



PHARMACOGNOSTICAL STUDY OF THE LEAF, STEM AND ROOT OF BHRINGARAJA (ECLIPTA ALBA LINN.) CULTIVATED THROUGH HYDROPONICS SYSTEM - NUTRIENT FILM TECHNIQUE (NFT)

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Article Received on 28 Sept. 2025,
Article Revised on 18 October 2025,
Article Published on 01 Nov. 2025,

<https://doi.org/10.5281/zenodo.17473405>

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How to cite this Article: Dr. Dhaval Prajapati*, Dr. Dharmendra P. Jani. (2025). Pharmacognostical Study of The Leaf, Stem and Root of Bhringaraja (*Eclipta Alba* Linn.) Cultivated Through Hydroponics System - Nutrient Film Technique (nft). World Journal of Pharmacy and Pharmaceutical Sciences, 14(11), 556-566.

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ABSTRACT

Background: *Bhringaraja* (*Eclipta alba* (L.)) is a widely used medicinal herb in Ayurveda, known for its *Rasayana* and *Keshya* properties. It balances *Pitta* and *Vata Doshas* and is cited across classical texts like Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya for treating conditions such as *Pandu*, *Kamala*, *Khalitya*, *Palitya*, *Kasa*, and *Shwasa*. As global demand for food increases and arable land decreases, hydroponic cultivation offers a viable solution to maintain productivity. Among various hydroponic systems, the Nutrient Film Technique (NFT) ensures a continuous flow of nutrient-rich solution over plant roots, promoting optimal growth, enhanced nutrient uptake, and improved phytochemical composition. **Materials and Methods** - For the present study, *Bhringaraja* (*Eclipta alba* (L.)) have been selected as herbal drug. A thorough study has been carried out of Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* (L.)) Cultivated through

Hydroponics System - Nutrient Film Technique (NFT) including its macroscopical and microscopical (pharmacognostical) studies. **Observation & Result** - In the present study Pharmacognostical Identification of *Bhringaraja* (*Eclipta alba* (L.)) was done which includes macroscopical and microscopical features. The Leaf of *Bhringaraja* (*Eclipta alba* (L.))

Cultivated through Hydroponics System - Nutrient Film Technique (NFT) was greenish, oblong-lanceolate, pubescent in touch and characteristic odour. In the transverse section of the leaf, several features were observed, including upper epidermis, lower epidermis, vascular bundle, trichomes, Palisade cells, and collenchyma. The stem was greenish brown, pubescent in touch and odourless. In the transverse section of the stem, several features were observed, including Epidermis, Endodermis, Pericyclic fibre, Phloem, Xylem 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 Brown content. **Conclusion:** The structures which are observed here help in correct identification of *Bhringaraja (Eclipta alba (L.))* In this study, *Bhringaraja (Eclipta alba (L.))*, cultivated through a hydroponic system using the Nutrient Film Technique (NFT), was botanically compared with a standard reference. Brown content as a new structure was found during microscopy.

KEYWORD: Hydroponics, NFT (Nutrient Film Technique), *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 plants are grown using nutrient-enriched water under controlled environmental conditions. This method provides all essential minerals directly to the plant roots, ensuring faster growth and higher yield compared to traditional soil-based farming. Among the various hydroponic systems, the Nutrient Film Technique (NFT) is one of the most commonly used hydroponic systems, designed to provide plants with a continuous and balanced supply of nutrients. In this technique, a thin film of nutrient-rich water flows through a gently sloped channel, allowing plant roots to absorb essential nutrients directly from the circulating solution. For medicinal plants such as *Bhringaraja (Eclipta alba (L.))*, hydroponic cultivation can help preserve or even improve their bioactive compounds, thus strengthening their potential for both traditional and contemporary therapeutic use.

In *Samhitas*, *Bhringaraja (Eclipta alba (L.))* is mentioned in various therapeutic contexts. It is classified under *Prakritivighatkar Dravyas* for the treatment of *Krimi*, *Palitya*, *Kaphaja Kasa* and various disease conditions.

VERNACULAR NAMES OF BHRINGARAJA^[2]

Table no. 1: Vernacular name of *Bhringaraja* (*Eclipta alba* (L.))

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
11.	Kannad	Garagadasoppy
12.	Malayalam	Kyonni
13.	Punjabi	Bhangra
14.	Arabic	Kadimelbint

Taxonomic classification of *Bhringaraja*

Table no. 2: Toxonomic classification of *Bhringaraja* (*Eclipta alba* (L.))

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 prostata

AIM

To perform macroscopical, macroscopical (Pharmacognostical) study of Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* (L.)) cultivated through Hydroponics system - Nutrient Film Technique (NFT) with a specially designed protocol.

OBJECTIVE

1. To study the macroscopic features of Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* (L.)) Cultivated Through Hydroponics - Nutrient Film Technique (NFT).
2. To study the microscopic features of Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* (L.)) Cultivated Through Hydroponics - Nutrient Film Technique (NFT).

MATERIAL AND METHODS

Bhringaraja (*Eclipta alba* (L.)) was cultivated through Hydroponics system - Nutrient Film Technique (NFT) used as a drug material. A detailed macroscopic and microscopic study of Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* (L.)) were carried out to establish the correct identity of the *Bhringaraja* (*Eclipta alba* (L.)) by comparing with standard reference book of Ayurvedic Pharmacopoeia of India (API), Part I, Vol. II^[3] and Quality Standards of Indian Medicinal Plants (Vol. 9).^[4]

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* (L.)) was collected from the Hydroponic system Nutrient Film Technique (NFT) 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* (L.)) cultivated through Hydroponics system - Nutrient Film Technique (NFT).

OBSERVATIONS

Table No. 3: Macroscopic study of leaf, stem and root of *Bhringaraja* (*Eclipta alba* (L.)) cultivated through Hydroponics system - Nutrient Film Technique (NFT).

No.	Macroscopic Characters	Observation					
		Leaves	Fig.no.	Stem	Fig.no.	Root	Fig.no.
1.	Shape and structure	Oblong-Lanceolate ^[5]	1.c	Cylindrical. ^[6]	1.b	Cylindrical. ^[7]	1.c
2.	Colour	Green. ^[8]	1.c	Greenish	1.b	Creamish	1.c

				Brown. ^[9]		Brown. ^[10]	
3.	Odour	Characteristic. ^[11]	-	Odourless. ^[12]	-	Odourless. ^[13]	-
4.	Surface	Pubescent. ^[14]	1.c	Pubescent. ^[15]	1.b	Rough. ^[16]	1.c
5.	Taste	Astringent	-	-	-	-	-

B. Microscopic Study

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

OBSERVATIONS

Table No. 4: Microscopic study of the Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* (L.)) Cultivated Through Hydroponics - Nutrient Film Technique (NFT).

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

RESULTS AND DISCUSSION

Bhringaraja (*Eclipta alba* (L.)) 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 (L.))* cultivated through Hydroponics system - Nutrient Film Technique (NFT) was done which included macroscopical, microscopical features of the same.

The Leaf of *Bhringaraja (Eclipta alba (L.))* cultivated through Hydroponics system - Nutrient Film Technique (NFT) 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, vascular bundle, trichomes, Palisade cells, and collenchyma.

The stem of *Bhringaraja (Eclipta alba (L.))* Cultivated through Hydroponics - Nutrient Film Technique (NFT) was greenish brown, pubescent in touch and odourless. In the transverse section of the stem, several features were observed, including Epidermis, Endodermis, Paricyclic fibre, Phloem, Xylem and Pith.

The root of *Bhringaraja (Eclipta alba (L.))* Cultivated through Hydroponics - Nutrient Film Technique (NFT) 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 Brown content.

CONCLUSION

In conclusion, the pharmacognostic characterization of the of *Bhringaraja (Eclipta alba (L.))* cultivated through Hydroponics system - Nutrient Film Technique (NFT) sample confirms the identity of the plant as a *Bhringaraja (Eclipta alba (L.))*. Microscopical observation of leaf, root and stem of *Bhringaraja (Eclipta alba (L.))* reveals the presence of Upper epidermis, Lower epidermis, Vascular bundle, Palisade cells, Trichomes, Collenchyma, Epidermis, Endodermis, Pericyclic fibre, Phloem, Xylem, Pith, Medullary ray, Cavity, Cork, Cortex and Brown content. Thus, it provides valuable information for the correct identification of the plant. Brown content as a new structure found rather than standard reference given for identify of *Bhringaraja (Eclipta alba (L.))*.

Plate No. 1: Images of Macroscopy of the Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* (L.)) Cultivated Through Hydroponics - Nutrient Film Technique (NFT).

Fig. No. 1: NFT system and Macroscopy of Leaf, Stem & Root of *Bhringaraja* (*Eclipta alba* (L.))



Plate No. 2: Images of Microscopy of the Leaf, Stem and Root of *Bhringaraja* (*Eclipta alba* (L.)) Cultivated Through Hydroponics - Nutrient Film Technique (NFT).

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

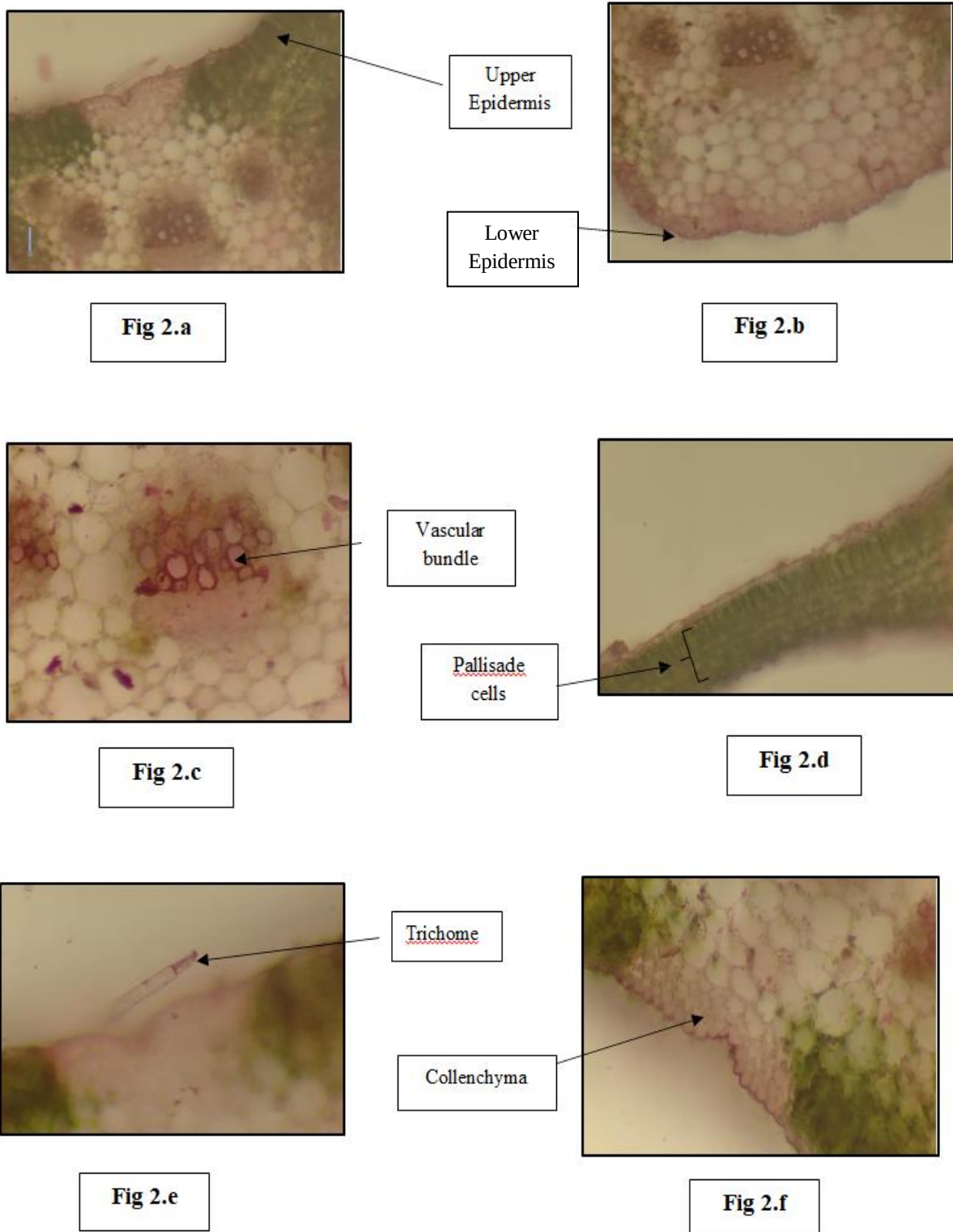


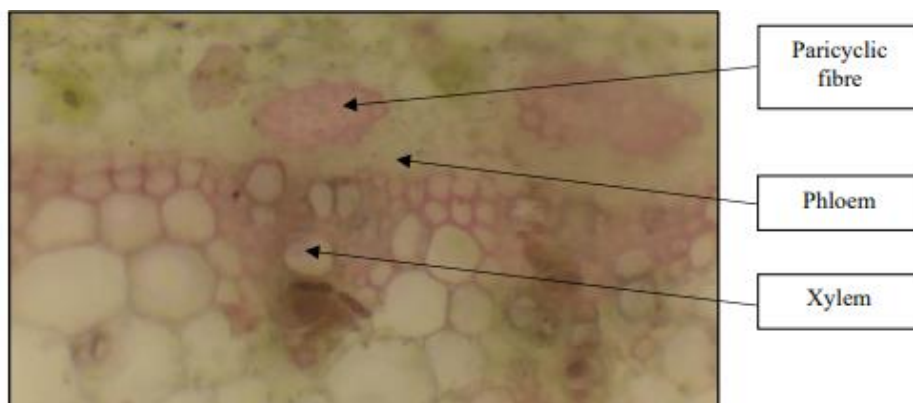
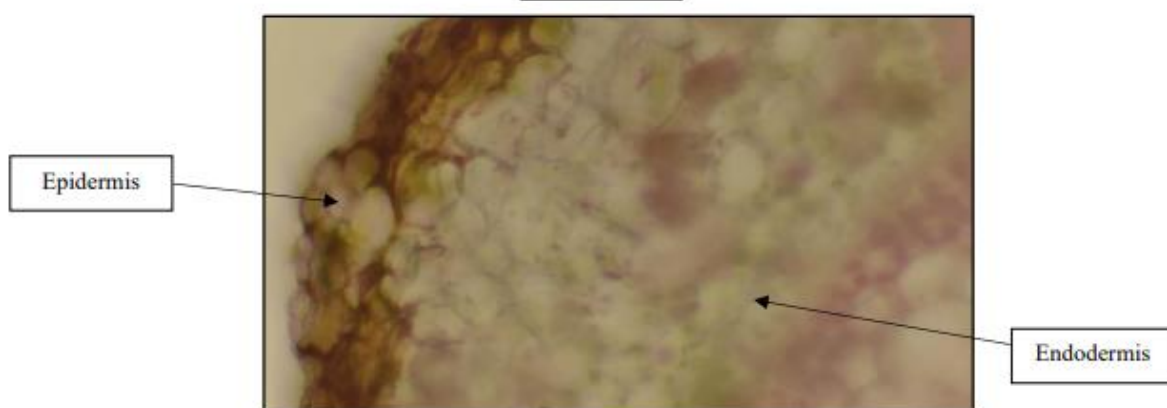
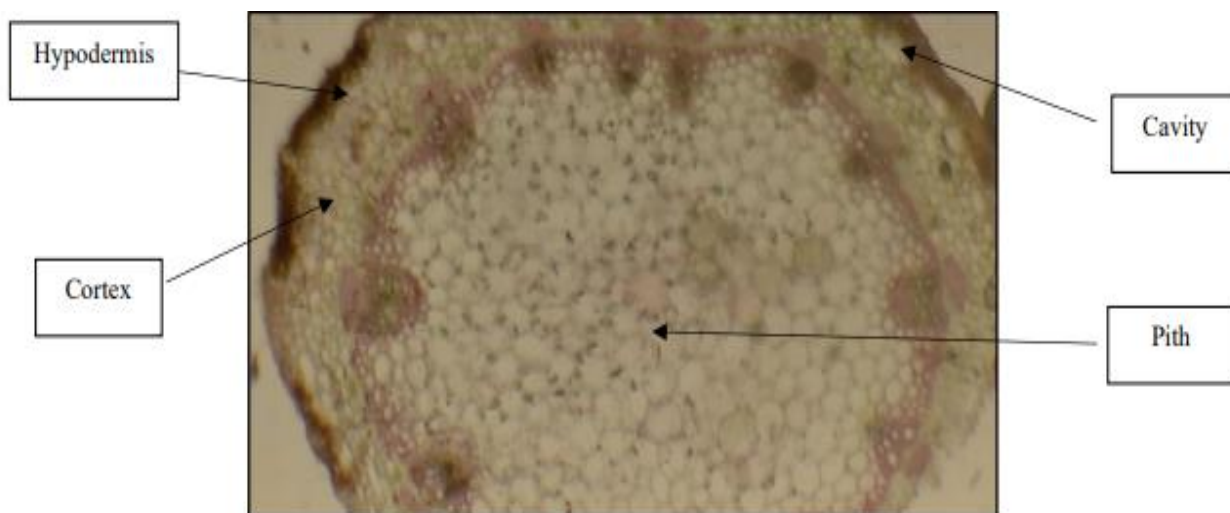
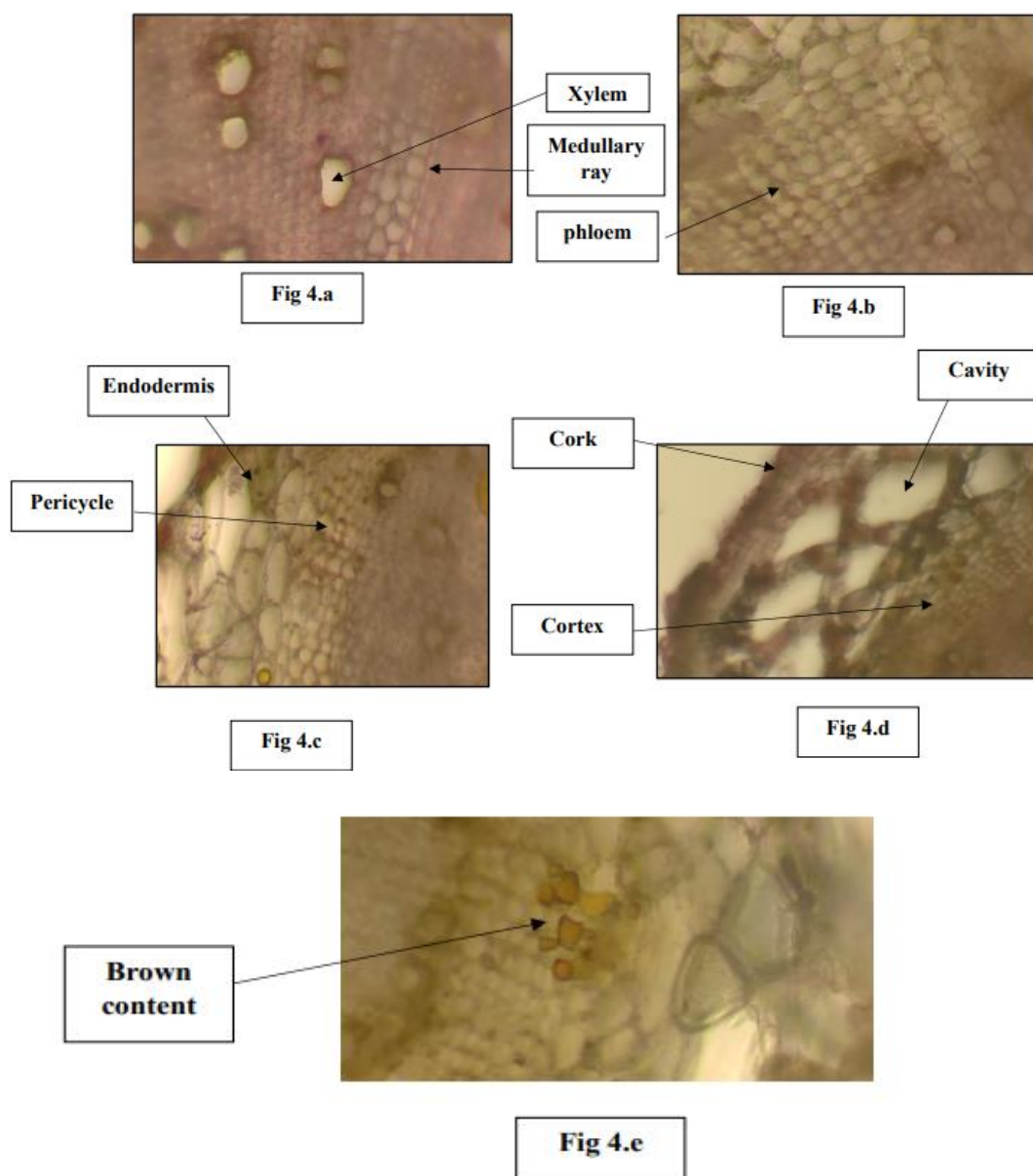
Fig. No.3: T.S. of Stem of *Bhringaraja* (*Eclipta alba* (L.)).**Fig 3.a****Fig 3.b****Fig 3.c**

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

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