaction when mixed with different reagents, thereby indicating the presence or absence of different compounds in the drug. As showed in the Tables, the powder drug of *T. procumbens* L. seems to contain protein, sterol, terpenes, sugar and phenol. Fluorescence analysis of the drug powder as well as drug extract is other simple tests for standardizing the drug (Table 4, 5). Thus, the anatomical characters coupled with preliminary phytochemical results are specific for the weed drug *T. procumbens* L.

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