



PHARMACOGNOSTICAL STUDY OF THE LEAF, STEM AND ROOT OF *BHRINGARAJA* (*ECLIPTA ALBA* LINN.) CULTIVATED THROUGH HYDROPONICS SYSTEM – AEROPONIC TOWER

Dr. Dhaval Prajapati^{1*}, Dr. Dharmendra P. Jani²

*¹Third Year P.G. Scholar, Upgraded P.G. Department of *Dravyaguna*, Government Ayurved College, Vadodara, Gujarat, India.

²Associate Professor, Upgraded P.G. Department of *Dravyaguna*, Government Ayurved College, Vadodara, Gujarat, India.

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*Corresponding Author

Dr. Dhaval Prajapati

Third Year P.G. Scholar, Upgraded
P.G. Department of *Dravyaguna*,
Government Ayurved College,
Vadodara, Gujarat, India.



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ABSTRACT

Background: *Bhringaraja* (*Eclipta alba* Linn.) is a well-known Ayurvedic medicinal plant valued for its *Rasayana* and *Keshya* effects. It helps pacify *Pitta* and *Vata Doshas* and is extensively mentioned in classical texts such as *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya* for the management of disorders including *Pandu*, *Kamala*, *Khalitya*, *Palitya*, *Kasa*, and *Shwasa*. Traditionally, crops have been grown in soil-based systems; however, modern approaches such as hydroponics offer a viable alternative to address issues like soil-borne diseases, inconsistent yields, and the declining availability of agricultural land. Among hydroponic methods, the Aeroponics is a method of growing plants in a soil-free environment where the plant roots are suspended in air and are misted with a nutrient-rich water solution. **Materials and Methods** - For the present study, *Bhringaraja* (*Eclipta alba* Linn.) have been selected as trial drug. A detailed study has been carried out of Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* Linn.)

Cultivated through Hydroponics system - Aeroponic Tower including its macroscopical and microscopical (Pharmacognostical) studies. **Observation & Result:** In the present study, pharmacognostical identification of *Bhringaraja* (*Eclipta alba* Linn.) was carried out,

encompassing both macroscopical and microscopical characteristics. The leaves of *Bhringaraja* (*Eclipta alba* Linn.) cultivated using a hydroponic Aeroponic tower system were observed to be greenish, oblong-lanceolate, pubescent to touch, and possessed a distinct characteristic odour. In the transverse section of the leaf, several features were observed, including upper epidermis, lower epidermis, collenchyma, Vascular bundle, trichomes and Palisade cells. The stem was greenish brown, pubescent in touch and odourless. In the transverse section of the stem, several features were observed, including Epidermis, Hypodermis, Pericyclic fibre, Phloem, Xylem, Cortex, Cavity and Pith. The root was creamish brown, rough in touch and odourless. In the transverse section of the root, several features were observed, including in Xylem, Medullary rays, Phloem, Pericycle, Cavity, Cork, Cortex and Endodermis. **Conclusion:** The structures which are observed here help in correct identification of *Bhringaraja* (*Eclipta alba* Linn.). In this study, *Bhringaraja* (*Eclipta alba* Linn.), cultivated through a hydroponic system using the Aeroponic Tower, was botanically compared with a standard reference. No new structures were found during microscopy.

KEYWORDS: Hydroponics, Aeroponic Tower, *Bhringaraja* (*Eclipta alba* Linn.) Medicinal plants, Cultivation.

INTRODUCTION

The word 'Hydroponics' comes from the Greek term's 'hydro', meaning *water*, and 'ponos', meaning *labor*.^[1] Hydroponics is a soilless cultivation technique in which nutrients are supplied directly to plants through a water-based medium, making it an effective solution to many agricultural challenges. Among the different hydroponic methods, the aeroponic tower system is considered one of the most efficient, as it ensures optimal space utilization, faster plant growth, precise nutrient delivery, and higher yields while using minimal water. Aeroponics is a method of growing plants in a soil-free environment where the plant roots are suspended in air and are misted with a nutrient-rich water solution^[2] Aeroponics is a relatively new technology, but it has already been successfully used to grow a wide range of crops including lettuce, tomatoes, and strawberries.^[3] *Bhringaraja* (*Eclipta alba* L.) can be grown well in an aeroponics system, producing healthy plants with good yield, while supporting optimal growth and bioactive compound quality.

However, aeroponics has not been more extensively used because of incomplete knowledge about the operational parameters, and the difficulty in maintaining the operating system.^[4]

VERNACULAR NAMES OF BHRINGARAJA^[5]

Table No. 1: Vernacular name of *Bhringaraja* (*Eclipta alba* Linn.).

1.	Sanskrit	<i>Bhringaraja</i>
2.	Hindi	Babri, Bhangra, Mochkand
3.	English	Trailing Eclipta
4.	Gujarati	Bhangra, Dodhak, Kalobhangaro, Kalaganthi
5.	Marathi	Bangra, Maka
6.	Tamil	Kaikeshi, Kayanthakoru
7.	Telugu	Guntagalijeru
8.	Urdu	Bhangra
9.	Uriya	Kesarda
10.	Bengali	Keysuria, Keshori, Kesuti

TAXONOMIC CLASSIFICATION OF BHRINGARAJA

Table No. 2: Toxonomic classification of *Bhringaraja* (*Eclipta alba* Linn.).

Kingdom	Plantae
Division	Spermatophyta
Subdivision	Angiosperma
Class	Dicotyledoneae
Subclass	Gamopetalae
Group	Inferae
Family	Compositae
Genus	Eclipta
Species	Alba
Binomial name	Eclipta alba L. Hassk
Synonyms	Eclipta prostrata

AIM

To perform macroscopical, macroscopical (Pharmacognostical) study of Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower with a specially designed protocol.

OBJECTIVE

1. To study the macroscopic features of Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower.
2. To study the microscopic features Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower.

MATERIAL AND METHODS

Bhringaraja (*Eclipta alba* Linn.) were cultivated through Hydroponics system - Aeroponic tower used as a drug material. A detailed macroscopic and microscopic study of Leaf, Stem

and Root of *Bhringaraja* (*Eclipta alba* Linn.) were carried out to establish the correct identity of the *Bhringaraja* (*Eclipta alba* Linn.) by comparing with standard reference book of Ayurvedic Pharmacopoeia of India (API), Part I, Vol. II^[6] and Quality Standards of Indian Medicinal Plants (Vol. 9).^[7]

The work plan was as follows:

1. Plant collection and identification
2. Pharmacognosy study
 - A. Macroscopic study
 - B. Microscopic study

1. Plant Collection and Identification

Panchanga of *Bhringaraja* (*Eclipta alba* Linn.) was collected from the hydroponic system - Aeroponic tower established at the Medicinal Plant Cultivation and Technique Research Laboratory (MPCTRL), Government Ayurveda College, Vadodara. Fig.1.a. After the proper collection the Macroscopic & Microscopic studies were performed at Pharmacognosy laboratory of Upgraded department of *Dravyaguna Vijnana*, Government Ayurveda College, Vadodara.

2. Pharmacognosy Study

A. Macroscopic Study

The morphological studies were carried out for shape, structure, color, odour and surface of the leaf, stem and root of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower.

OBSERVATIONS

Table No. 3: Macroscopic study of leaf, stem and root of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower.

No.	Macroscopic Characters	Observations					
		Leaves	Fig.no.	Stem	Fig.no.	Root	Fig.no.
1.	Shape and structure	Oblong-Lanceolate ^[8]	1.c	Cylindrical ^[9]	1.b	Cylindrical ^[10]	1.d
2.	Colour	Green ^[11]	1.c	Greenish brown ^[12]	1.b	Creamish brown ^[13]	1.d
3.	Odour	Characteristic ^[14]	-	Odourless ^[15]	-	Odourless ^[16]	-
4.	Surface	Pubescent ^[17]	1.c	Pubescent ^[18]	1.b	Rough ^[19]	1.d
5.	Taste	Astringent	-	-	-	-	-

B. Microscopic Study

The free hand transverse sections of the Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* Linn.) were taken and slide was prepared separately using reagents Saffranine and Iodine. Various microscopic identification structures of transverse section (T.S.) of the Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* Linn.) were observed and evaluated.

OBSERVATIONS

Table No. 4: Microscopic study of the Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower.

No.	Part	Characteristics of <i>Bhringaraja</i> (<i>Eclipta alba</i> Linn.)	Figure no.
1.	Leaf	Upper epidermis	Fig.2.a
2.		Lower epidermis	Fig. 2.a & 2.b
3.		Collenchyma	Fig. 2.a & 2.b
4.		Vascular bundle	Fig.2.c
5.		Palisade cells	Fig.2.d
6.		Trichomes	Fig.2.e
7.	Stem	Epidermis	Fig.3.a
8.		Hypodermis	Fig.3.a
9.		Cavity	Fig.3.b
10.		Pericyclic fibre	Fig.3.c
11.		Endodermis	Fig.3.c
12.		Phloem	Fig.3.c
13.		Cortex	Fig.3.d
14.		Xylem	Fig.3.d
15.		Pith	Fig.3.c
16.	Root	Xylem	Fig.4.a, 4.b
17.		Phloem	Fig.4.a, 4.b
18.		Medullary rays	Fig.4.a
19.		Pericycle	Fig.4.b
20.		Endodermis	Fig.4.b
21.		Cork	Fig.4.c
22.		Cortex	Fig.4.c
23.		Cavity	Fig.4.c

RESULTS AND DISCUSSION

Bhringaraja (*Eclipta alba* Linn.) is an important plant which is used in many diseases mentioned in Ayurvedic system of Medicine literature.

In the present study Pharmacognostical identification of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower was done which included macroscopical & microscopical features of the same.

The Leaf of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower was Greenish in colour, oblong-lanceolate, pubescent in touch and characteristic odour. In the transverse section of the leaf, several features were observed, including upper epidermis, lower epidermis, collenchyma, Vascular bundle, trichomes and Palisade cells.

The Stem of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower was greenish brown, pubescent in touch and odourless. In the transverse section of the stem, several features were observed, including Epidermis, Hypodermis, Pericyclic fibre, Phloem, Xylem, Cortex, Cavity and Pith.

The Root of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower was creamish brown, rough in touch and odourless. In the transverse section of the root, several features were observed, including in Xylem, Medullary rays, Phloem, Pericycle, Cavity, Cork, Cortex and Endodermis.

CONCLUSION

It is concluded that, the pharmacognostic characterization of the of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower sample confirms the identity of the plant as a *Bhringaraja* (*Eclipta alba* Linn.). Microscopical observation of leaf, Root and Stem of *Bhringaraja* (*Eclipta alba* Linn.) reveals the presence of Upper epidermis, Lower epidermis, Hypodermis, Vascular bundle, Palisade cells, Trichomes, Collenchyma, Epidermis, Endodermis, Pericyclic fibre, Phloem, Xylem, Pith, Medullary rays, Cavity, Cork, and Cortex. Thus, it provides valuable information for the correct identification of the plant. No new structure found rather than standard reference given for identify of *Bhringaraja* (*Eclipta alba* Linn.).

Plate No. 1: Images of Macroscopy of the Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower.

Fig. No. 1: Aeroponic tower system and Macroscopy of Leaf, Stem Root of *Bhringaraja* (*Eclipta alba* Linn.)



Fig. 1a.

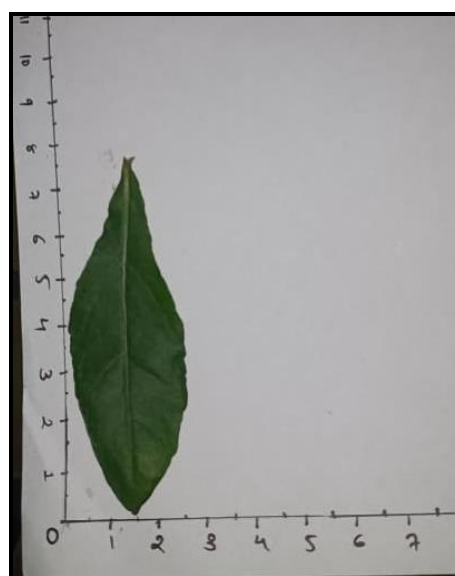


Fig. 1.b.

Plate No. 2: Images of Microscopy of the Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* Linn.) cultivated through Hydroponics system - Aeroponic tower.

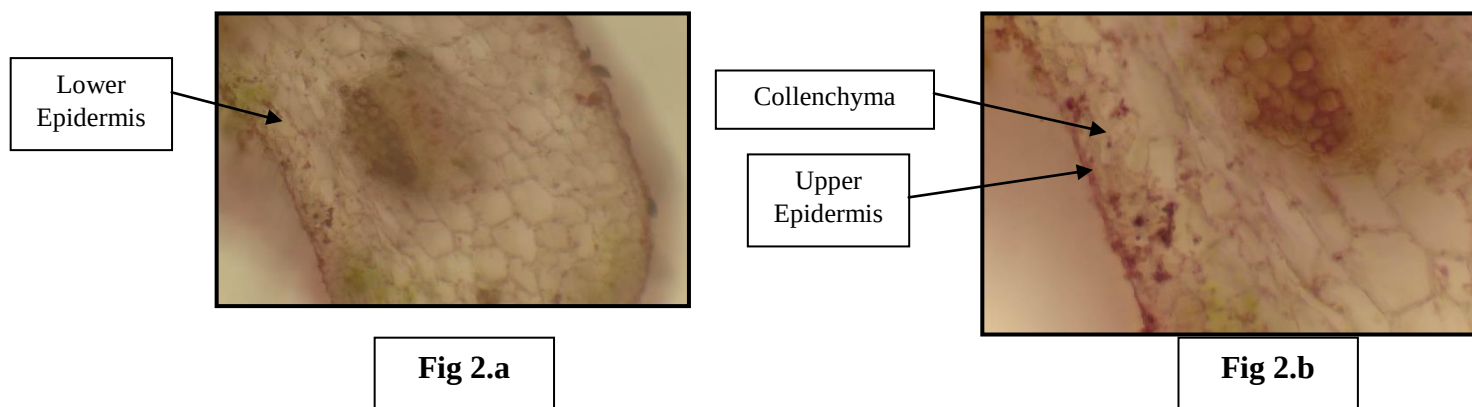


Fig. No. 2: T.S. of Leaf of *Bhringaraja* (*Eclipta alba* Linn.)

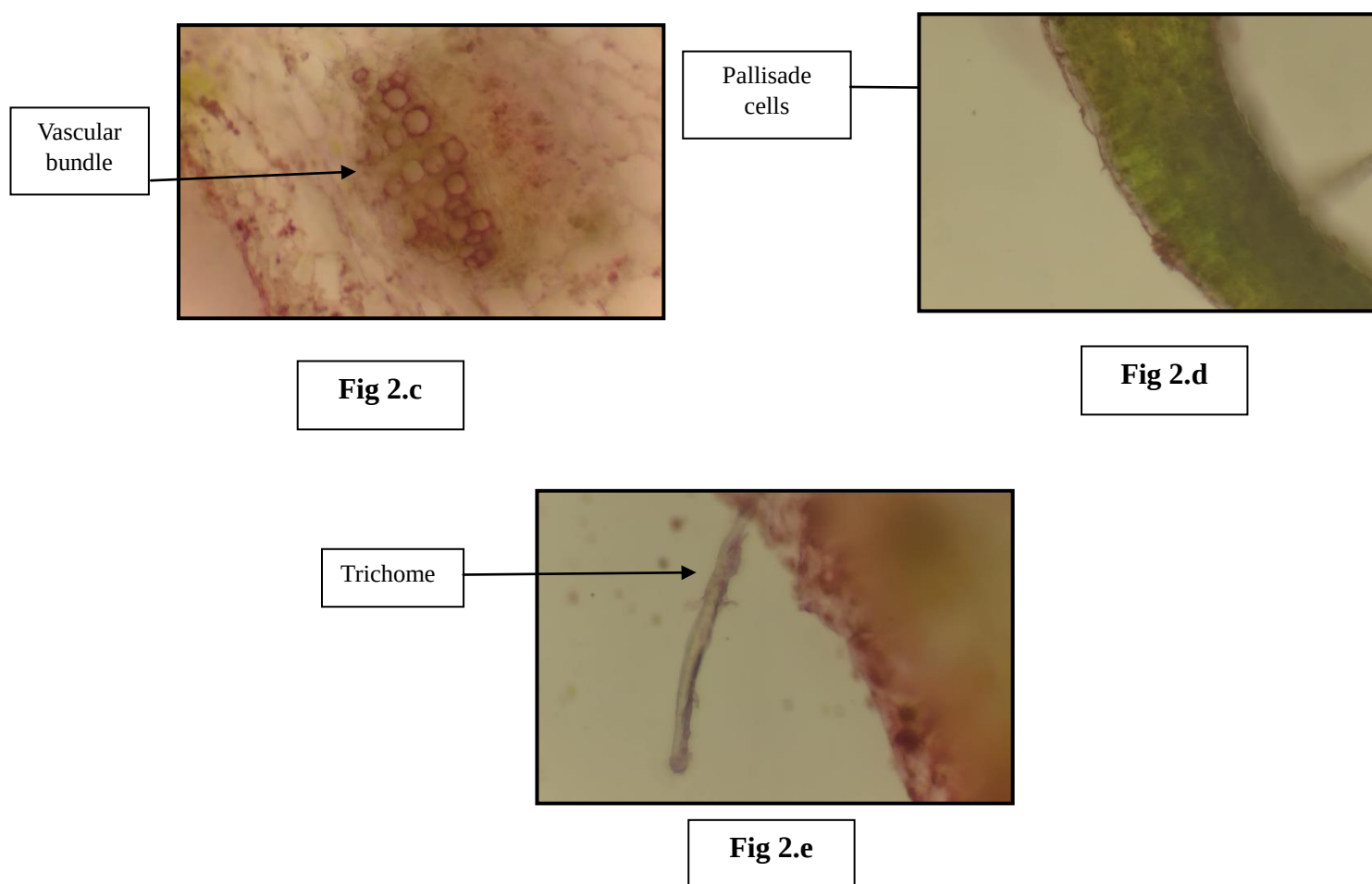


Fig. No. 3: T.S. of Stem of *Bhringaraja* (*Eclipta alba* Linn.).

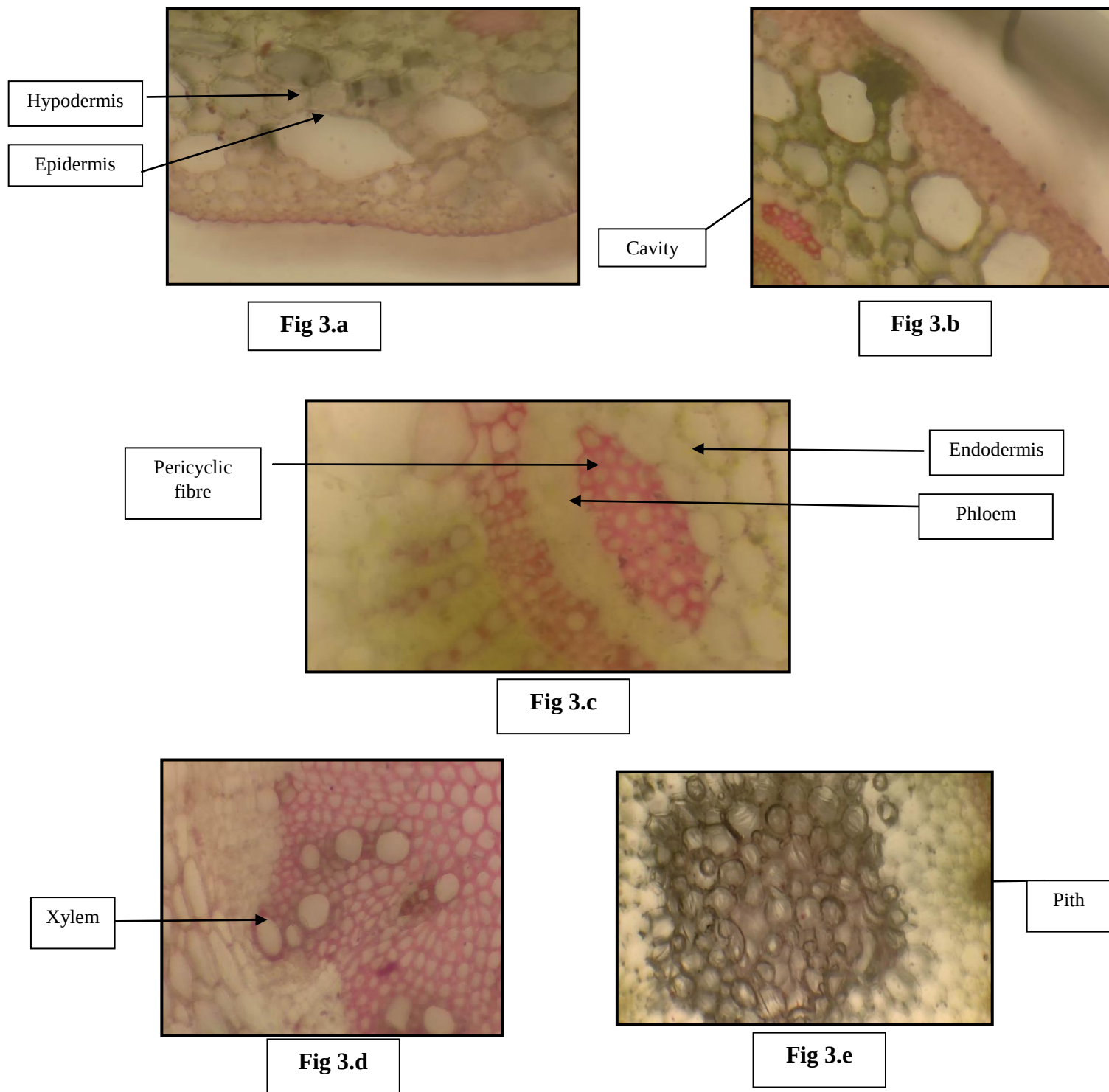


Fig. No.4: T.S. of Root of *Bhringaraja* (*Eclipta alba* Linn.)

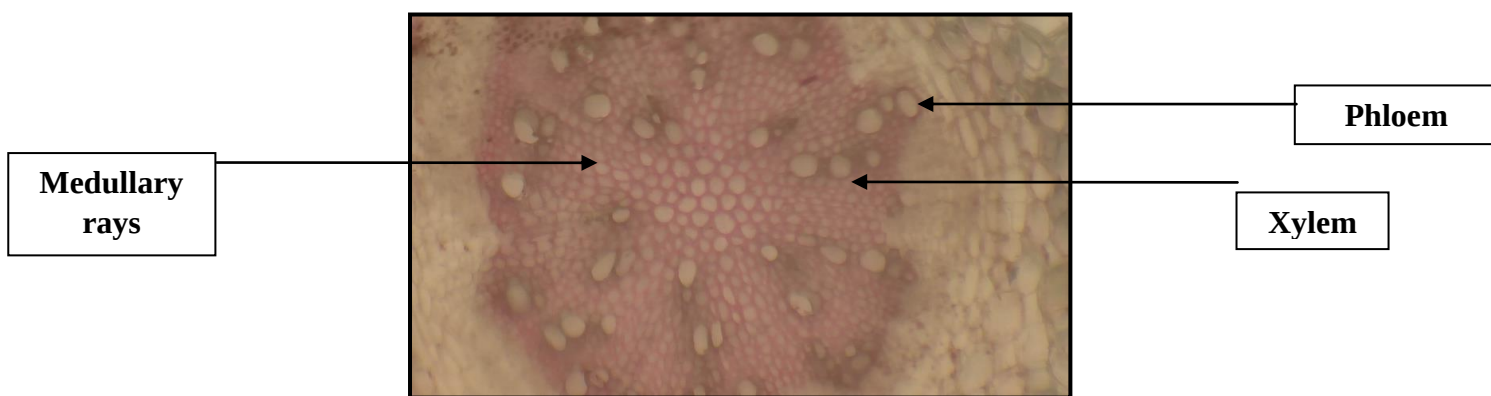


Fig 4.a

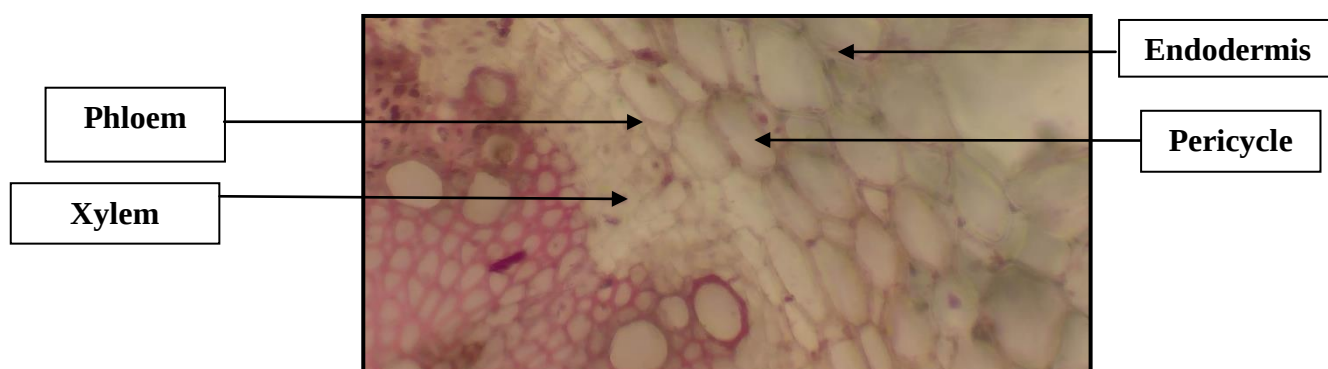


Fig 4.b

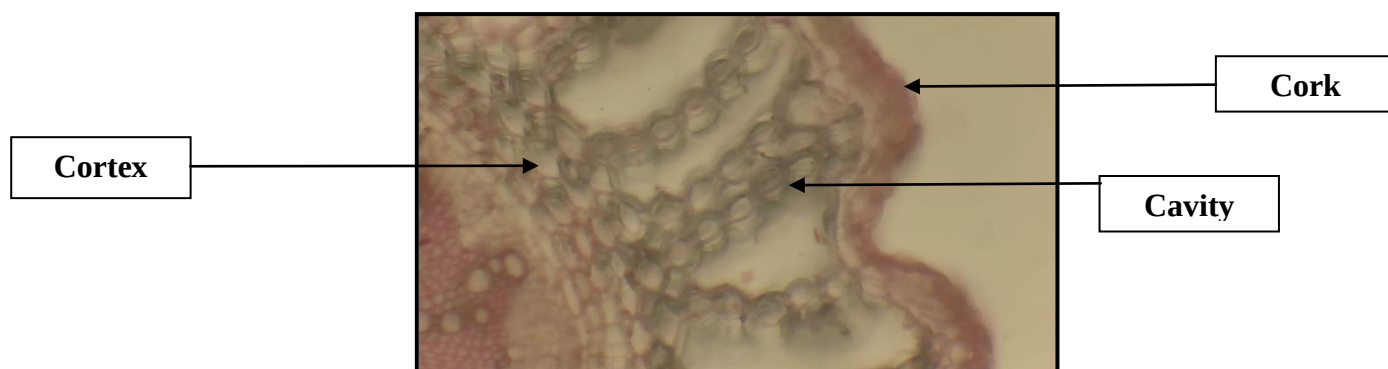


Fig 4.c

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