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MACRO AND MICROSCOPIC STUDY OF MEETHA NEEM (MURRAYA KOENIGII LINN)

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ABSTRACT

Background: *Meetha Neem (Murraya koenigii Linn.)* commonly known as *curry patta* is a culinary important plant of Indian origin, and also been a component of many formulations used in the *Ayurvedic* system of medicine since many centuries. **Objective:** The current review provides a detailed report of the microscopic, macroscopic, phytochemical, works carried out on this culinary plant and also throws light on its therapeutic prospects. **Methods:** The plant was morphologically examined for shape of leaves, apex, base, margin etc. The powdered drug was separately treated with phloroglucinol – HCl solution, saffron reagent, glycerin and iodine solution to determine the presence of lignified cells, calcium oxalate crystals and starch grains; as a part of quantitative microscopy. Stomata number, stomatal index, vein islet and veinlet termination number were determined by using fresh leaves of the plant. Total ash, water and alcohol soluble ash, water soluble extractive values were determined. **Results:** All these parameters, which are being reported, could be useful in identification of distinctive features of the drug. **Conclusion:** From the phytochemical study, it can be concluded that only selected species of Murraya contains the reported phytoconstituents. Hence, detailed

screening may be done to isolate the active constituent so that it may be scientifically proved to access the pharmacological responses of the plant to ascertain its folklore uses.

KEYWORDS: *Ayurveda, Murraya koenigii Linn.,* culinary plant, microscopic study.

INTRODUCTION

World's about 80% population relies upon herbal products, because they have been considered as safe, effective and economical. The *Murraya koenigii* plant is widely used as herb, spice, condiments and also used to treat various types of ailments in Indian traditional system. ***Murraya koenigii (Linn) Spreng.*** or sweet neem also referred as Curry Plant is a popular tree which produces an aromatic leaf often used in Indian cuisine. The small and narrow leaves somewhat resemble the leaves of the Neem tree. Its tender, fern-like leaves have a spicy aroma and tangy flavor. [1] It mainly grows in tropical and sub tropical climates. Curry leaf tree is native to India but also grows in Sri Lanka, Burma, Malaysia and South Africa.

Scientific Classification[2]

Kingdom Plantae – Plants
Subkingdom Tracheobionta – Vascular plants
Superdivision Spermatophyta – Seed plants
Division Magnoliophyta – Flowering plants
Class Magnoliopsida – Dicotyledons
Subclass Rosidae
Order Sapindales
Family Rutaceae – Rue family
Genus Murraya J. Koenig ex L. – murraya
Species Murrayakoenigii (L.) Spreng. – curryleaftree

Various names[3]

English- Curry leaves; Kannada- Karibevu; Hindi- Karipatta, Mitha nim; Tamil- Kariveppilai; Malayalam- Kariveppu; Marathi- Kadhilimb; Sanskrit- Girinimba; Telugu- Karepeku; Tulu- Bevusoppu; Portuguese- Folhas de caril; Russian- Listya karri; Spanish- Hojas de curry; Italian- Fogli di Cari; French- Feuilles de Cari; German- Curryblatter; Gujarathi- Mitho limado.

Plant Description[4]

A small aromatic tree with dark grey bark. Leaves imparipinnate, alternate leaflets alternate, obliquely ovate, gland dotted and aromatic; flowers white in terminal corymbose cymes, fragrant; fruits subglobose berries dark purple when ripe. 2 seeded. Flowering starts from the middle of April and ends in the middle of May. The fruiting season was observed to continue from the middle of July to the end of August.

Distribution

Throughout India cultivated as well as growing wild, up to an elevation of 1000 m.

Cultivation

For Propagation and cultivation through seeds, the seeds must be ripe and fresh to plant. The dried or shriveled fruits are not viable. One can plant the whole fruit, but it's best to remove the pulp before planting in potting mix that is kept moist but not wet. Stem cuttings can be also used for propagation

Chemical Constituents

The Murraya koenigii tree contains a carbazole isolated from this plant. Curry leaf contains the amino acid cysteine. The leaves of *Murrya koenigii* contain proteins, carbohydrate, fiber, minerals, carotene, nicotinic acid, Vitamin C, Vitamin A, calcium and oxalic acid. It also contains crystalline glycosides, carbazole alkaloids, koenigin, girinimbin, iso-mahanimbin, koenine, koenidine and koenimbine. Triterpenoid alkaloids cyclomahanimbine, tetrahydromahanimbine are also present in the leaves.

Bark contains carbazole alkaloids like murrayacine, murrayazolidine, murrayazoline, mahanimbine, girinimbine, koenioline and xynthyletin.

The pulp of fruits generally contain 64.9% moisture, 9.76% total sugar, 9.58% reducing sugar and negligible amount of tannin and acids, besides containing 13.35% Vitamin C. The pulp of fruit also contains trace amounts of minerals, 1.97% phosphorus, 0.082% potassium, 0.811% calcium, 0.166% magnesium, 0.007% iron and remarkable amount of protein.

Carbazole alkaloids which are abundantly present in the leaves, fruits, roots and bark of this plant, have been reported for their antidiabetic, anticancer, antibacterial, anti-nociceptive and antioxidant activities.

Ayurvedic Properties[5]

Rasa	**:**	**Katu, Tikta, Madhura**
Guna	**:**	**Guru, Rooksha**
Virya	**:**	**Ushna**
Vipak	**:**	Katu

Medicinal uses

Murraya koenigii is an aromatic stomachic and carminative and is useful in anorexia acute and chronic dyspepsia flatulence and colic. It is often employed to correct the griping pains caused by purgatives. It is used as an antidote for snake bites especially the bites of Kraits.[6]

Useful part: Root, Bark, Leaves

Curry leaf tree (*Murraya koenigii* L., Family: Rutaceae) is a plant which has various important uses in the traditional system of medicine in Eastern Asia. Based on ethnomedicine, *Murraya koenigii* is used as a stimulant, antidysentric and for the management of Diabetes Mellitus.[7] The plant is highly valued for its leaves an important ingredient in an Indian cuisine to promote appetite and digestion. The leaves, root and bark are tonic, stomachic, and carminative. Leaves are used internally in dysentery also checking vomittig. Steam distillate of the leaves can be used as stomachic, purgative, febrifuge and anti emetic. Leaves are applied externally to bruises and eruption. The leaves and roots are bitter, acrid, cooling, anthelmintic, analgesic, it cures piles, allays heat of the body, thirst, inflammation and itching. It is also useful in leucoderma and blood disorders. An infusion of the toasted leaves in used to stop vomiting.[8] The juice of the root is good for pain associated with kidney. Crushed leaves are applied externally cures skin eruption and to relieves burn. The pastes of leaves are applied externally to treat the bites of poisonous animals. The plant is credited with tonic and stomachic property. The branches of *Murraya koenigii* are very popular for cleaning the teeth as *datun.* It is also said that the branches of *Murraya koenigii* are used to strengthen gums and teeth's.

Therapeutic Uses

The bark and the roots are used as a stimulant by the physicians. They are also used externally to cure eruptions and the bites of poisonous animals.

The green leaves are stated to be eaten raw for curing dysentery, and the infusion of the washed leaves stops vomiting

1. Diabetes: Curry leaf benefits individuals suffering from hereditary diabetes and diabetes caused by obesity. Eat 10 fresh curry leaves daily in the morning for at least three month.
2. Eyes: The juice extracted from curry leaves brightens the eyes and delays cataract.
3. Diarrhea: Drinking the juice of 15-20 curry leaves mixed with a teaspoon of honey serves as an efficient curry leaf for diarrhea.[9]
4. Constipation: Take one teaspoon of dried curry leaf powder with a teaspoon of honey in it. Consume this for about two to three times in a day to get rid of constipation.
5. Nausea: Drinking a cup of water mixed with one tablespoon of roasted curry leaves serves as one of the most effective for nausea.
6. Curry leaf benefits the body by stimulating digestive enzymes, reducing body heat, relieving kidney pain, controlling Diabetes, making the eyes appear brighter, retaining the natural pigmentation of hair,. Curry leaves are known to be good for hair, for keeping them healthy and long.
7. For snake bite poisoning, drink decoction of whole plant with raw turmeric and salt.
8. For skin rashes, boil leaf with cow's milk and apply paste.
9. For vomitting, leave leaf or root powder to stand in boiling water, strain and drink.
10. For abdominal pain, take leaves, aralu and pepper powder.

Pharmacological Properties [10]

Pharmacological Activity	Plant part	Extract
Anti-inflammatory	Leaf	Ethanol, Petroleum ether, Chloroform, methanol
Anti-amnesic	Leaf	Petroleum ether
Hypocholesterolemic	Leaf	Ethanol
Memory enhancer	Leaf	petroleum ether
Anti-helminthic	Leaf	Alcoholic
Anti-bacterial	Bark, Leaf	Petroleum ether , Alcohol
Anti-cancer	Stem bark	Petroleum ether
Anti-diabetic	Whole plant, fresh leaf, fruit.	Aqueous, methanol
Antidiarrhoeal	Seeds	n-hexane
Anti-fungal	Leaf	Petroleum ether, alcohol and acetone
Radioprotective and chemoprotective	Leaf	Methanol
Analgesic and Antinociceptive	Leaf	Methanol
Anti-oxidant	Leaf	Methanol and Aqueous
Cardiovascular	Leaf	Aqueous
Anti-lipid peroxidative	Leaf	Methanol
Anti-tumor	Leaf	Petroleum ether

Anti-ulcer	Leaf	Aqueous
Cytotoxicity	Roots, stem	Aqueous
Wound healing activity	Leaf	Ethanol
Phagocytic activity	Leaf	Methanol

MATERIALS AND METHODS

Plant collection

The leaves and stem of *Murraya koenigii* were collected in summer season from botanical garden of Dravyaguna department of National instate of ayurveda, jaipur (Rajasthan) in May 2013. Fresh leaves were collected and dried under shade for 15 days, and were powered using mechanical grinder. This powered material was used for further analysis. The plant was morphologically examined for shape of leaves, apex, base, margin etc. A separate section was prepared and examined for the identification of starch grains by staining with iodine solution. The powdered drug was separately treated with phloroglucinol – HCl solution, saffron reagent, glycerin and iodine solution to determine the presence of lignified cells, calcium oxalate crystals and starch grains; as a part of quantitative microscopy. Stomata number, stomatal index, vein islet and veinlet termination number were determined by using fresh leaves of the plant. Total ash, water and alcohol soluble ash, water soluble extractive values were determined.

Leaf Microscopy

The outer epidermal membranous layer (in fragments) were cleared in chloral hydrate, mounted with glycerin and observed under a compound microscope. The presence/absence of the following was observed: epidermal cells, stomata (type and distribution) [F.1] and epidermal hairs (types of trichomes and distribution) [F.2], epidermis (upper and lower), hypodermis, spongy parenchyma [F.3], stomata number, stomatal index, vein islet and veinlet termination number were determined by using fresh leaves of the plant. Xylem elements and ground tissue were also observed under microscope. The transverse sections of the fresh leaves through the lamina and the midrib were also cleared, mounted and observed [F.4].

Stem Macroscopic and Microscopic Examination

Macroscopic examinations

Murraya koenigii is an aromatic and small tree up to 6 m in height and 15-40 cm in diameter. The young stems are green in color with sweet aromatic odor and characteristic taste. The outer surface is smooth, soft and glabrous.

Microscopic examinations

The stem of *Murraya koenigii* has a circular transaction and shows following features.

Epidermis

It is single layered, parenchymatous, uniseriate, unicellular, tangentially elongated surrounded by thick cuticle. Epidermis exhibits 5-6 unicellular, uniseriate, covering trichomes [F.5], [F.9].

Oil gland

Just below the epidermis, there are 6-10 schizolysigenous oil glands present [F.8].

Cortex

Continuous strands of 4-6 layers of compactly arranged parenchymatous, polygonal cells constitute the cortex region. The cortex region shows the presence of lignified sclerenchymatic cells [F.5].

Vascular bundle

The vascular system consists of a cylinder of xylem produced towards the cylinder of phloem outward along with bi or triseriate medullary rays. Vascular bundles are of collateral, conjoint and open type [F.6, 7].

Pith

Pith consists of thin walled polygonal, parenchymatous cells bearing starch grains [F.10].

Table 1. Phytochemical screening of bark of *M. koenigii*

Phyto constituent	Methanol Extract	Petroleum Ether Extract	Aqueous extract
Alkaloids	+	+	+
Carbohydrates	+	+	+
Steroids	-	-	-
Proteins	-	+	-
Saponins	-	-	+

Table 2. Physicochemical parameters of bark of *M. koenigii*

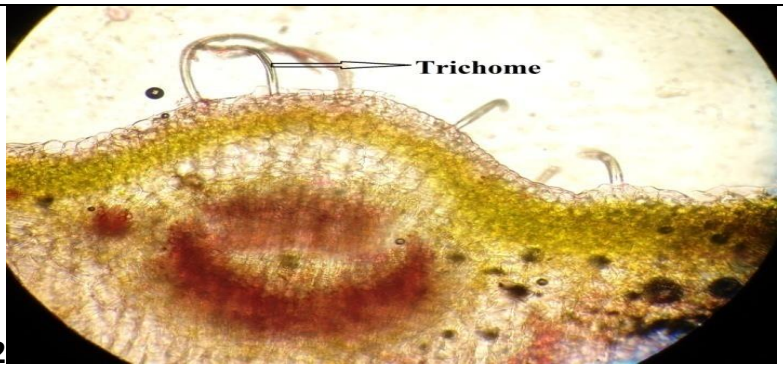
Parameters	Values obtained
Total ash	10.15% w/w
Acid insoluble ash	2.8% w/w
Water soluble ash	3.65% w/w
Moisture content	9.42% w/w

Recent research

1. Curry leaf extracted in a 1:1 ratio of alcohol to water had the highest level of antioxidant properties, according to the findings of a study published in 2013 in pubmed.[11]
2. The Scientist study suggests that M. koenigii leaves to be a potent source of proteasome inhibitors that lead to cancer cell death. Therefore, identification of active component(s) from the leaf extract could lead to the development of anti-cancer agents which could be useful in the treatment of different types of cancers.[12]

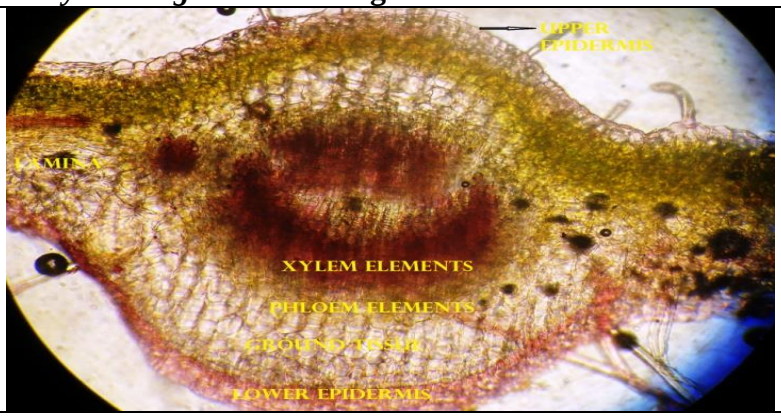
RESULTS AND CONCLUSION

Generated data can be used for determining correct identity and purity of plants part and detection of adulteration as well. Botanical authentication and physicochemical parameters will give an idea about the quality of drug. All these parameters, which are being reported, could be useful in identification of distinctive features of the drug. From the phytochemical study, it can be concluded that only selected species of Murraya contains the reported phytoconstituents. Hence, detailed screening may be done to isolate the active constituent so that it may be scientifically proved to access the pharmacological responses of the plant to ascertain its folklore uses.

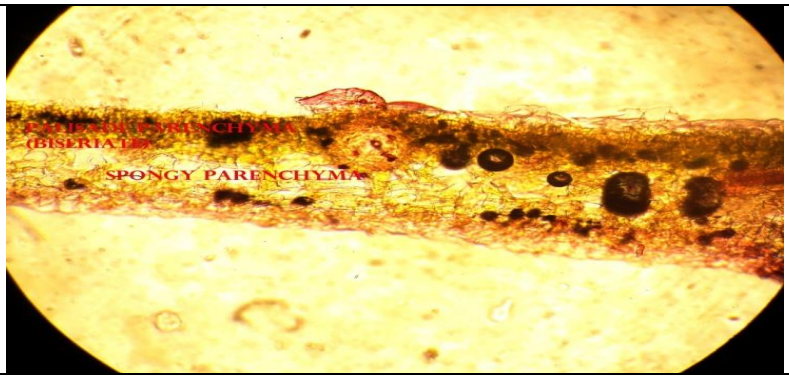


; 2

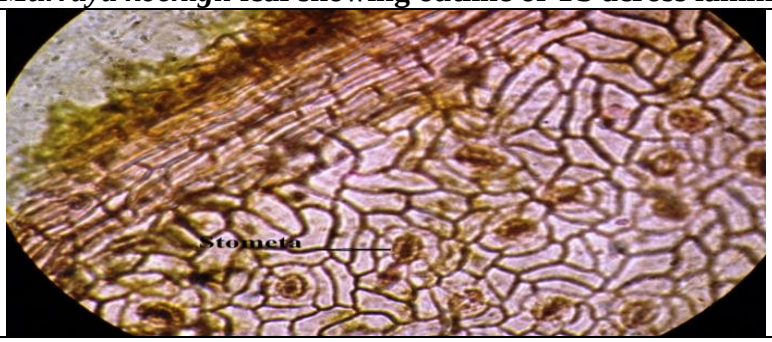
Microscopy of *Murraya koenigii* leaf showing Trichome stained with saffron. [F.2]



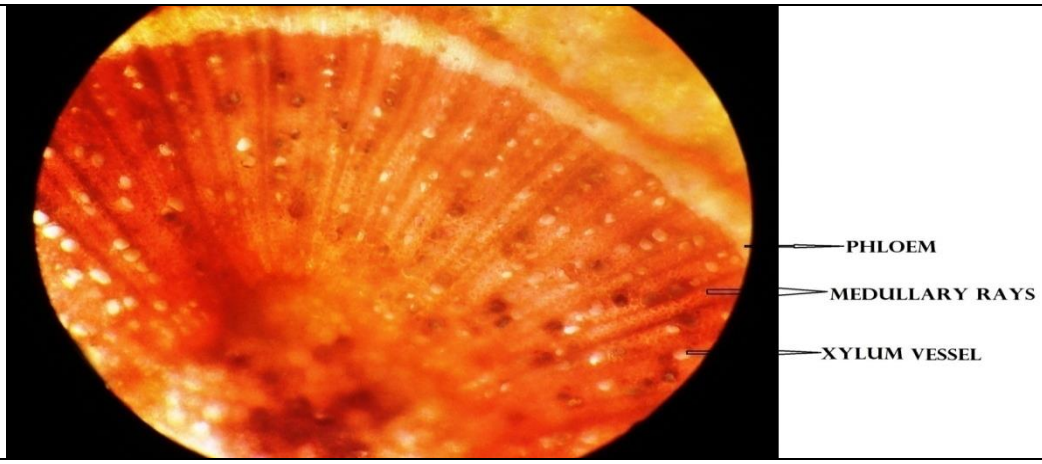
Microscopy of *Murraya koenigii* leaf showing outline of TS across midrib stained with phloroglucinol and HCl. [F.3]



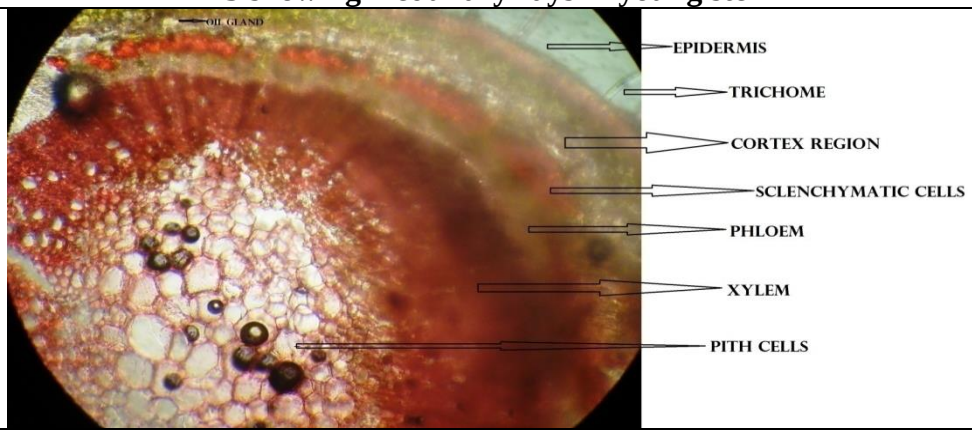
Microscopy of *Murraya koenigii* leaf showing outline of TS across lamina. [F.4]



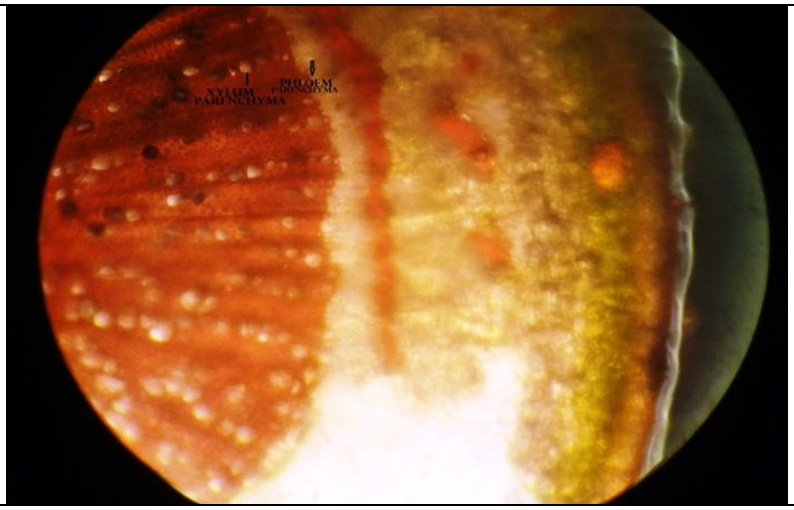
Microscopy of *Murraya koenigii* leaf showing Stometa stained with saffron. [F.1]



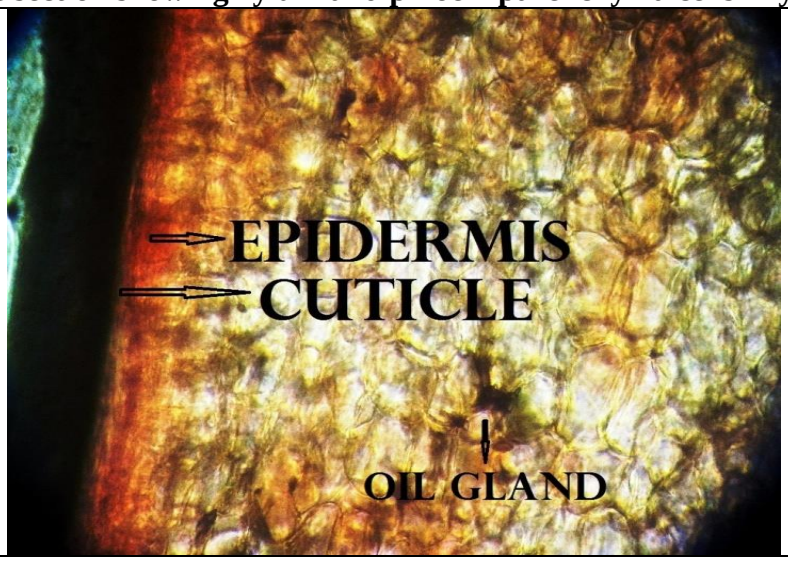
TS showing medullary rays in young stem



Primary growth of murraya koenigi young stem

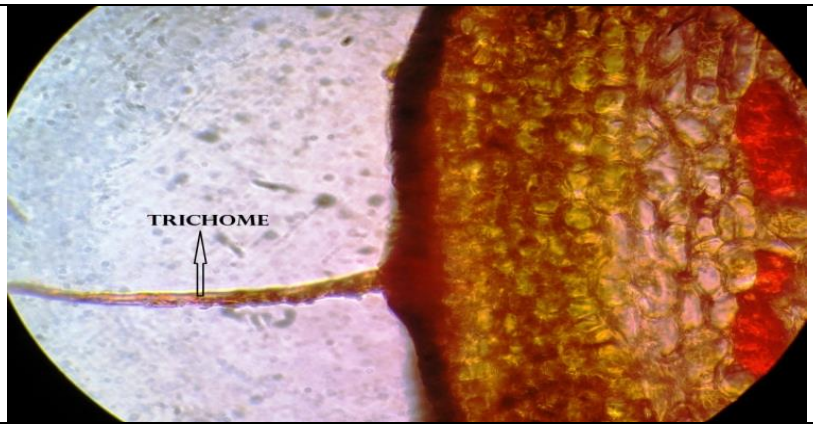


Transverse section showing xylum and phloem parenchyma cells in young stem



Transverse section showing cuticle, layer of epidermis and oil gland in young stem

Transverse section showing starch granule in pith region in young stem



Transverse section showing trichome in young stem

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