Pharmacognostical study of *Tridax procumbens* Linn

ABSTRACT

Tridaxprocumbens Linn is a native of tropical America and has naturalized in tropical Africa, Asia, and Australia. It is a wild plant that may be found all throughout India. It has been widely utilized in the Ayurvedic medical system and is prescribed as "Bhringraj" by some Ayurvedic doctors. In India, a weed known as "Jayanti Veda" is called *Tridax procumbens* L. *Asteraceae's Tridax Procumbens* Linn., sometimes known as coat buttons. Pharmacognostic studies are very important since the parameters estimated are the identity of a particular plant and they are very useful to authenticate the plant under study and prevent it from adulteration and substitution. complete botanical evaluation which comprises macroscopic, microscopy physicochemical parameters like loss on drying extractive value, ash value and to investigate the Phytochemical present the extract in the preliminary level were carried out for the quality control of the drug.Pharmacognostic studies are crucial because the estimated parameters help identify a specific plant. They are also highly helpful to authenticate the plant being studied and guard against adulteration and substitution.

KEYWORDS: Coat button, *Tridax procumbens*, *Asteraceae*, Lanceolate, Parenchymatous.

INTRODUCTION :

Tridax procumbens Linn. is a member of the Compositae family. It is a plant that is sometimes called "Common button" or "Coat button" across all of India (5). In the "Fon" language of Benin, the plant is referred to as "azuiman". Its therapeutic qualities were the focus of numerous studies (6). Tropical Africa, Asia, Australia, and India have all adopted the plant as native to tropical America. It is a India-wide distribution of wild herbs (7). It is a typical therapeutic herb utilized by practitioners of ethnomedicine. It is most well-known for being a common weed and nuisance plant.(8). Plant produces daisy-like white or yellow flowers with three-toothed ray florets that have a yellow core. Serrated leaves are present and arrowhead-shaped (2). In the US, *T. Procumbens* is considered a nuisance and a toxic wild plant*. T. accedens, T. dubia, T. erecta, T. angustifolia, T. serboana, T. bicolor ,T.rosea* are the important Tridax species for medicine . *Tridax Procumbens*, also referred to as coat buttons or tridax daisies, is a flowering member of the daisy family (9). An annual herb that spreads can reach a height of 20 cm. It is widely utilized in the Ayurvedic medical system for numerous ailments (10). Additionally, coat buttons can be found in wastelands, dikes, railroads,

riverbanks, meadows, and dunes. Its vast use and significance as a Due to its spreading branches and large amount of seed production.Tridax is a 12-year-old straggling herb.6-8 long and very long leaves, about 24 cm long, thin, single peduncles that are at least a foot long (11).

MATERIALS AND METHODS

Materials

Plant material The plant material was collected from the Namakkal region, in the month September and October 2023. The plant was identified and authenticated by Department of Pharmacognosy, Siddha Central Research Institute (CCRS), Anna Hospital Campus, Arumbakkam, Chennai 600106,TamilNadu . A herbarium was preserved in the department for further reference. The whole plant were , dried, coarsely powdered passed through sieve no 40 and stored in a closed container for further use. All reagents used were of analytical grade.

Methods

1. **Macroscopy**

   External feature of test sample was documented using Nikon D-5600 Digital camera.

2. **Microscopy**

   Sample was preserved in fixative FAA for more than 48 h. The preserved specimens were cut into thin transverse section using a sharp blade and the sections were stained with toluidine blue. Transverse sections were photographed using Axiolab5 trinocular microscope attached with Zeiss Axiocam208 color digital camera under bright field light. Magnifications were indicated by scale bar.

3. **Quantitative microscopy**

   Rectangular cut leaf pieces were boiled with saturated chloral hydrate solution until colourless and slides prepared for vein islets, vein termination, epidermal number, stomatal number, stomatal index and palisade ratio.

4. **Powder microscopy**

   A pinch of the powdered sample was mounted on a microscopic slide with a drop of 50% glycerol after clearing with saturated solution of chloral hydrate. Sample was treated with iodine solution to confirm the presence of starch grains. Characters were observed using Nikon ECLIPSE E200

trinocular microscope attached with Zeiss ERc5s digital camera under bright field light. Photomicrographs of diagnostic characters were captured and documented.

5. Histochemical tests

Plant sections were treated following the standard procedures:

1. Crystals

The section was mounted in water and one end of the cover slip was irrigated with acetic acid. While looking through the microscope, the water within the cover slip was replaced using a piece of filter paper at the opposite end of the cover slip.

-Formation of air bubbles indicated Calcium carbonate crystals

-If no air bubbles were formed, the experiment was repeated with conc. HCl, wherein dissolution of crystal and formation of needles of Calcium sulphate indicated the presence of Calcium oxalate crystals

2. Fats, Fatty oils volatile oils and resins

About1 to 2 drops of Sudan-IV was added to the section and allowed to stand for a few minutes. Presence of fatty oil substances were indicated by orange red/pink/red colored globules; while red coloured irregular contents indicated resin.

3. Starch

A drop of 2% iodine water solution was added - blue colour indicated starch.

4. Tannin

A drop of alcoholic ferric chloride was added - bluish black-coloured contents indicated tannin.

5. Mucilage

A drop of ruthenium red was added - pink to red colored contents indicated mucilage.

6. Lignified cell walls

A drop of phloroglucinol was added to the section and allowed to stand for about 2 min or until almost dry. A drop of 50% HCl was added and observed over a cover-glass - cell walls stained pink to cherry red indicating presence of lignin.

7. Suberized or cuticular cell walls

A drop of Sudan red III was added and allowed to stand for a few minutes, warmed gently if necessary - cell walls-stained orange-red or red indicated suberin or cutin deposition over cell wall.

8. Alkaloids

A drop of Wagner's reagent was added - the presence of yellow to reddish brown colored contents confirmed alkaloids.

RESULTS AND DISCUSSION

1. Macroscopy

Taproot, cylindrical, brownish yellow coloured, no characteristic taste and odour; stem is light green coloured, creeping, decumbent, slender, cylindrical, hispid, covered by hairs of 1 mm long, tuberculate at the base, branched, producing roots at nodes; leaves are green coloured, simple, opposite, ovate to lanceolate in shape, decussate with cuneate base, acute apex, serrated to irregularly toothed margins; measuring 3 to 7 cm in length and 1 to 4 cm wide in breadth; petiolate, petiole short and hairy; odour is not characteristic and slightly bitter taste.

Figure 1. Macroscopy of *Tridax procumbens* Linn

2. Microscopy

Root

TS of root is circular in outline; outer layer consists of 2 to 3 layers of cork cells with exfoliating outer layer followed by narrow cortex region composed of 8 to 9 layers of parenchymatous cells with some oil globules; next to cortex is broad xylem region surrounded by narrow band of phloem; xylem is formed of vessels, fibers and xylem parenchyma traversed by multiseriate medullary rays; medullary rays are radially traversing through the xylem up to the phloem making a wedge like appearance to xylem elements (Fig. 2).

Stem

TS of stem is nearly circular in outline; it shows outer single layered epidermis covered by cuticle and bears few multiseriate covering trichomes; cortex is narrow and formed of 1 to 2 layers of collenchymatous cells followed by 2 to 3 layers of chlorenchyma cells in continuous with a layer of parenchyma; some of the cortical parenchyma cells have contents; a ring of 19 to 20 vascular bundles are arranged at the inner cortex surrounded by discontinuous patches of pericyclic fibres; vascular bundles are conjoint, collateral and open; a ring of 2 to 4 layered cambium connects the bundles; phloem is found outside and endarch xylem towards inner side; xylem consists of vessels; fibres and xylem parenchyma; protoxylem elements can be seen towards the pith region; pith is very broad and parenchymatous (Fig. 3).

Petiole

TS of petiole shows upper flat surface with two lateral horn like projections and lower convex surface; outer layer is single layered epidermis covered by thin cuticle and bears uniseriate, multicellular covering trichomes; collenchymatous hypodermis can be seen below the epidermis followed by 2 to 3 layers of chlorenchymatous cortex in continuation with parenchymatous ground tissue embedded with 3 vascular bundles arranged in a half ring at the center; vascular bundles are conjoint, bicollateral and closed; center bundle is larger than the lateral bundles; xylem and phloem is formed of normal vascular elements; two trace bundles are found, each one in the wing region (Fig. 4).

Leaf

TS of leaf shows upper elevated and lower convex midrib surface with lateral laminar extensions (Fig. 5).

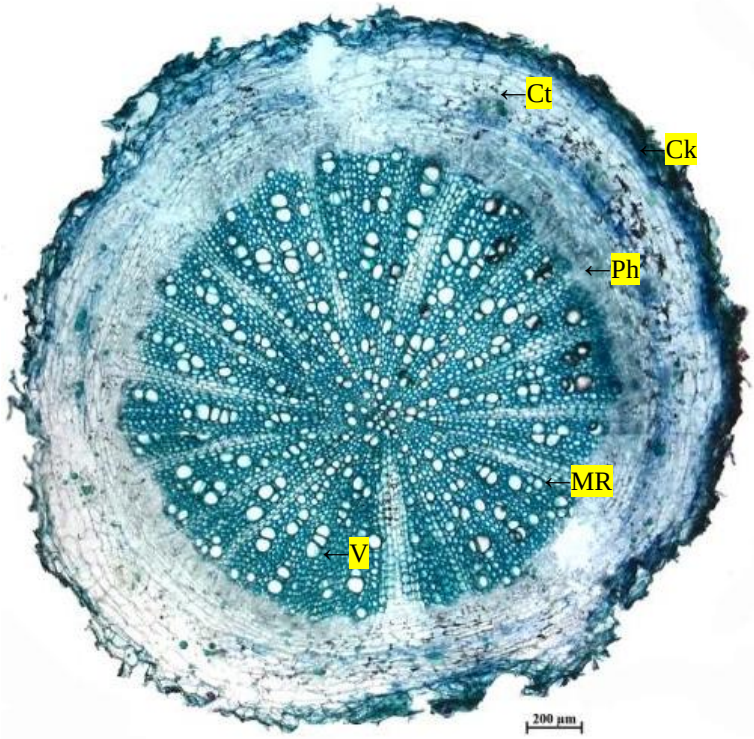
Midrib

TS of leaf passing through midrib shows upper and lower single layered epidermis covered by thin cuticle and bears numerous covering trichomes; beneath the epidermis, a layer of collenchymatous hypodermis is present followed by parenchymatous ground tissue; a single conjoint, collateral vascular bundle can be seen at the center with xylem facing towards upper and phloem on the lower side; xylem and phloem is formed of normal vascular elements (Fig. 5).

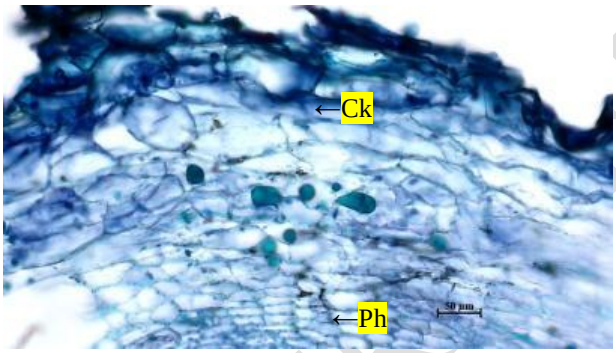
Lamina

TS of lamina shows upper and lower single layered epidermis covered by thin cuticle and bears numerous covering trichomes; mesophyll tissue is differentiated into a row of upper palisade cells followed by 4 to 5 layers of spongy parenchymal cells traversed by veins; some cell contents are found in the lamina and midrib (Fig. 5).

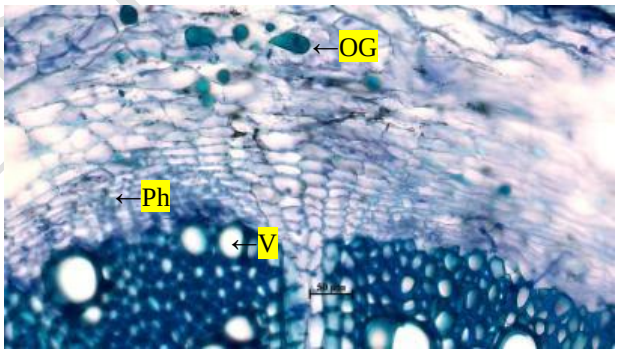
Figure 2. TS of *Tridax procumbens* Linn (root)



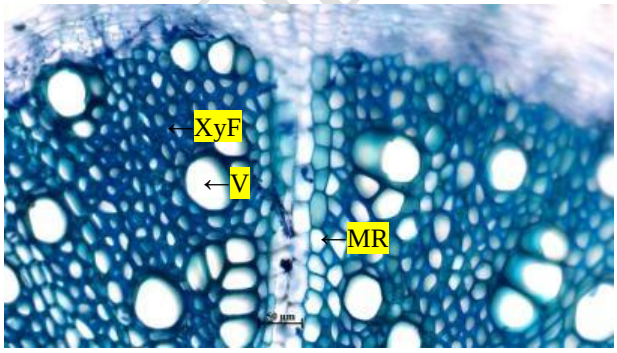
TS of root

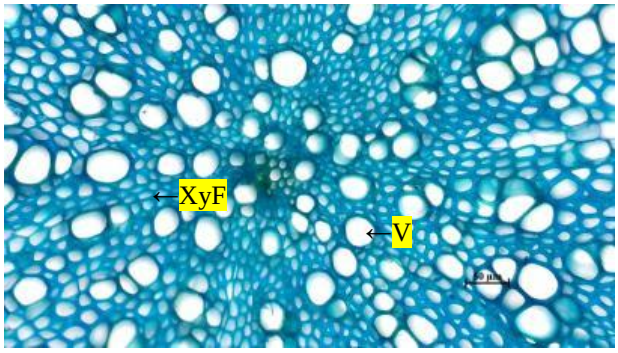


Cork and cortex enlarged view



Cortex and vascular bundle enlarged view

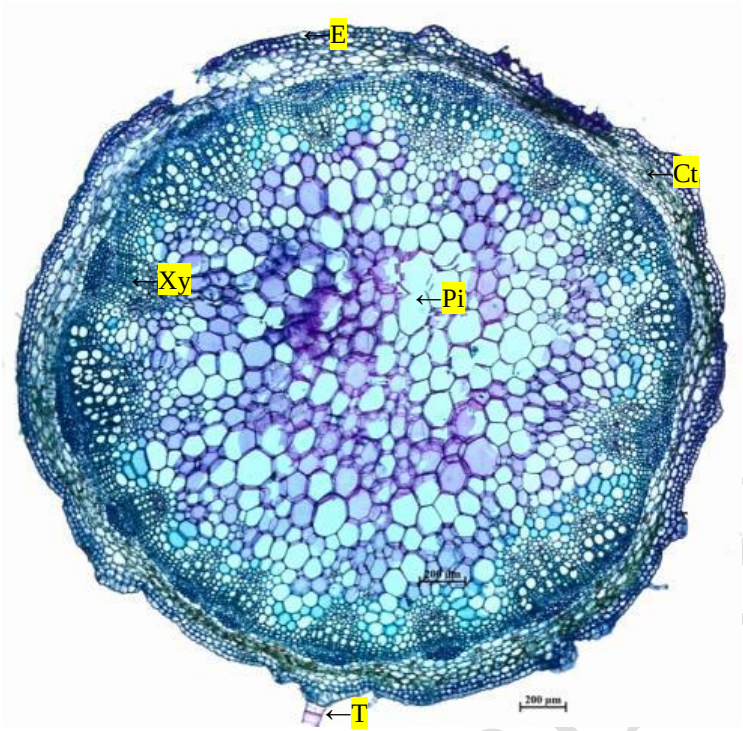




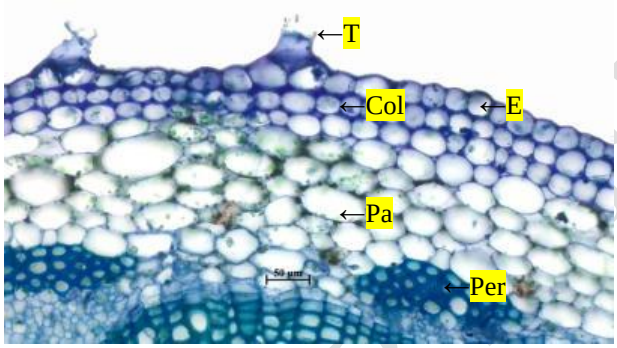
Enlarged view of xylem with medullary rays

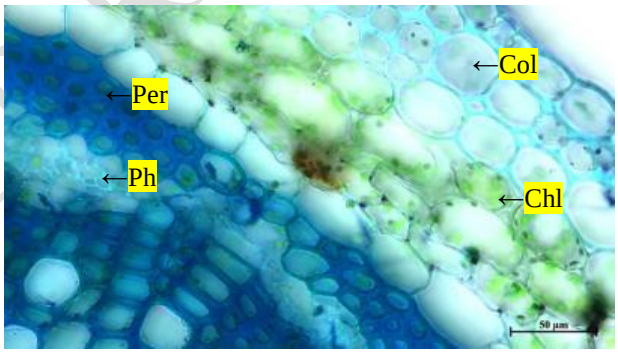
Ck - cork; **Ct** - cortex; **MR** - medullary ray; **OG** - oil globule; **Pa** - parenchyma cells; **Ph** - phloem; **V** - vessel; **XyF**- xylem fibre

Figure 3. TS of *Tridax procumbens* Linn (stem)

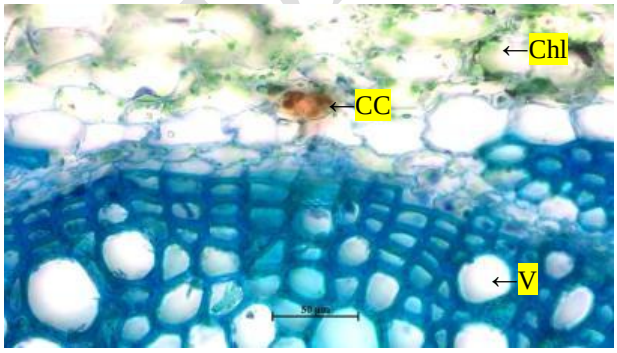


TS of stem

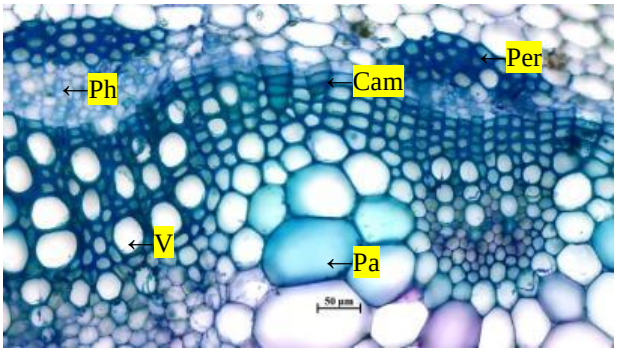




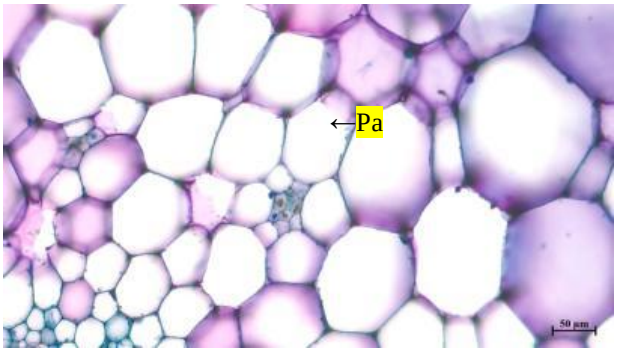
Upper portion enlarged view



Cortex and vascular bundle



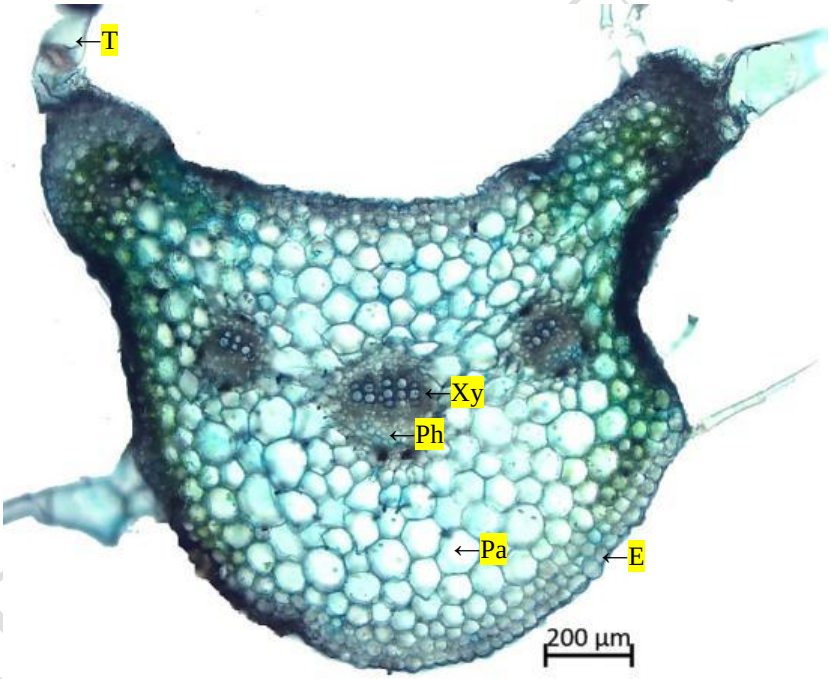
Enlarged view of vascular bundles



Pith region

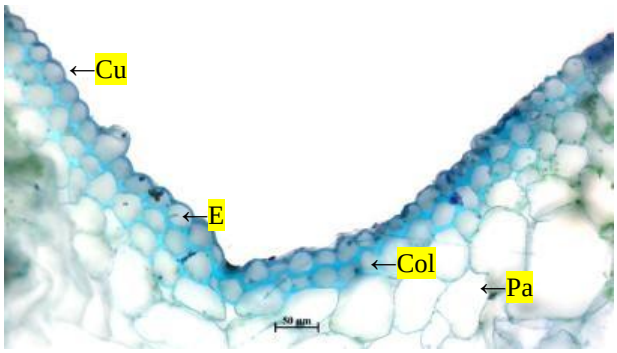
Cam - cambium; **CC** - cell content; **Chl -** chlorenchyma; **Col** - collenchyma; **Cu** - cuticle; **Pa** - parenchyma cells; **Per** - pericycle; **Ph** - phloem; **T** - trichome; **V** - vessel

Figure 4. TS of *Tridax procumbens* Linn (petiole)

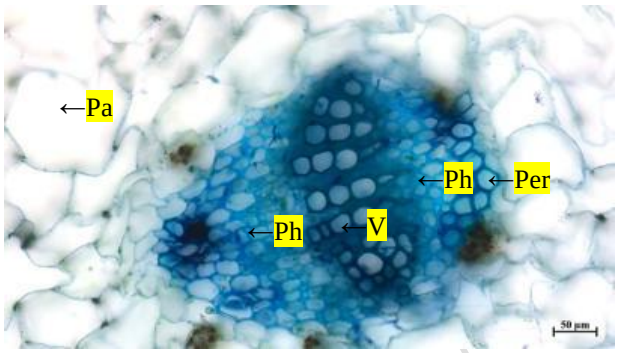


TS of petiole

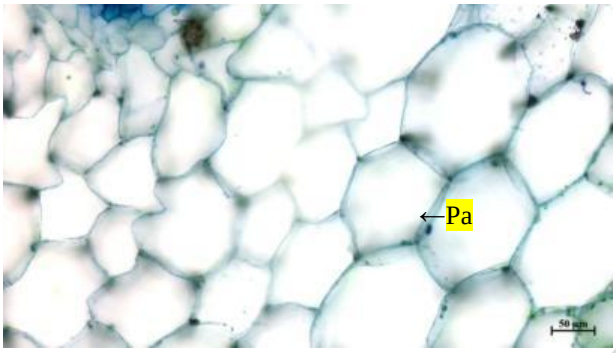
Enlarged view of wing region



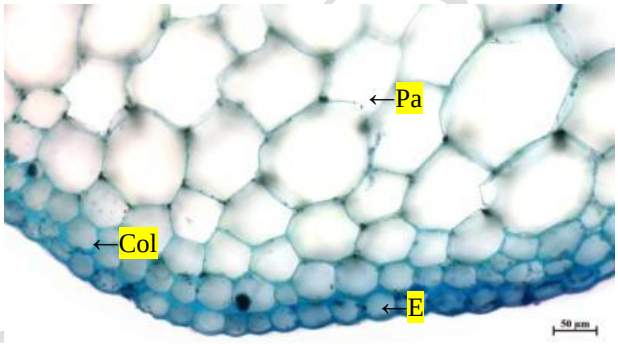
Upper region enlarged



Vascular bundle enlarged



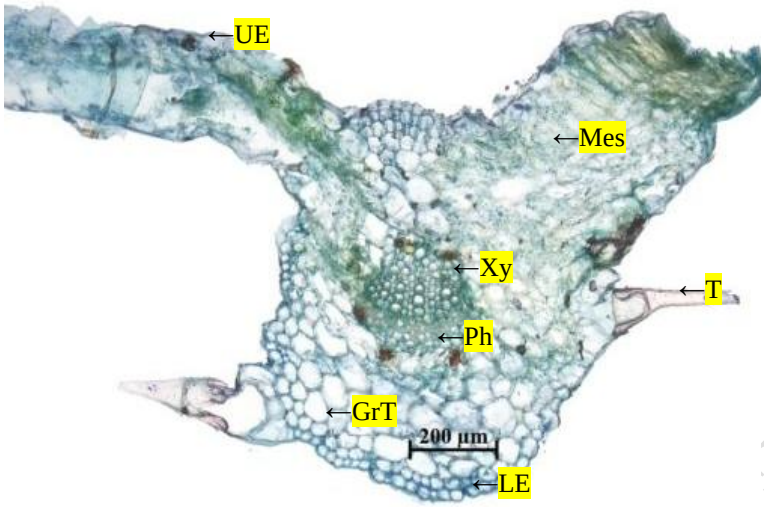
Ground tissue



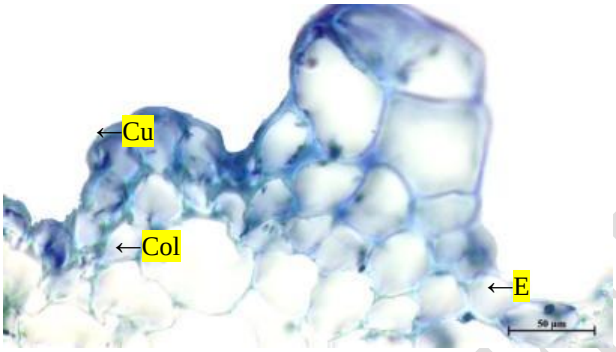
Lower portion enlarged

Chl - chlorenchyma; **Col** - collenchyma; **Cu** - cuticle; **Pa** - parenchyma cells; **Per** - pericycle; **Ph** - phloem; **T** - trichome; **V** – vesse

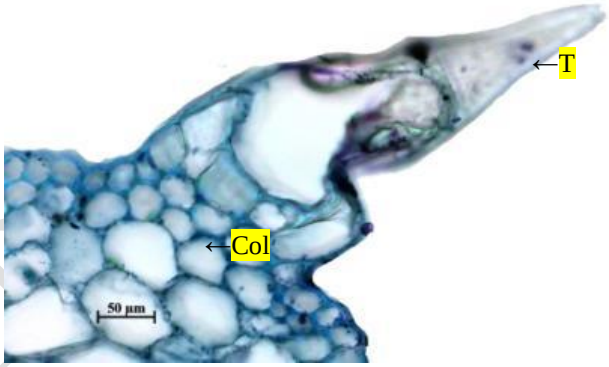
Figure 5. TS of *Tridax procumbens* Linn (Leaf)



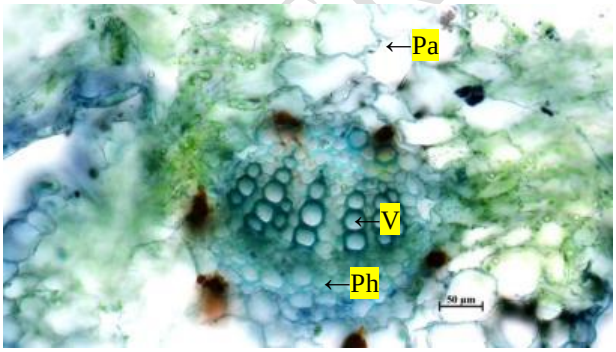
TS of leaf

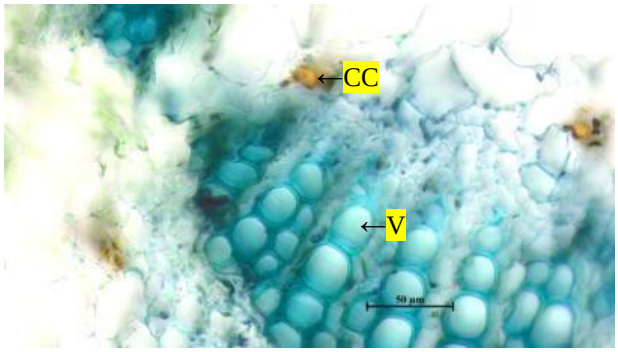


Midrib upper portion enlarged view

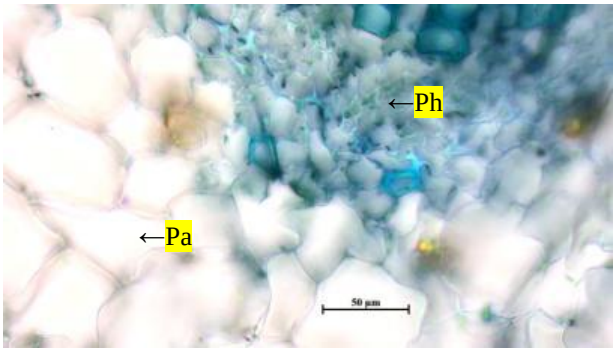


Trichome enlarged view

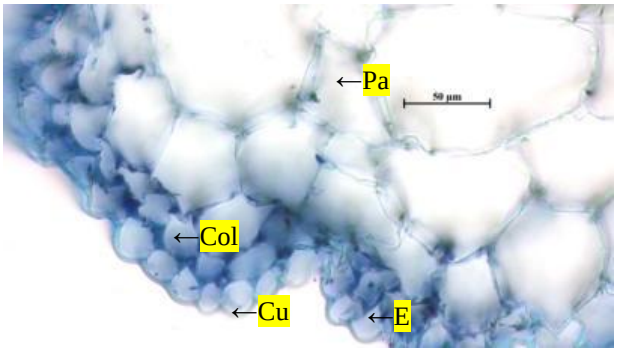




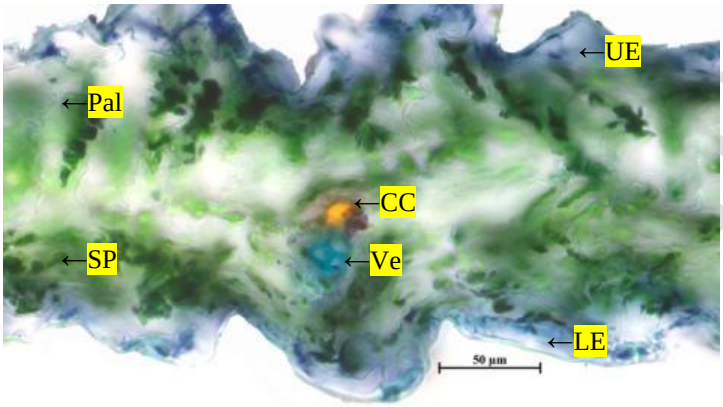
Vascular bundle



Ground tissue and phloem



Lower portion enlarged



TS of lamina

CC - cell content; **Col** - collenchyma; **Cu** - cuticle; **GrT** - ground tissue; **LE** - lower epidermis; **Mes**-mesophyll cells; **Pa** - parenchyma; **Pal** - palisade cells; **Ph** - phloem; **SP** - spongy parenchyma; **T** - trichome; **UE** - upper epidermis; **V** - vessel; **VB** - vascular bundle; **Ve** – vein

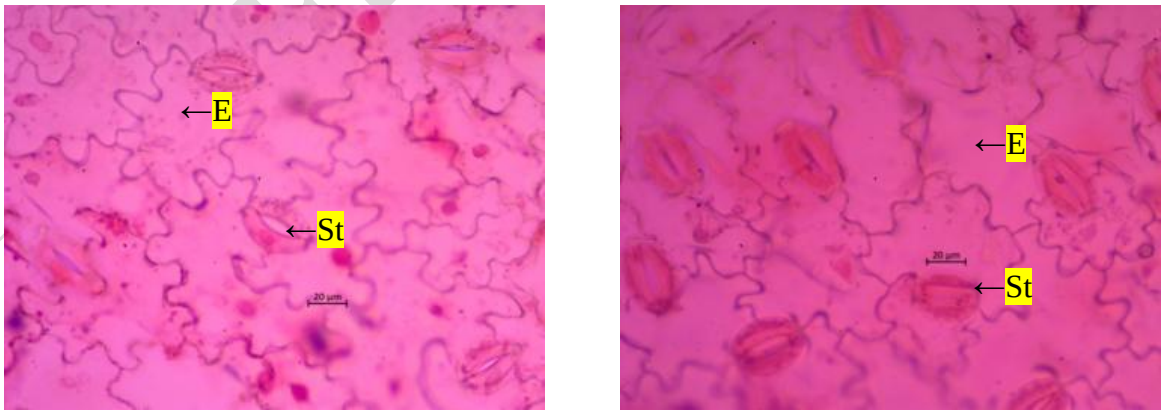
3. Quantitative microscopy

The quantitative parameters obtained during microscopic observation of epidermal peelings of leaf were recorded (Table 1). The leaf is amphistomatic with anomosocytic and anisocytic stomata (Fig. 6).

Table 1. Quantitative microscopy of *Tridax procumbens* Linn (Leaf)

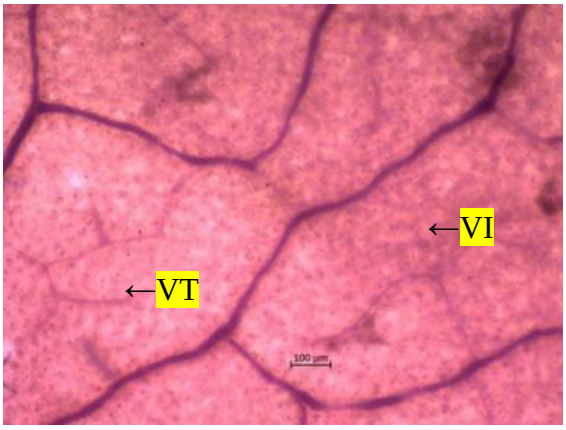
Parameters	Upper epidermis (/mm^2)	Lower epidermis (/mm^2)
Epidermal number	125-140	130-145
Stomatal number	22-28	43-46
Stomatal index	15-16	25-30
Palisade ratio	2-3	
Vein islets	5-6	
Vein terminations	1 2-14	

Figure 6. Quantitative microscopy of *Tridax procumbens* Linn (Leaf)



Upper Epidermis

Lower epidermis



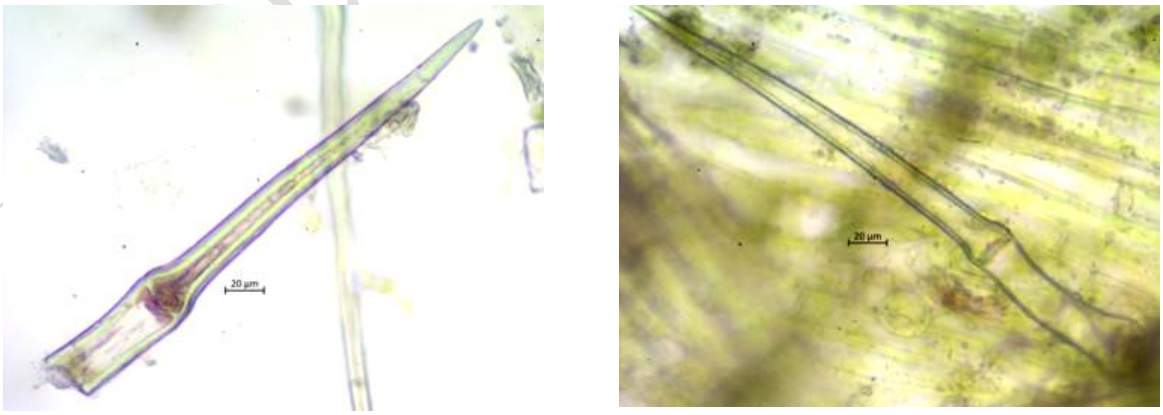
Vein islets and terminations

E - epidermis; **St -** stomata; **VI -** vein islets; **VT -** vein termination

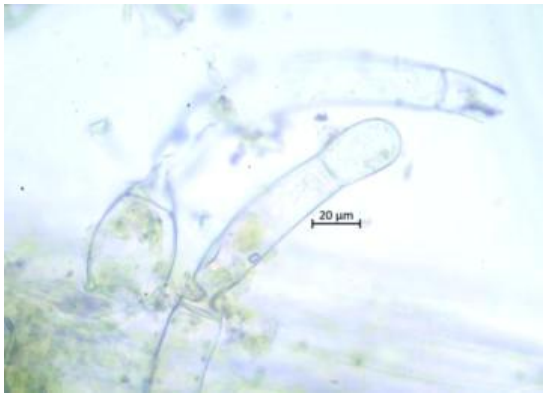
4. Powder microscopy

Powder is dark green coloured with no characteristic odour and tastes slightly bitter; it shows characters like covering and glandular trichomes from leaf; small bicellular trichomes from flower; surface view of leaf epidermis with anomocytic stomata; fragment of epidermis with anomocytic stomata from petiole; epidermal cells from flower; fragment showing epidermis with papillary outgrowth from flower stalk; vascular fragment showing spiral, pitted and reticulate thickenings; tracheids with simple pits; surface view of cork cells with tannins; anther wall, pollen grains; parenchyma cells with starch grains; cells with reddish brown contents; cicatrix of trichome and oil drops (Fig. 7).

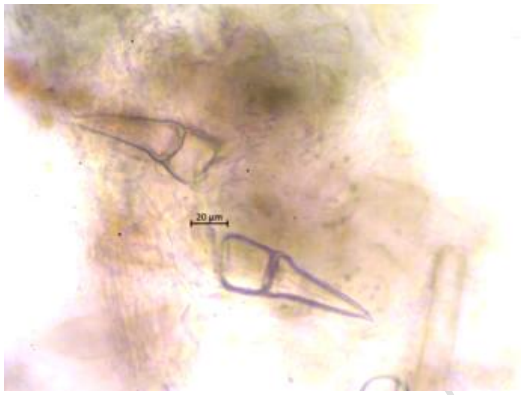
Figure 7. Powder microscopy of *Tridax procumbens* Linn(whole plant)



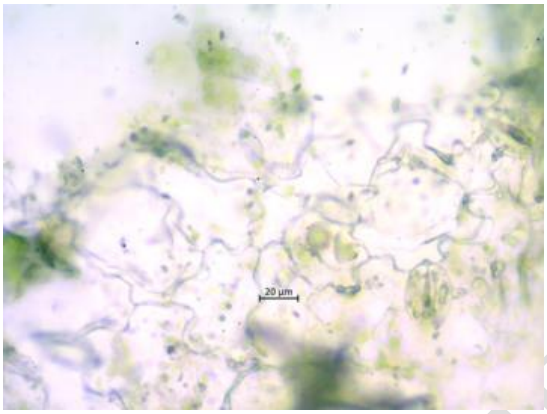
Simple covering trichomes



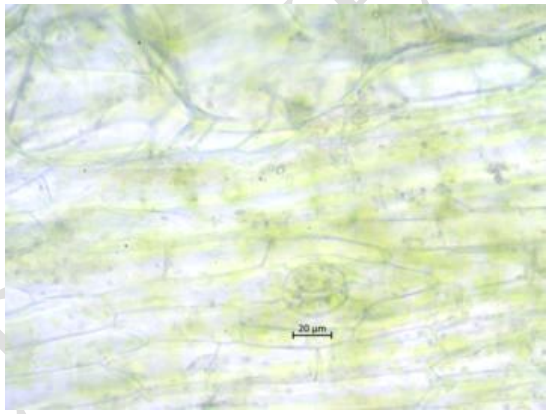
Glandular trichomes



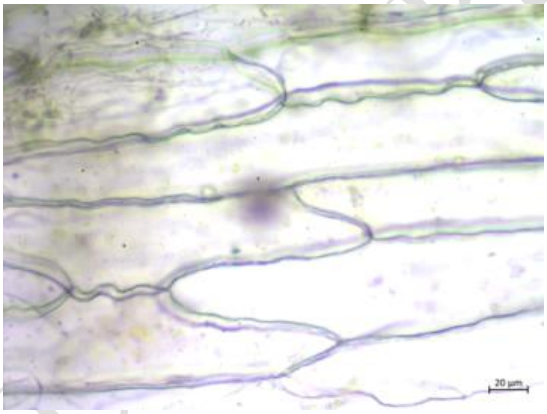
Trichomes from flower



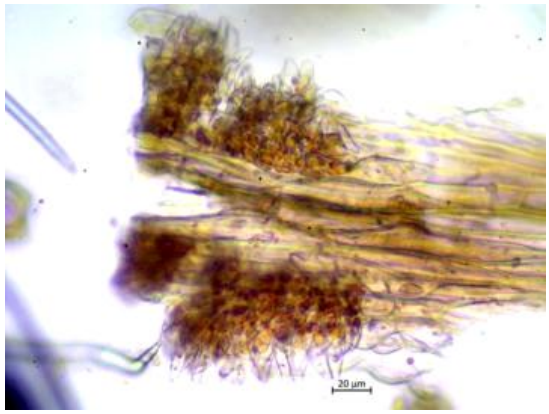
Surface view of epidermis with stomata



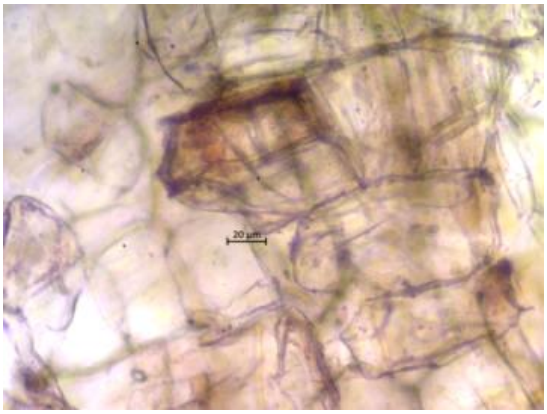
Petiole epidermis with stomata



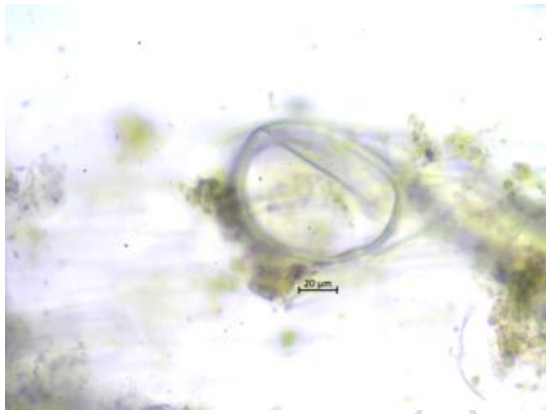
Epidermal cells from flower



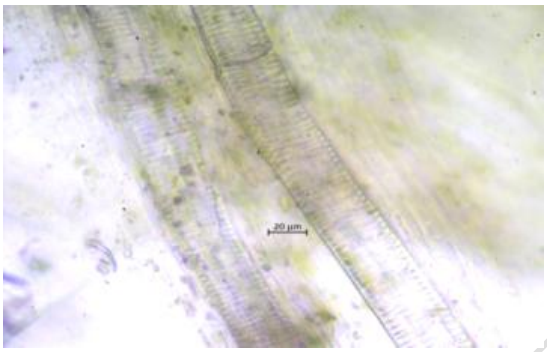
Fragment showing epidermis with papillary outgrowth from flower stalk

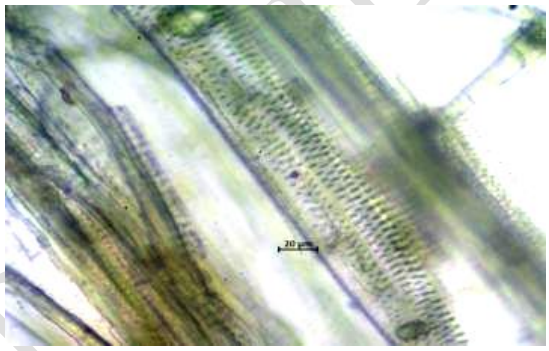


Surface view of cork cells with tannin

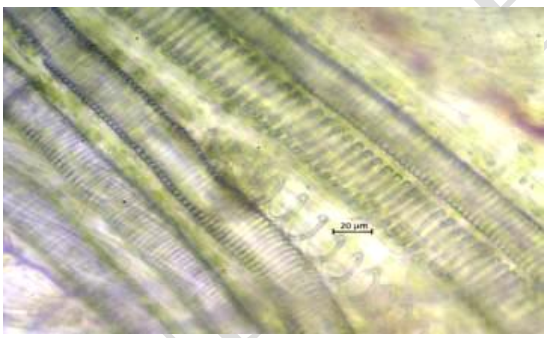


Cycatrix

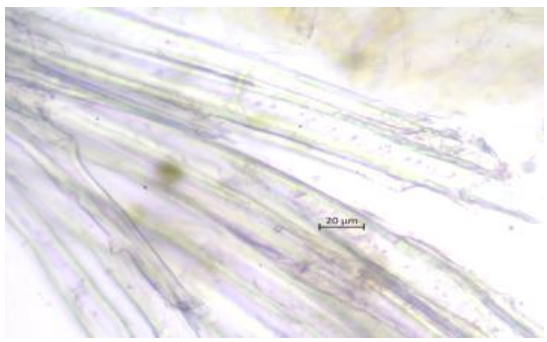




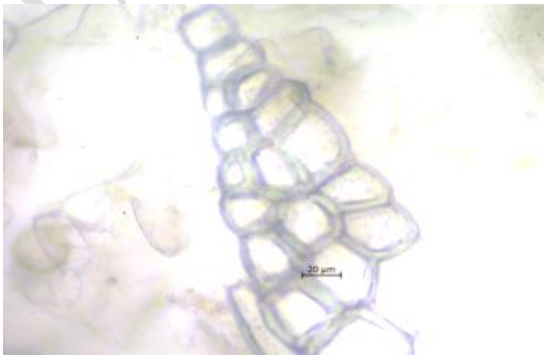
Reticulate vessels

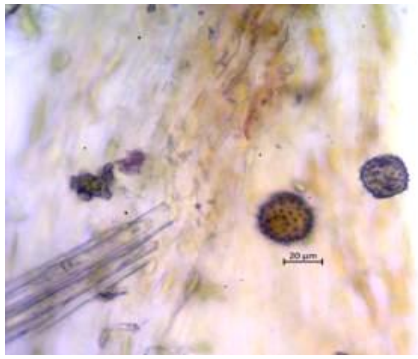


Vascular fragment showing spiral vessels

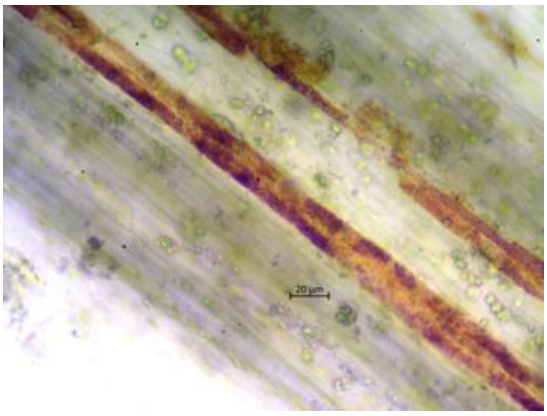


Tracheids



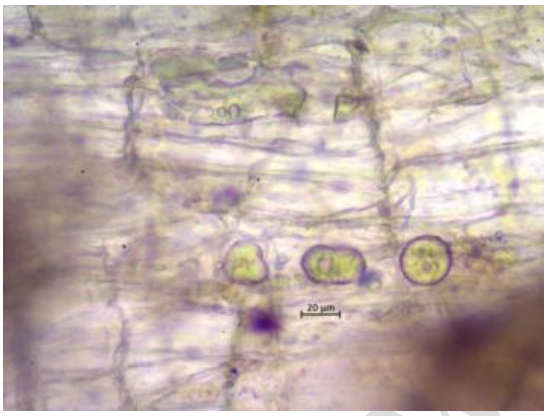


Anther wall

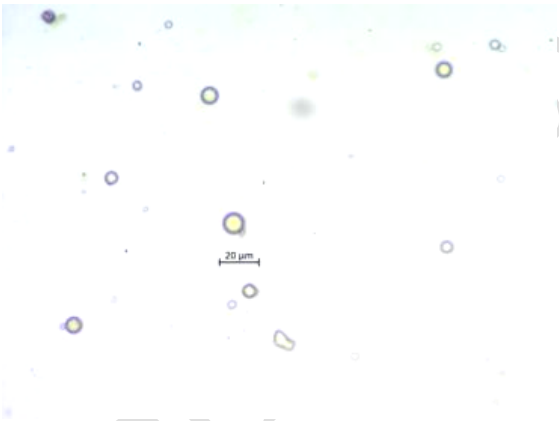


Reddish brown content

Pollen grains



Parenchyma with starch grains and contents



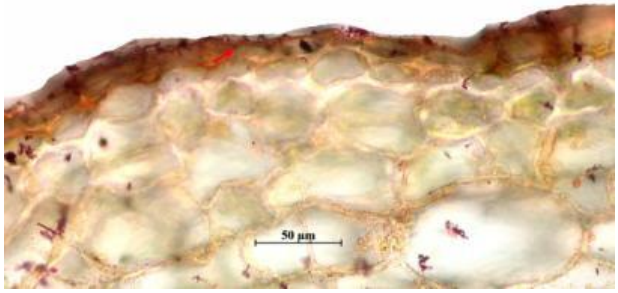
Oil drops

5. Histochemistry

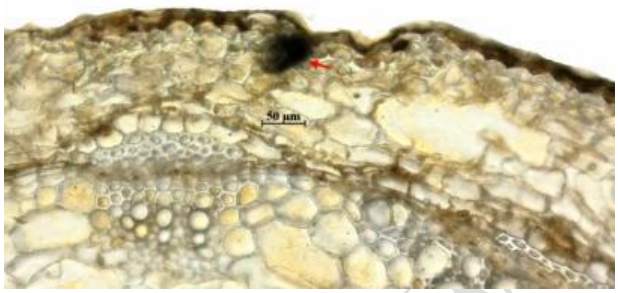
Stem

Cutin was present on epidermis; tannin deposition was present in cortex; alkaloid was detected in epidermis and cortex; starch grains were found in cortex; lignin was observed in xylem; oil globules were observed in cortical cells; resin and mucilage were absent (Fig. 8).

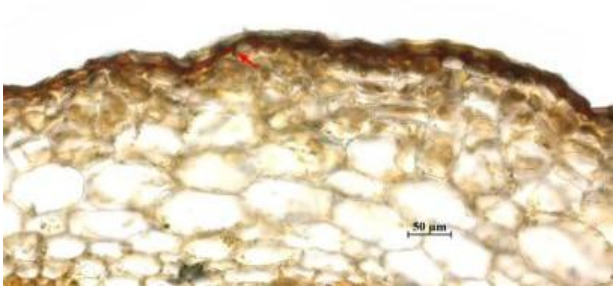
Figure 8. Histochemistry of *Tridax procumbens* Linn (stem)



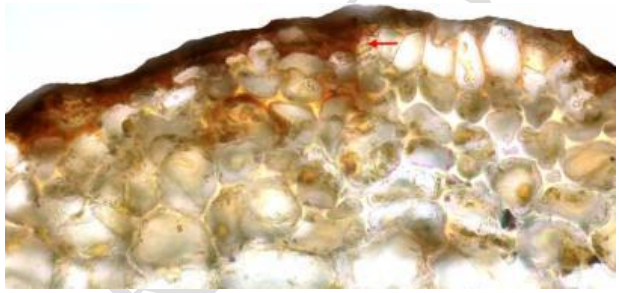
Cutin in epidermis



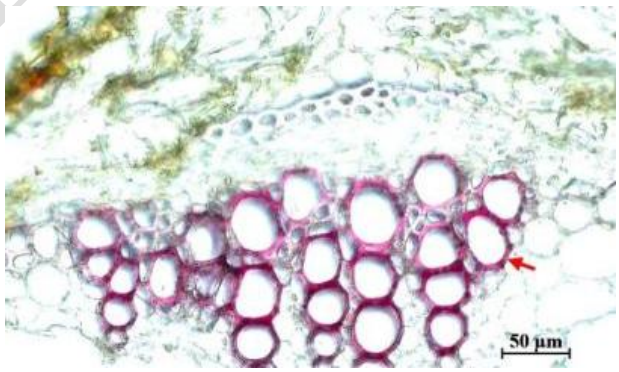
Tannin in cortex



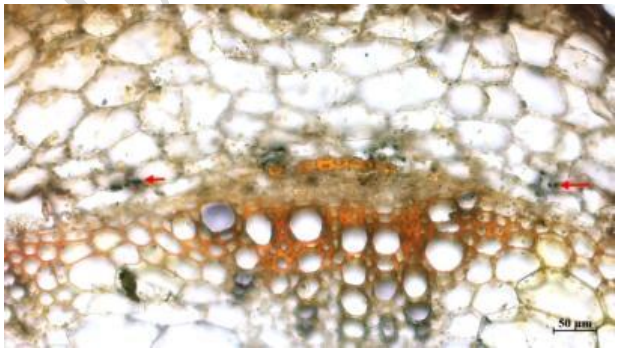
Alkaloid in epidermis

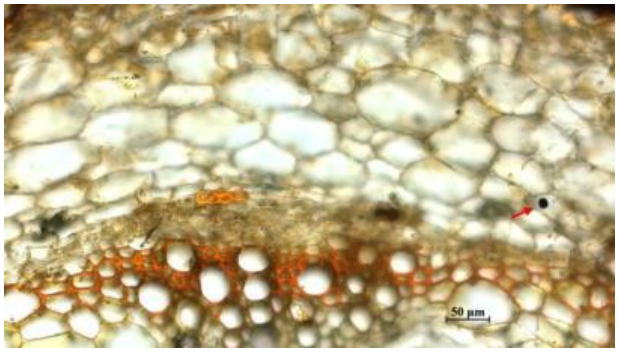


Alkaloid in cortex

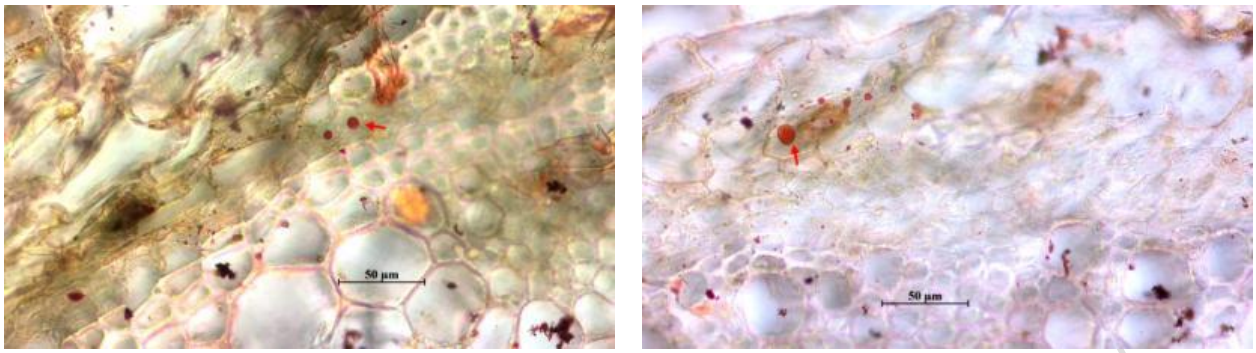


Lignin in xylem





Starch grains in cortex



Oil globules in cortex

CONCLUSION :

Macroscopy, microscopy, quantitative and powder microscopy, and histochemical studies of *Tridax procumbens* whole planthave been documented as per standard procedures.

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