



RESEARCH ARTICLE

MICROSCOPIC STUDIES OF *TRIDEX PROCUMBENS* LINN.

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Present study was aimed to develop complete microscopy and macroscopy of *Tridex procumbens*. *Tridex procumbens* Linn. (Family: Asteraceae) commonly known as 'coat buttons', is an important plant used against various disorders in indigenous system of medicine viz. hepatoprotective, anti-hepatotoxic, antipyretics, anti-inflammatory, anti-diabetic, immunomodulator, blood coagulant, and wound healing activity. The transverse section of leaf showed single layered epidermis on both the surfaces, covered with thick cuticle. The mid rib region showed slight depression on ventral side and slightly protuberated on dorsal side. Trichomes were of covering type, simple, multicelled and more in number on dorsal side. Leaves consisted of glandular and non-glandular type of trichomes. The anomocytic types of stomata were present in both lower and upper surface of leaves. The quantitative microscopical studies of leaf were also carried out and various leaf constants such as palisade ratio, vein islet number, vein termination number, stomatal number (lower surface), stomatal index (upper and lower surface) were determined.

Key words: Macroscopy, Microscopy, *Tridex procumbens*, Asteraceae.

INTRODUCTION

Tridax procumbens Linn. (Family: Asteraceae) is a common plant which was introduced in China in the 1940. It is found in tropical areas, growing primarily during rainy season and commonly known as 'ghamra' and popularly called 'coat buttons' because of appearance of flowers (Chatterjee and Pakrashi, 2000; Saxena and Albert, 2005).

Tridax procumbens is reported to have hepatoprotective activity (Ravikumar *et al* 1995). It also possesses anti-inflammatory, immunomodulator, anti-diabetic activity, and *in vitro* activity against promastigotes, haemostatic, antioxidant, anti-hepatotoxic, antipyretic and antibacterial activity (Nazeruddin *et al* 2011; Wagh, 2010; Mundada and Shivhare, 2010). The leaves are reported as antidiarrheal, antidysentric and found to be useful in bronchial catarrh (Jude *et al* 2009). The juice of leaves control bleeding wounds. In addition, *Tridax procumbens* is also utilized to manage hypertension, in treatment of fever,

typhoid fever, cough, asthma and epilepsy (Salahdeen *et al* 2004; Tejaswini *et al* 2011).

The plant has been reported to contain flavonoids, alkaloids, sterols, carotenoids and tannins. The plant also contain glucoluteolin, luteolin, isoquercetin and quercetin (flowers), fumaric acid (leaves), *n*-alkanes (C₁₅-C₃₂), saturated and unsaturated fatty acid (C₁₂-C₂₂), arachidic, behenic, lauric, linoleic, linolenic, myristic, palmitic, palmitoleic and stearic acid, dotriacontane, 1-(2,2-dimethyl-3-hydroxypropyl)-2-isobutylphthalate, heptacosanyl-cyclohexane carboxylate, 12-hydroxytetracosan-15-one, methyl-14-oxooctadecanote, methyl-14-oxo nonacosanoate, 3-methylnondecylbenzene, 32-methyl-30-oxotetriacont-31-en-1-ol, 30-methyl-28-oxodotriacont-29-enoic acid, 9-oxoheptadecane, 10-oxononadecane, β -amyryn, β -amyrone, Δ -dehydrolupen-3-one, lupeol, fucosterol and β -sitosterol were also isolated from the plant (Verma and Gupta, 1988). It is also a potential source of the

protein supplements and pro-vitamin A (carotenoids).

MATERIALS AND METHODS

Authentication of the plant material

The plant material was collected and authenticated in the month of January 2011 from college campus of Bansal College of Pharmacy, Bhopal (MP). The fresh parts of plant were used for microscopic studies. The leaves were separated, dried, coarsely powdered and stored in a closed container for further studies. Macroscopic and microscopical characters were studied as described in quality control method. Microtome sections were taken, stained, mounted and observed under binocular and projection microscope. Photograph at different magnifications were taken by using Nikon digital camera 12 megapixel.

Macroscopical studies

Macroscopic studies were carried out by using organoleptic evaluation method. The shape, size, colour, odour, taste, base, texture, margin, apex of leaves and various plant parts of *Tridax procumbens* Linn. were observed.

Microscopic studies

Microscopic studies were carried out by preparing thin sections of leaf, stem, and petiole. The thin sections were collected in watch glass and bleached with bleaching agent along with little boiling. Thin sections were further washed with water, stained with safranin and mounted in glycerin for observation.

Powder microscopy

Preliminary analysis of the powdered leaves of

Tridax procumbens Linn were carried out. Results are presented in **Table 2**.

RESULTS AND DISCUSSION

Macroscopic characters of leaf, flower, stem and root

Leaf

Decumbent perennial herb with leaves 3-6 cm long and 1-4 cm wide, lanceolate to ovate shaped, hairy, opposite, often deeply lobed with irregularly toothed margin and acute apex. Heads solitary, involucre bracts very hairy, the outer shorter, receptacle convex, pileate. Petiole was short and easily fractured (**Table 1**).

Flower

Flowers were of two types, disc flowers, the corolla narrow-campanulate, 8 mm long, bright yellow and hairy at the top, with spreading pappus of plumose hairs. Ray flowers 5 or 6, female, with narrow corolla tube and brown ligulate limb, white or pale yellow, flowering and fruiting throughout the year (**Figure 1**).

Stem

Stem was herbaceous, cylindrical, decumbent and branched.

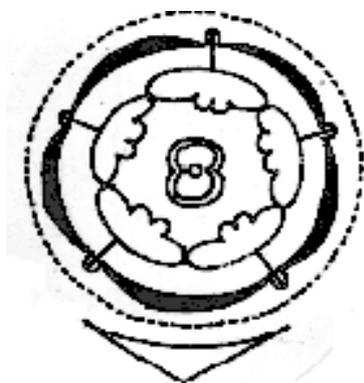
Root

Tridax procumbens having a tap root system.

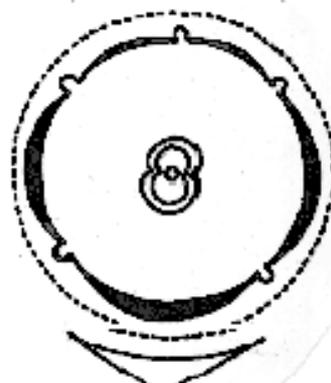
Microscopical character

Stem

Dicot type of stem is present in *Tridax procumbens* and it consisted of 2-4 layered cell cork, 5-7 layered cell epidermis, xylem, phloem, pith (**Table 2**).



Floral formula: Br., Ebrl., \oplus , $\frac{\square}{+}$, K_{∞} , $\overline{C}_{(5)}$, $A_{(5)}$, $\overline{G}_{(2)}$



Br., Ebrl., $\%_{\square}$, $\frac{\square}{+}$, K_{∞} , $C_{(5)}$, A_0 , $\overline{G}_{(2)}$

Figure 1. Floral diagram of disc floret and floral diagram of ray floret

Table 1. Macroscopy of *Tridax procumbens* Linn.

Part of plant	Morphology of leaves	Observation
Leaf	Colour	Green
	Odour	Characteristic
	Taste	Acrid
	Size	3-7 cm long, 1- 5 cm wide
	Shape	Lanceolate to ovate
	Texture	Short
	Fracture	Easy
	Apex	Acute
	Margin	Irregularly toothed
	Arrangement	Opposite
	Appearance	Rough & Scabrous
Stem	Petiole	Short
	Colour	Green
	Odour	Characteristic
	Taste	Acrid
	Size	23-46 cm
	Shape	Cylindrical
	Texture	Smooth
Root	Fracture	Soft
	Colour	Brown
	Odour	Characteristic
	Taste	Acrid
	Size	15-32 cm
	Shape	Tortuous
	Texture	Rough
Fracture	Soft	

Petiole

The petiole was found to be kidney shaped towards the distal end and crescent shaped towards the laminal side. Single layered epidermis was covered with cuticle and interrupted by simple, multicellular, 3-5 celled trichomes. Hypodermis was 1-2 celled and collenchymatous. Ground tissue parenchymatous, vascular bundles 5, the size of the vascular bundles varies from centre to margin *i.e.* large to small. These were centripetal *i.e.* xylem surrounded by the phloem (**Table 2**).

Root

Dicot type of root was present in *Tridax procumbens* and it consisted of 2-3 layered cells cork, 8-12 layered cells epidermis, xylem, phloem, medullary rays (**Table 2**).

Leaf

Transverse section (T.S.) of leaf showed dorsiventral, epidermis single layered on both the surfaces and covered with thick cuticle. T.S. passing through the mid rib region showed slight depression on ventral side and slightly protuberated on dorsal side. Trichomes were of covering type which are simple, multicelled (3-6 celled) and more in number on dorsal side. The basal cells of the trichomes were swollen and trichomes looked like claw. Meristeeel consists of single centrally located collateral vascular bundle surrounded by some parenchymatous cells filled with dark content. T.S. passing through the laminar region shows single layered palisade cells just below the epidermis followed by 5-7 celled mesophylls, parenchyma mostly devoid of intercellular spaces (**Table 2**).

Trichomes

Trichomes were variable outgrowths of epidermal cells which were useful in the identification of the plant material. The trichomes may be differentiated into base embedded in the cell and a projecting body. *Tridax procumbens* consisted of glandular and non-glandular type of trichomes (Table 2).

Stomata

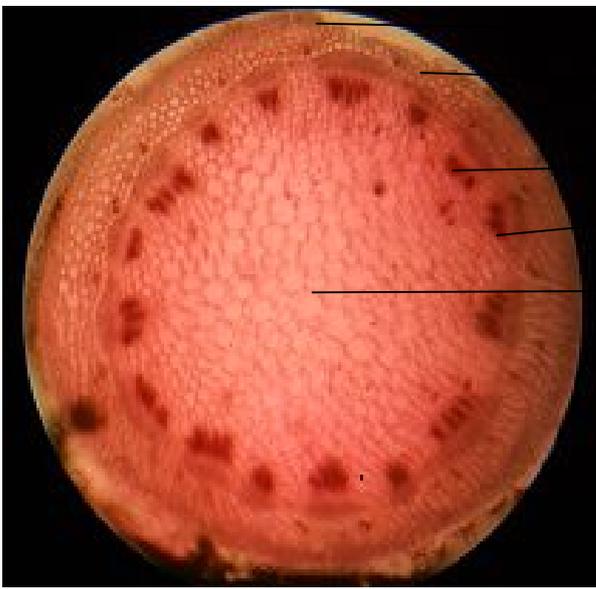
Stomata may occur in the epidermis particularly in leaves. Stoma consisted of a pair of identical cells called guard cells and a center pore through which gaseous exchange takes place. Stomata

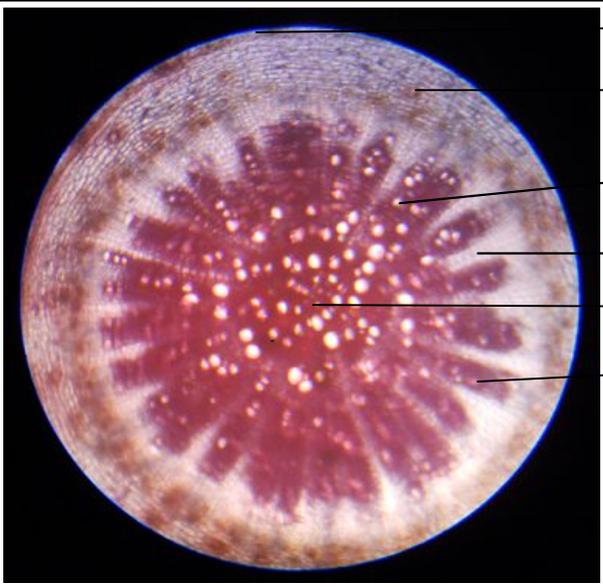
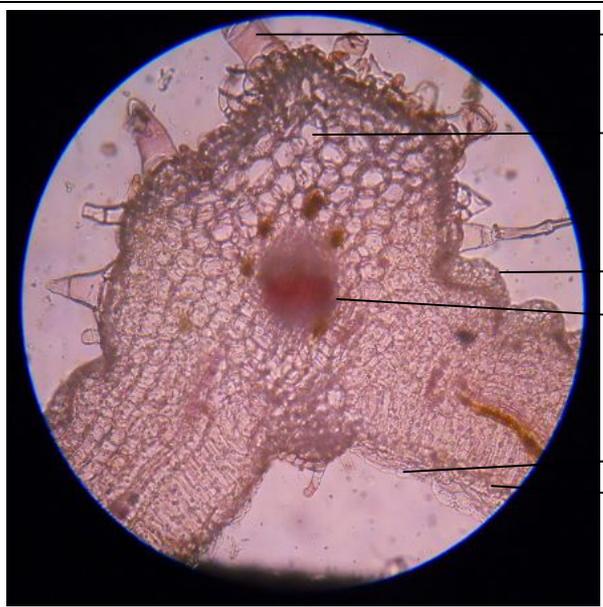
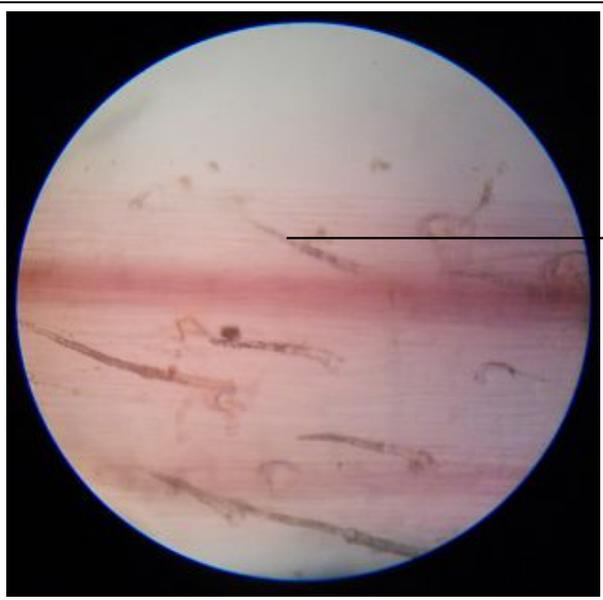
were surrounded by epidermal cells. The anomocytic type of stomata was present in both lower and upper surface of leaves (Table 2).

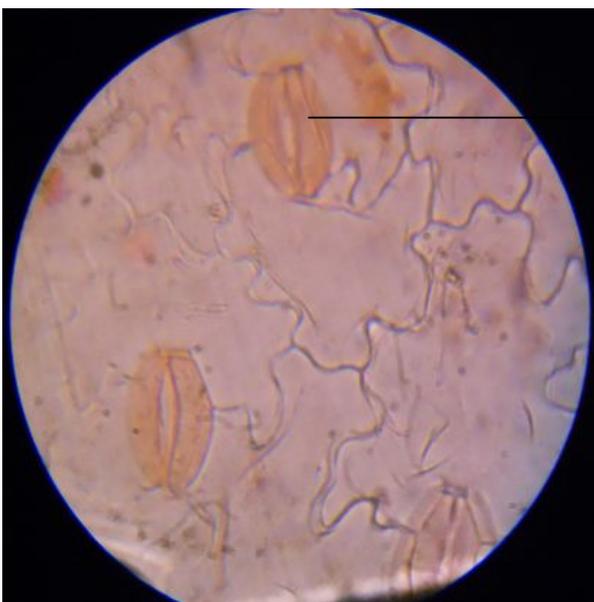
Powder microscopy

The powder appeared dark green in color, fine, odorless with slight bitter taste. The powder microscopy revealed the presence of different types of (glandular and non-glandular) trichomes, trichome base, fibres, stone cells, laticifers with adjacent parenchyma. Spiral thickenings vascular bundles were also present (Table 2, Table 3).

Table 2. Microscopy of *Tridax procumbens*

S. No.	Part	Photo	Details
1.	Stem		<ul style="list-style-type: none"> → Cork → Epidermis → Xylem → Phloem → Pith
2.	Petiole		<ul style="list-style-type: none"> → Epidermis → Xylem → Phloem → Trichomes

<p>3.</p>	<p>Root</p>		<ul style="list-style-type: none"> → Cork → Epidermis → Xylem → Phloem → Pith → Medullary Rays
<p>4.</p>	<p>T.S of leaf</p>		<ul style="list-style-type: none"> → Trichome → Spongy mesophyll → Upper epidermis → Vascular bundle → Lower epidermis → Palisade cells
<p>5.</p>	<p>Trichomes of petioles</p>		<ul style="list-style-type: none"> → Trichome

<p>6.</p>	<p>Trichomes of lower surface of leaves</p>		<p>Non-glandular (multicellular) trichome</p> <p>Glandular (multicellular) trichome</p>
<p>7.</p>	<p>Trichomes of upper surface of leaves</p>		<p>Non-glandular (multicellular) trichome</p> <p>Glandular (multicellular) trichome</p>
<p>8.</p>	<p>Stomata of lower surface of leaves</p>		<p>Stomata (anomocytic)</p>

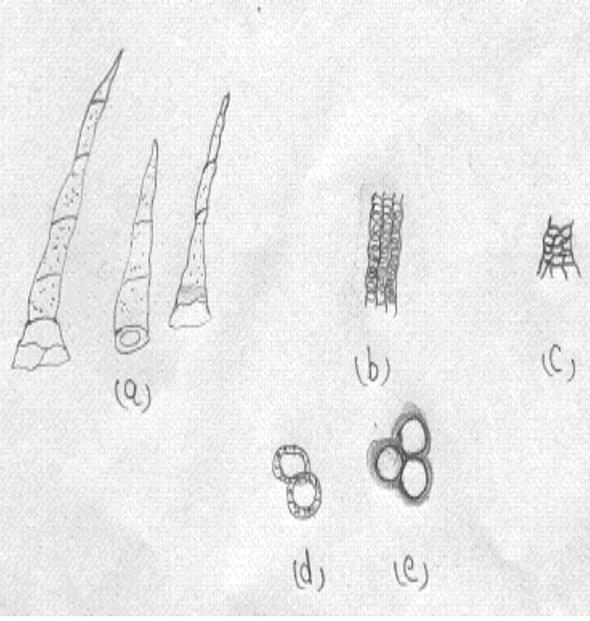
<p>9.</p>	<p>Stomata of upper surface of leaves</p>		<p>→ Guard cells</p> <p>→ Stomata (anomocytic)</p>
<p>10.</p>	<p>Powder microscopy</p>		<p>a) Simple trichomes</p> <p>b) Spinal vascular bundle</p> <p>c) Trichome base</p> <p>d) Stone cell</p> <p>e) Stone cell</p>

Table 3. Quantitative microscopy of *Tridax procumbens* leaves parameters

Quantitative microscopy of <i>Tridax procumbens</i> leaves parameters	Range
Palisade ratio	1:8
Vein islet number	8-10
Vein termination number	2-3
Stomatal number (lower surface)	3-4
Stomatal index (upper surface)	13.3-22.2
Stomatal index (lower surface)	12.0-13.7

CONCLUSION

The macroscopical and microscopical characters of *Tridax procumbens* were studied and found to be in agreement with the reported characters in

literature. The powder microscopical characters were established which are helpful in the identification of crude drug either as a single powder or in the mixture of powdered drugs.

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