

Pharmacognostical and Phytochemical Study of- *Adhahapushpi (Trichodesma Indicum Linn. R. Br.)*

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Abstract

Objective: To carry out pharmacognostical and phytochemical studies on each part of *Adhahapushpi (Trichodesma Indicum Linn. R. Br.)* belonging to the family *Boraginaceae*. **Methods:** The root, leaf, stem, flower and fruits of *Adhahapushpi (Trichodesma Indicum Linn. R. Br.)* were assessed for pharmacognostical studies such as macroscopic, microscopy, powder study, and quantitative microscopy. The powder was assessed for proximate analysis like ash value, extracting value, moisture content, elemental analysis, and preliminary phytochemical studies. **Results:** The study showed microscopic and phytochemical properties which will help in identification and standardisation of *Adhahapushpi (Trichodesma Indicum Linn. R. Br.)*. **Conclusion:** The study discloses precise identifying characteristics for the crude drug which will be of substantial use in identification and prevention of adulteration of the raw drug and can help as a reference for any further investigations.

Keywords: *Trichodesma Indicum Linn. R. Br.*, *Boraginaceae*, *Adhahapushpi*, pharmacognostical, phytochemical

INTRODUCTION

Trichodesma Indicum Linn. R. Br. belonging to the family, *Boraginaceae*, is an annual erect, much branched very hispid herb [1]. It is distributed throughout the greater part of India, in the plains, Baluchistan, Ceylon, Afghanistan, Persia, and Mauritius. The therapeutic uses of the drug are: it is held in repute in snake bites, also considered diuretic. In the Deccan, the plant is used as an emollient poultice. In Chota Nagpur, the root pounded and made into a paste is applied to reduce swellings, particularly of joints. In Chattisgarh state, tribal people are using *Trichodesma Indicum Linn. R. Br.* for the treatment of breast cancer [2]. Research works on its anticancer activity have been carried out against human breast cancer, cervical cancer and laryngeal epithelial cell lines [3]. However it is not included in Ayurvedic pharmacopeia of India, so the study is aimed to conduct pharmacognostic and preliminary phytochemical study of each part of the drug.

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Received Date: March 05, 2021

Accepted Date: May 13, 2021

Published Date: June 19, 2021

Citation: Sarojini Devidas Byadigi, Subrahmanya Padyana. Pharmacognostical and Phytochemical Study of-*Adhahapushpi (Trichodesma Indicum Linn. R. Br.)*. Research & Reviews: A Journal of Ayurvedic Science, Yoga & Naturopathy. 2021; 8(2): 28–44p.

MATERIAL AND METHODS

First step in standardisation is identification of drug by organoleptic microscopic methods, macroscopic methods, physical methods, and chemical methods [4]. Microscopic, macroscopic, and physical methods will help in identification of the drug. By chemical methods, we can identify and isolate bioactive compounds. So, the study is divided into three parts viz.:

1. Organoleptic microscopic methods, macroscopic methods.

2. Physical methods
3. Chemical methods.

Organoleptic Microscopic Methods, Macroscopic Methods

Authentication, Collection and Preparation of Plant Material

Fresh and fully grown plants of *Trichodesma Indicum* Linn. R. Br. were collected from the Western Ghat area of Khanapur in the month of October–November. The plant was authenticated by Dr. Harsha Hegade, scientist RCMR, Belagavi and voucher specimen PHD/SDB/AAMC-11 was deposited to the Department of Dravyagunavignana, Alvas Ayurvedic Medical College, Moodbidri.

After authentication of plant, the plant was studied for macroscopy and microscopy of leaf, stem, flower, fruit and root. Then the plant was dried under shade. The material was powdered separately and stored in airtight containers and used for further studies.

Macroscopic/Organoleptic Characters

Organoleptic characters were assessed through sense organs. Organoleptic characters such as shape, size, colour, odour, taste and fracture of stem bark, leaf structure like margin, apex, base surface, venation and inflorescence, etc. were evaluated.

Microscopical Determination

For the preparation of transverse section of each part of plant, i.e. root, stem, leaf, flower and fruit:

With the help of pith, thin transverse section of each part was taken with sharp razor and washed in water followed by staining in safronin stain for 2–3 min. Then the sections were washed in water to remove extra staining and the sections were put on clean glass slide. A drop of glycerine solution was put and mounted the slide under the microscope in 10x and 45x objective lens. The presence/absence of epidermal cells, covering trichomes, xylem, phloem, stomata and collenchyma were observed [5].

Powder Characteristics

For powder preparation of leaves, stems, fruit and root of *Trichodesma indicum* were dried under shade. They were powdered by grinding and passed through the sieve number 60. Finally, the coarse powders were subjected for microscopical examination. Slides were prepared same as mentioned in above method [6].

Quantitative Microscopy

Quantitative microscopy including stomatal number, stomatal index, palisade ratio, vein-islet number, and veinlet termination number was also determined using prescribed methods [7].

Proximate Analysis

Proximate analysis of powders of leaves and stems, fruit and root of *Trichodesma indicum* was carried out using methods prescribed in the Ayurvedic Pharmacopoeia of India by subjecting them to various determinations like: Water soluble extractive value, Alcohol soluble extractive value [8], Methanol soluble extractive value [9], Chloroform soluble extractive value [10], Toluene soluble extractive value [11], Total Ash [12], Acid insoluble ash [13], Water soluble ash [14], Moisture content [15], and Swelling Index [16].

Preliminary Phytochemical Studies [17]

The drug powder is extracted with water, ethanol, methanol, chloroform and toluene by using cold maceration method. The extractives were dried by evaporation of solvent under reduced pressure by rotary evaporator. Preliminary phytochemical analysis was carried out according to standard procedures explained in Ayurveda Pharmacopoeia of India and recorded.

Preliminary Phytochemical Screening

The preliminary phytochemical screening of the ethanol and water, methanol, chloroform and toluene (cold) extracts of powder of root, stem, leaf, flower and fruit of Adhahapushpi (*Trichodesma Indicum* Linn. R. Br.) were carried out using standard laboratory procedures, to detect the presence of different secondary metabolites (phytochemical constituents) such as carbohydrates, reducing sugars, monosaccharaides, pentose, hexose, non-reducing sugars, proteins, amino acids, fats and oils, steroids, flavonoids, alkaloids and tannins.

Chromatography [18]

- Stationary phase: TLC plate coated with 0.25 mm layer of silica gel 60F254 with fluorescent indicator was used (Each plate dimension is 10 cm long and 2 cm width).
- Activation of pre-coated silica gel 60F254: Plates were dried in hot oven at 105°C for 1½ h.
- Solvent system: Toluene:Ethylacetate (7:3).

Procedure

Apply 10 µl each extract of Adhahapushpi, *Trichodesma Indicum* Linn. R. Br. On a TLC plate as bands of 10 mm develop the plate to a distance of 8 cm from the line of application. Dry the plate in air and spray with solution of Vanillin sulphuric acid reagent. Heat the plate at 110°C for about 5 min or till the bands are clearly visible.

RESULTS

Organoleptic Characters

Leaf of *Trichodesma Indicum* Linn. R. Br.

Figure 1 shows the macroscopy of leaf, stem, root, flower, fruit and seeds of *Trichodesma Indicum* Linn. R. Br. and Table 1 shows the organoleptic characters of leaf of *Trichodesma Indicum* Linn. R. Br.





Figure 1. Macroscopy of Leaf, stem, root, flower, fruit and seeds of *Trichodesma Indicum* Linn. R. Br.

Table 1. Organoleptic characters of Leaf of *Trichodesma Indicum* Linn. R. Br.

	Leaf	Stem	Root	Flower	Fruit
Shape	Oblong, lanceolate	Rounded	Rounded		Ellipsoid
Size	Length: 3–10 cm, width: 0.5–3 cm	50 cm long and 0.2–0.3 cm in width	10 cm long and 1–2 cm in width	Sepal tube (calyx): 1–13 cm long	5 mm long
Colour	Green above and pale green beneath	Pale Green when wet, light brown when dry	Light brown	White-violet when wet	Pale Green when wet, light brown when dry
Odour	Odourless	Odourless	Odourless	Odourless	Odourless
Taste	<i>Madhura, Katu</i>	Tasteless	Tasteless	Tasteless	Tasteless
Fracture of stem bark		Brittle	Brittle		

Transverse Section of Leaf

TS Microscopy of Leaf (Figure 2)

Figure shows details of microscopy of leaf.

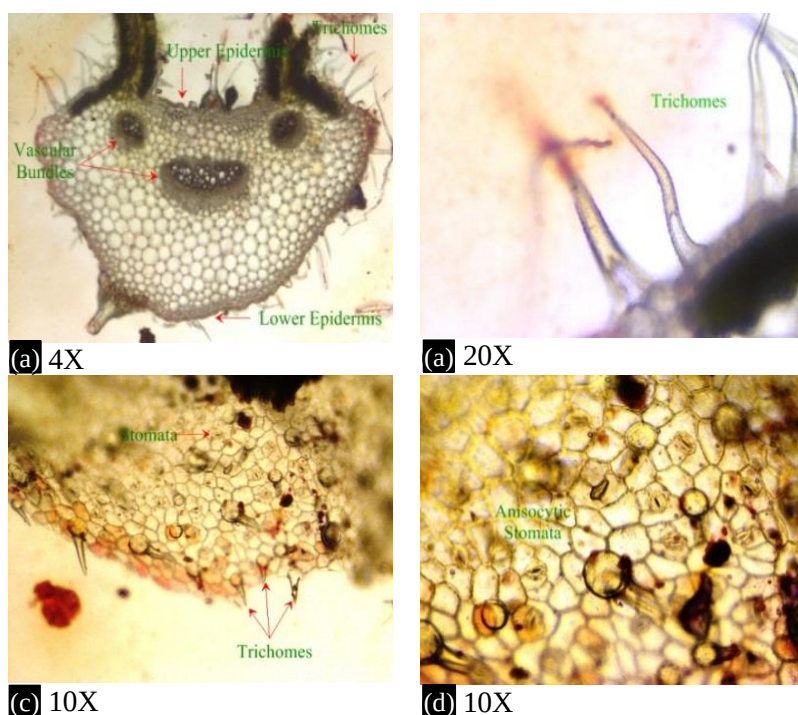


Figure 2. Characters observed in the TS Microscopy: Upper epidermis, lower epidermis, Trichomes and vascular bundles (a), Trichome (b), Stomata and Trichomes (c), Anisocytic stomata (d).

TS Microscopy of Stem (Figure 3)

The figure shows the vascular bundle, trichome etc.

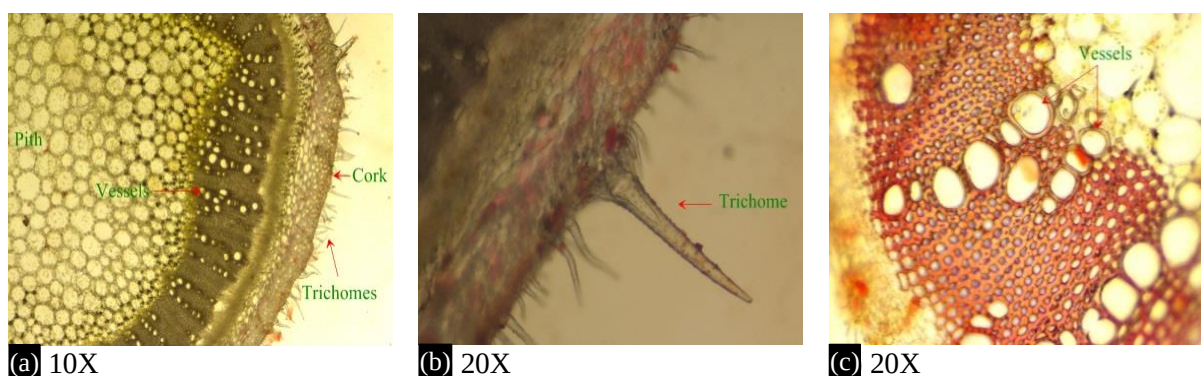


Figure 3. Characters Observed in the TS microscopy: Cork, Trichome, Vessels and Pith (a), Trichome (b), Vessels (c).

TS Microscopy of Ovule (Figure 4)

The figure shows the ovary wall with ovule of *Trichodesma indicum*.

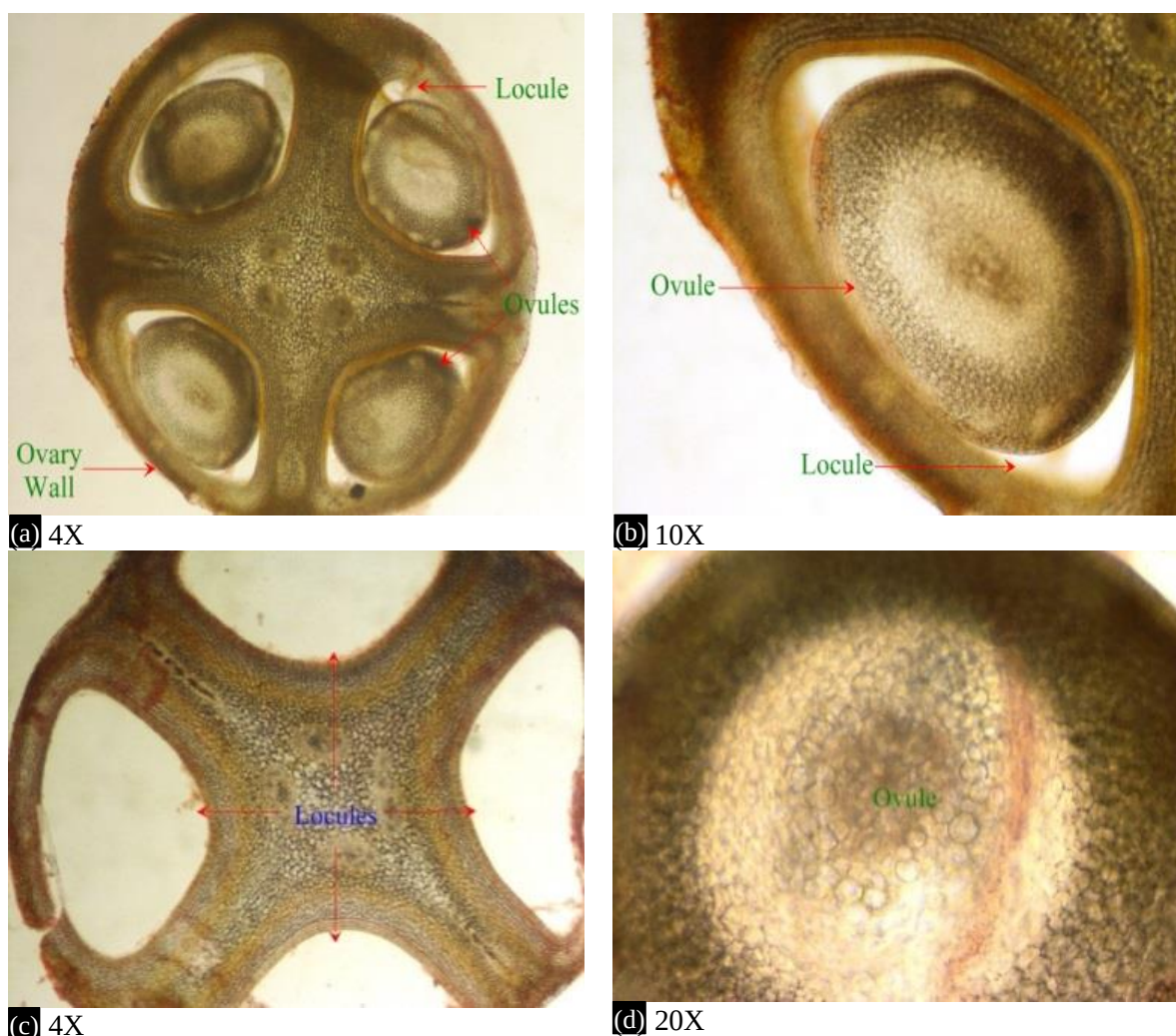


Figure 4. Characters observed in the TS Microscopy: Ovary wall, Locule and Ovules (a), Locule and Ovule (b), Empty Locules (c), Ovule (d).

TS Microscopy of Root (Figure 5)

The figure shows vascular bundle and the starch grain, oil globules and medullary rays etc.

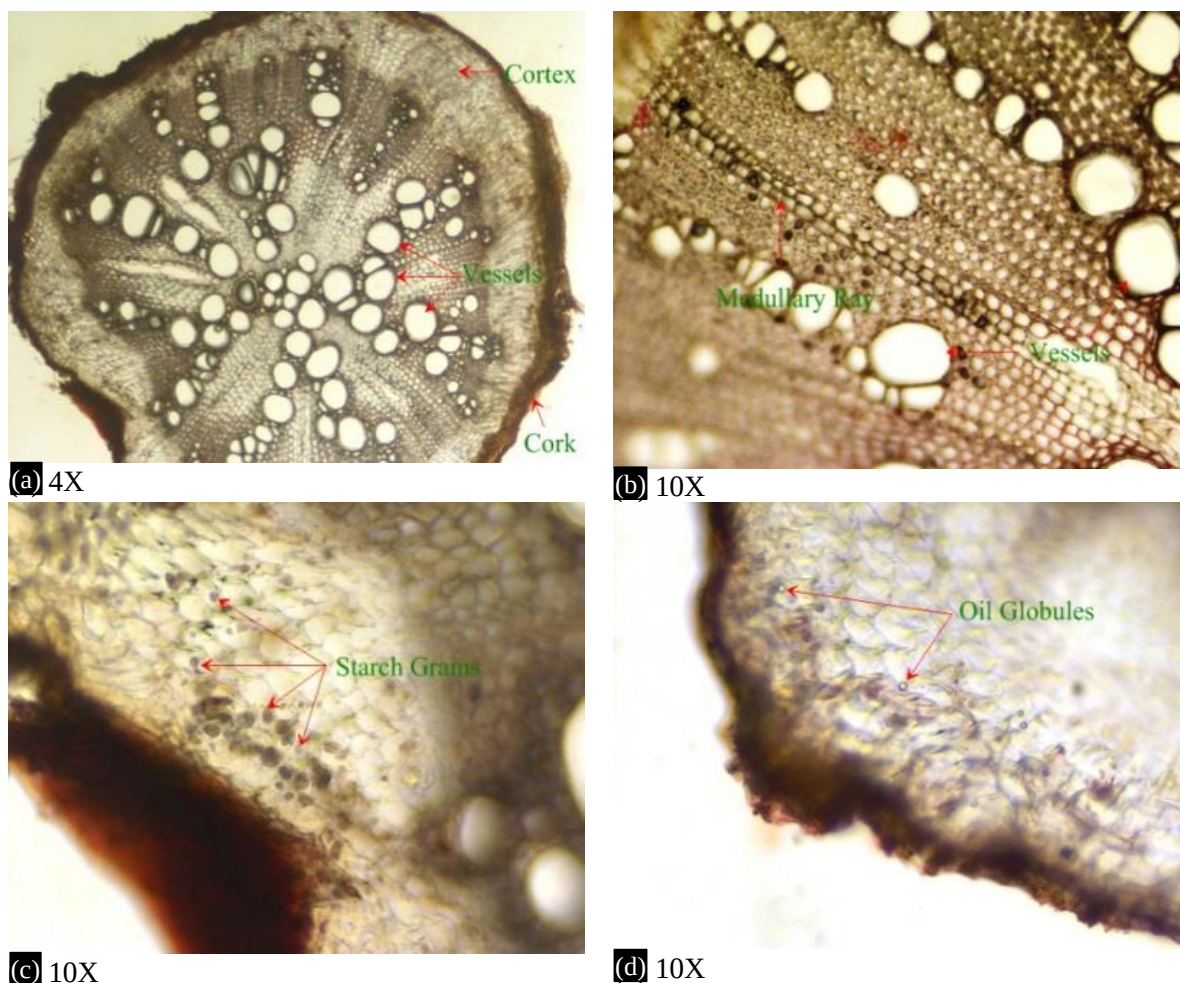
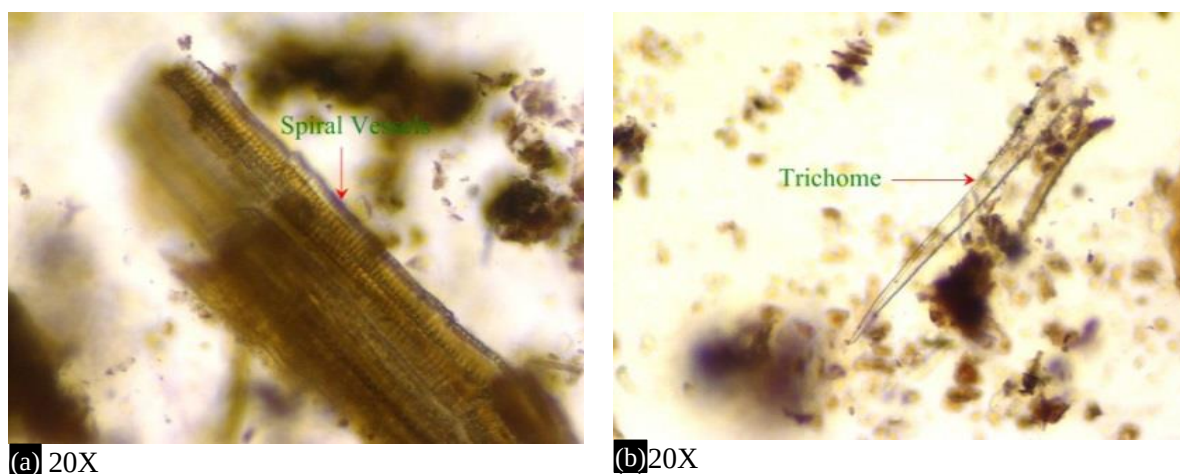


Figure 5. Characters observed in the TS microscopy: Cork, Cortex and Vessels (a), Medullary rays and Vessels (b), Starch Grain (c), Oil Globule (d).

Powder Microscopy (Figure 6)

Leaf powder microscopy shows the presence of iron vessels, trichome, and stomata, and presence of calcium oxalate crystals.



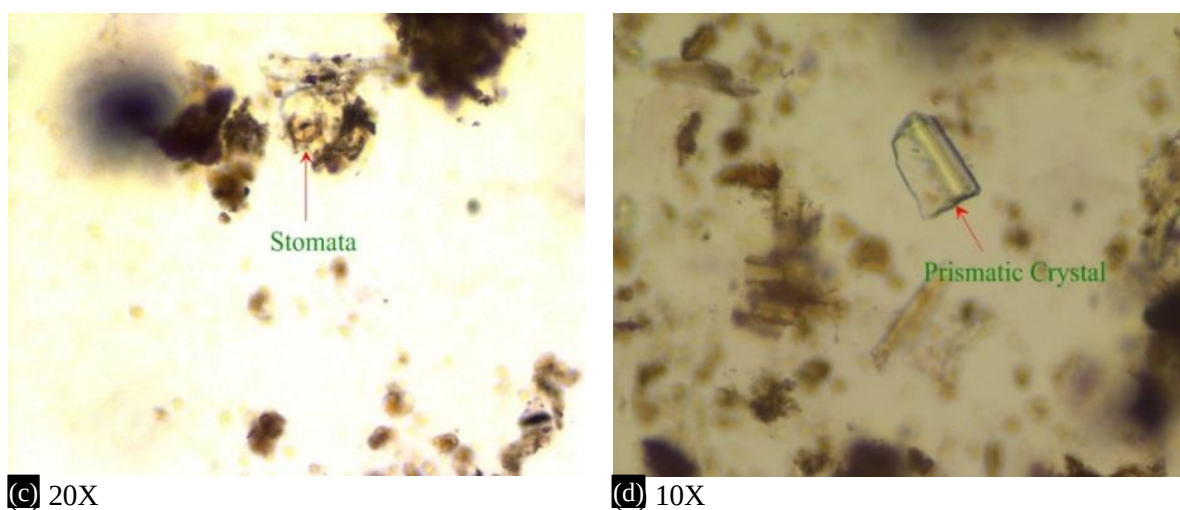


Figure 6. Leaf Powder Microscopy Characters observed in the Leaf powder microscopy: Spiral Vessels (a), Trichome (b), Stomata(c), Prismatic crystal of Calcium oxalate (d).

Stem Powder Microscopy (Figure 7)

The figure shows the presence of spiral and pitted vessels, and trichome, oil globules etc.

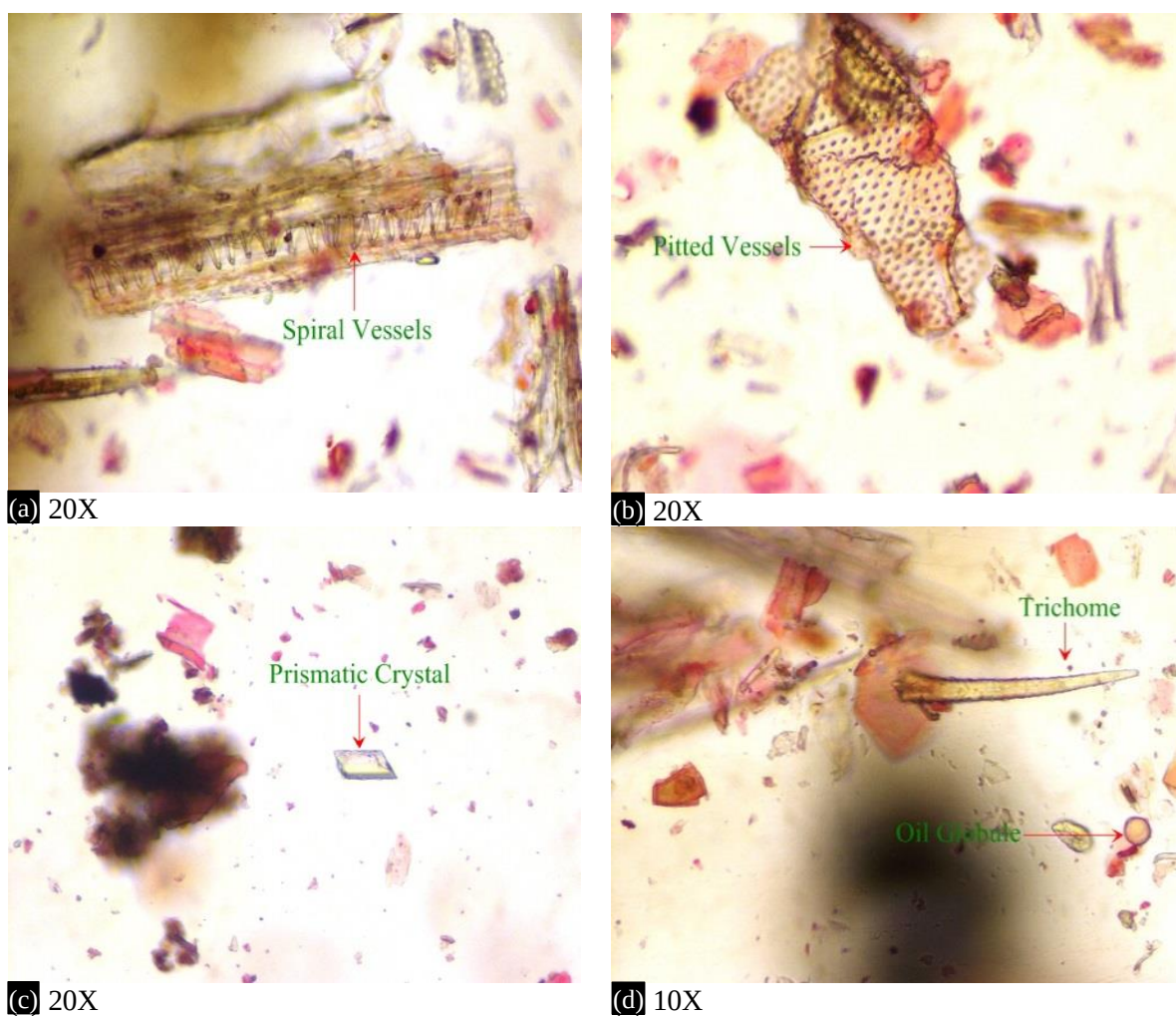


Figure 7. Characters Observed in the stem powder microscopy: Spiral Vessels (a), Pitted vessels (b), Prismatic crystal of Calcium oxalate (c), Trichome and Oil globule (d).

Fruit Powder Microscopy (Figure 8)

The figure shows the presence of trichome, spiral vessels, and oil globules in fruit.

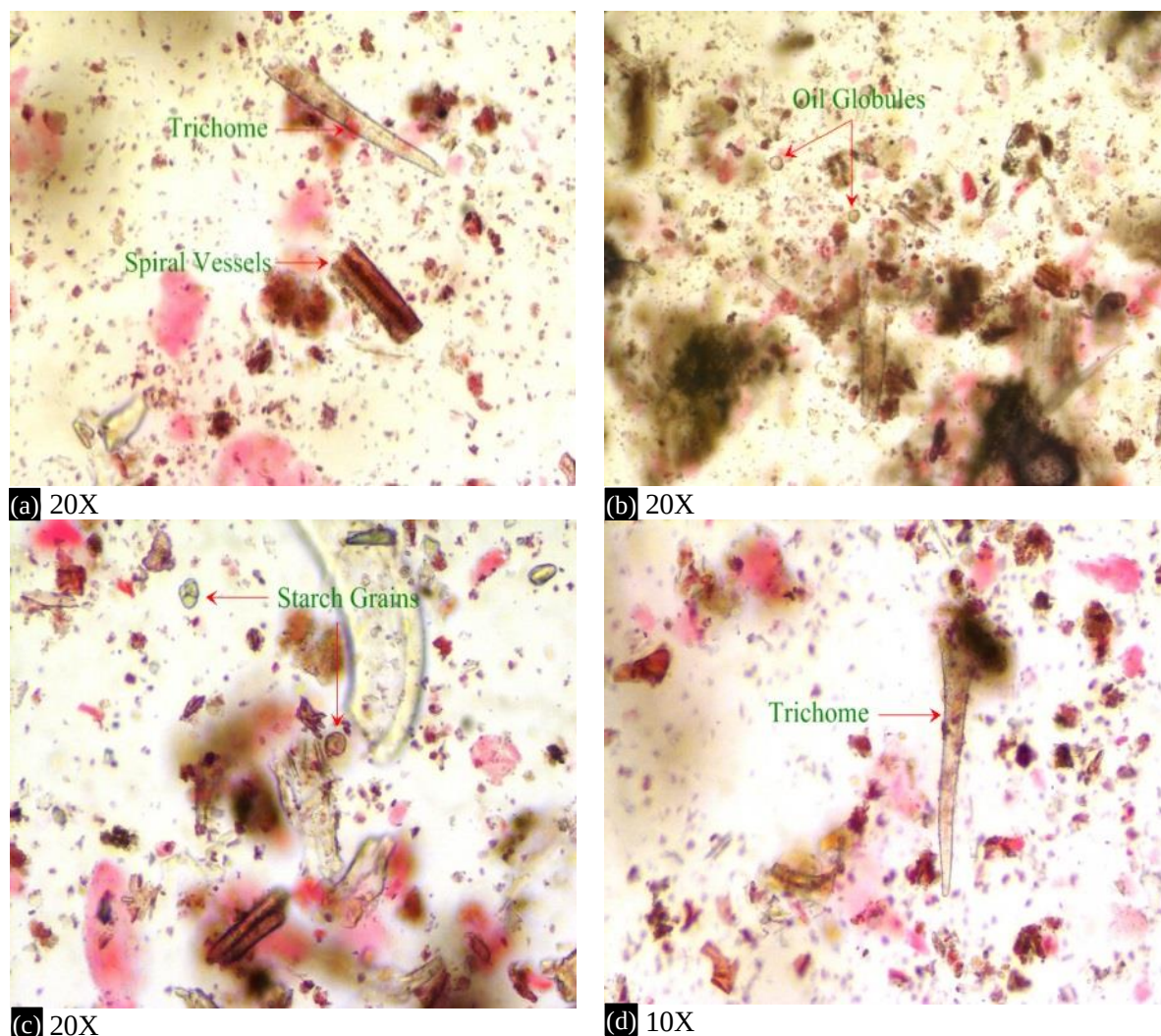


Figure 8. Characters Observed in the Fruit powder microscopy: Trichome and Spiral Vessels (a), Oil Globule (b), Starch Grain (c), Trichome (d).

Table 2 shows the standardization parameters of each part of *Trichodesma indicum*.

Table 2. Standardization parameters of each part of *Trichodesma indicum*.

S.N.	Determination	Leaf (Percentage w/w)	Stem (Percentage w/w)	Flower (Percentage w/w)	Root (Percentage w/w)	Fruit (Percentage w/w)
1.	Total Ash	21.35%	7.796%	15.75%	4.600%	18.725%
2.	Acid insoluble Ash	10.50%	1.349%	6.75%	0.650%	8.914%
3.	Alcohol Soluble Extractive value	36.01%	2.68%	7.36%	6.760%	5.329%
4.	Water soluble Extractive value	16.88%	13.38%	17.43%	12.512%	18.608%
5.	Chloroform Extractive value	8.243%	1.512%	-	1.756%	8.747%
6.	Toluene Extractive value	4.345%	0.368%	-	35.600%	3.298%
7.	Methanol Extractive value	35.567%	5.269%	-	3.106%	9.910%
8.	Moisture content	7.36%	7.063%	6.758%	7.253%	10.123%
9.	Total solid content	92.64%	92.937%	93.242%	92.747%	89.877%

Preliminary Phytochemical Screening of Root of Adhahapushpi (Table 3)

- Water extract was positive for carbohydrates, reducing sugars, monosaccharides, flavonoids and tannins.
- Alcohol extract was positive for carbohydrates, reducing sugars, monosaccharides and flavonoids.
- Both chloroform and methanol extract was positive for carbohydrates and flavonoids.
- Toluene extract was positive for carbohydrates.

Preliminary phytochemical screening of Leaf of Adhahapushpi (Table 4)

- Water extract was positive for carbohydrates, reducing sugars, monosaccharides, flavonoids.
- Alcohol extract was positive for carbohydrates, reducing sugars, monosaccharides, pentose and flavonoids.
- Chloroform extract was positive for carbohydrates and reducing sugars.
- Toluene extract was positive for carbohydrates.
- Methanol extract was positive for carbohydrates, reducing sugars, proteins, amino acids, steroids, flavonoids, alkaloids and tannins.

Table 3. Preliminary phytochemical screening of Root of Adhahapushpi extracts.

S.N.	Tests for	Water	Alcohol	Chloroform	Toluene	Methanol
1	Carbohydrates	Positive	Positive	Positive	Positive	Positive
2	Reducing Sugars	Positive	Positive	Negative	Negative	Negative
3	Monosaccharides	Positive	Positive	Negative	Negative	Negative
4	Pentose	Negative	Negative	Negative	Negative	Negative
5	Hexose	Negative	Negative	Negative	Negative	Negative
6	Non Reducing Sugars	Negative	Negative	Negative	Negative	Negative
7	Proteins	Negative	Negative	Negative	Negative	Negative
8	Amino acids	Negative	Negative	Negative	Negative	Negative
9	Fats and Oils	Negative	Negative	Negative	Negative	Negative
10	Steroids	Negative	Negative	Positive	Negative	Negative
11	Flavonoids	Positive	Positive	Negative	Negative	Positive
12	Alkaloids	Negative	Negative	Negative	Negative	Negative
13	Tannins	Positive	Negative	Negative	Negative	Negative

Table 4. Preliminary phytochemical screening of Leaf of Adhahapushpi extracts.

S.N.	Tests for	Water	Alcohol	Chloroform	Toluene	Methanol
1	Carbohydrates	Positive	Positive	Positive	Positive	Positive
2	Reducing Sugars	Positive	Positive	Positive	Negative	Positive
3	Monosaccharides	Negative	Positive	Negative	Negative	Negative
4	Pentose	Negative	Positive	Negative	Negative	Negative
5	Hexose	Negative	Negative	Negative	Negative	Negative
6	Non Reducing Sugars	Negative	Negative	Negative	Negative	Negative
7	Proteins	Negative	Negative	Negative	Negative	Positive
8	Amino acids	Negative	Negative	Negative	Negative	Positive
9	Test for Fats and Oils	Negative	Negative	Negative	Negative	Negative
10	Steroids	Negative	Negative	Negative	Negative	Positive
11	Flavonoids	Positive	Positive	Negative	Negative	Positive
12	Alkaloids	Negative	Negative	Negative	Negative	Positive
13	Tannins	Negative	Negative	Negative	Negative	Positive

Preliminary phytochemical screening of Stem of Adhahapushpi (Table 5)

- Water extract was positive for carbohydrates, reducing sugars, monosaccharaides, flavonoids and tannins.
- Alcohol extract was positive for carbohydrates, reducing sugars, monosaccharaides, and flavonoids.
- Chloroform extract was positive for carbohydrates.
- Methanol extract was positive for reducing sugars.

Preliminary phytochemical screening of Flower of Adhahapushpi (Table 6)

- Water extract was positive for carbohydrates, reducing sugars, monosaccharaides, proteins, amino acids, flavonoids and tannins.
- Alcohol extract was positive for carbohydrates, reducing sugars, monosaccharaides, pentose, amino acids and flavonoids.

Table 5. Preliminary phytochemical screening of Stem of Adhahapushpi extracts.

S.N.	Tests for	Water	Alcohol	Chloroform	Toluene	Methanol
1	Carbohydrates	Positive	Positive	Positive	Negative	Negative
2	Reducing Sugars	Positive	Positive	Negative	Negative	Positive
3	Monosaccharaides	Positive	Positive	Negative	Negative	Negative
4	Pentose	Negative	Negative	Negative	Negative	Negative
5	Hexose	Negative	Negative	Negative	Negative	Negative
6	Non Reducing Sugars	Negative	Negative	Negative	Negative	Negative
7	Proteins	Negative	Negative	Negative	Negative	Negative
8	Amino acids	Negative	Negative	Negative	Negative	Negative
9	Fats and Oils	Negative	Negative	Negative	Negative	Negative
10	Steroids	Negative	Negative	Negative	Negative	Negative
11	Flavonoids	Positive	Positive	Negative	Negative	Negative
12	Alkaloids	Negative	Negative	Negative	Negative	Negative
13	Tannins	Positive	Negative	Negative	Negative	Negative

Table 6. Preliminary phytochemical screening of Flower of Adhahapushpi extracts.

S.N.	Tests	Water	Alcohol
1	Test for Carbohydrates	Positive	Positive
2	Test for Reducing Sugars	Positive	Positive
3	Test for Monosaccharaides	Positive	Positive
4	Test for Pentose	Negative	Positive
5	Test for Hexose	Negative	Negative
6	Test for Non Reducing Sugars	Negative	Negative
7	Test for Proteins	Positive	Negative
8	Test for Amino acids	Positive	Positive
9	Test for Fats and Oils	Negative	Negative
10	Test for Steroids	Negative	Negative
11	Test for Flavonoids	Positive	Positive
12	Test for Alkaloids	Negative	Negative
13	Test for Tannins	Positive	Negative

Preliminary phytochemical screening of Fruit of Adhahapushpi (Table 7)

- Water extract was positive for carbohydrates, reducing sugars, monosaccharaides, proteins, amino acids, flavonoids and tannins.
- Alcohol extract was positive for carbohydrates, reducing sugars, monosaccharaides, pentose, amino acids and flavonoids.
- Chloroform extract was positive for carbohydrates.
- Methanol extract was positive for carbohydrates, reducing sugars, steroids, alkaloids and tannins.

Inorganic Elements (Table 8)

- Leaf was positive for calcium, sodium, iron, chloride, sulphates and phosphates.
- Stem was positive for calcium, sodium, potassium, iron, chloride, sulphates and phosphates.
- Flower was positive for calcium, sodium, iron, chloride, sulphates and phosphates.
- Root was positive for calcium, sodium, iron, chloride, sulphates and phosphates.
- Fruit was positive for calcium, sodium, potassium, iron, chloride, nitrates, and carbonates.

Flemophotometry

Quantitative Analysis for Inorganic Elements of AdhahaPushpi Extracts (Table 9)

Leaf, Stem and Fruit and Root have Calcium > Potassium > Sodium.

Table 7. Preliminary phytochemical screening of Fruit of Adhahapushpi extracts.

S.N.	Tests for	Water	Alcohol	Chloroform	Toluene	Methanol
1	Carbohydrates	Positive	Positive	Positive	Negative	Positive
2	Reducing Sugars	Positive	Positive	Negative	Negative	Positive
3	Monosaccharaides	Positive	Positive	Negative	Negative	Negative
4	Pentose	Negative	Positive	Negative	Negative	Negative
5	Hexose	Negative	Negative	Negative	Negative	Negative
6	Non Reducing Sugars	Negative	Negative	Negative	Negative	Negative
7	Proteins	Positive	Negative	Negative	Negative	Negative
8	Amino acids	Positive	Positive	Negative	Negative	Negative
9	Fats and Oils	Negative	Negative	Negative	Negative	Negative
10	Steroids	Negative	Negative	Negative	Negative	Positive
11	Flavonoids	Positive	Positive	Negative	Negative	Negative
12	Alkaloids	Negative	Negative	Negative	Negative	Positive
13	Tannins	Positive	Negative	Negative	Negative	Positive

Table 8. Qualitative Analysis for Inorganic Elements of Powder of each part of *Trichodesma Indicum* Linn. R. Br.

S.N.	Elements	Leaf	Stem	Flower	Root	Fruit
1	Calcium	Present	Present	Present	Present	Present
2	Magnesium	Absent	Absent	Absent	Absent	Absent
3	Sodium	Present	Present	Present	Present	Present
4	Potassium	Absent	Present	Absent	Absent	Present
5	Iron	Present	Present	Present	Present	Present
6	Chloride	Present	Present	Present	Present	Present
7	Nitrates	Absent	Absent	Absent	Absent	Present
8	Sulphates	Present	Absent	Present	Present	Absent
9	Carbonates	Absent	Absent	Absent	Absent	Present
10	Phosphates	Present	Absent	Present	Present	Absent

Qualitative Analysis for Inorganic Elements of AdhahaPushpi Extracts (Table 10)

- Calcium, sodium, iron, and chlorides were present in all parts viz., stem, leaf, flower, root and fruit.
- Potassium was present in root and fruit.
- Nitrates were present only in fruit.
- Sulphates were present in stem, leaf and flower.
- Carbonates were present only in fruit.
- Phosphates were present in stem, leaf and flower.

Table 9. Quantitative Analysis for Inorganic Elements of Adhahapushpi Extracts.

S.N.	Elements	Leaf	Stem	Fruit	Root
1	Sodium (Na)	10.42 ppm	11.03 ppm	10.05 ppm	22.21 ppm
2	Potassium (K)	89.03 ppm	156.00 ppm	88.03 ppm	190.92 ppm
3	Calcium (Ca)	103.27 ppm	190.72 ppm	122.74 ppm	190.30 ppm

Table 10. Qualitative Analysis for Inorganic Elements of Adhahapushpi extracts.

S.N.	Elements	Stem	Leaf	Flower	Root	Fruit
1	Calcium	Present	Present	Present	Present	Present
2	Magnesium	Absent	Absent	Absent	Absent	Absent
3	Sodium	Present	Present	Present	Present	Present
4	Potassium	Absent	Absent	Absent	Present	Present
5	Iron	Present	Present	Present	Present	Present
6	Chloride	Present	Present	Present	Present	Present
7	Nitrates	Absent	Absent	Absent	Absent	Present
8	Sulphates	Present	Present	Present	Absent	Absent
9	Carbonates	Absent	Absent	Absent	Absent	Present
10	Phosphates	Present	Present	Present	Absent	Absent

Physicochemical Parameters

It includes TLC, quantitative study of different chemicals in various parts of Adhahapushpi

Table 11. TLC profile of Flower powder.

Extract	Solvent system	No. of Spots	R _f Value
Alcohol	Toluene:Ethyl acetate 7:3	10	0.04, 0.08, 0.41, 0.48, 0.54, 0.066, 0.77, 0.87, 0.93

Table 12. TLC profile of Root powder.

Extract	Solvent system	No. of Spots	R _f Value
Alcohol	Toluene:Ethyl acetate 7:3	06	Short wave: 0.18, 0.77, Long wave: 0.06, 0.11, 0.23, 0.26, 0.30, 0.34, 0.39, 0.46, 0.56, 0.61, 0.75
Methanol	Toluene:Ethyl acetate 7:3		Short wave: 0.17, 0.88, Long wave: 0.07, 0.35, 0.50, 0.91

Table 13. TLC profile of Stem powder.

Extract	Solvent system	No. of Spots	R _f Value
Alcohol	Toluene:Ethyl acetate 7:3	11	Short wave: 0.15, 0.75, 0.81, 0.87. Long wave: 0.06, 0.32, 0.53, 0.59, 0.74, 0.81, 0.87.
Methanol	Toluene:Ethyl acetate 7:3	12	Short wave: 0.18, 0.87. Long wave: 0.07, 0.12, 0.21, 0.31, 0.37, 0.67, 0.80, 0.85, 0.90, 0.97.

Table 14. TLC profile of Fruit powder.

Extract	Solvent system	No. of Spots	R _f Value
Alcohol	Toluene:Ethyl acetate 7:3	15	Short wave: 0.33, 0.39. Long wave: 0.08, 0.15, 0.22, 0.27, 0.32, 0.37, 0.46, 0.54, 0.62, 0.65, 0.70, 0.81, 0.89.
Methanol	Toluene:Ethyl acetate 7:3	12	Short wave: 0.87. Long wave: 0.11, 0.26, 0.35, 0.43, 0.55, 0.62, 0.71, 0.75, 0.82, 0.91, 0.97.

Table 15. TLC profile of Leaf powder.

Extract	Solvent system	No. of Spots	R _f Value
Alcohol	Toluene:Ethyl acetate 7:3	10	0.02, 0.23, 0.49, 0.56, 0.59, 0.63, 0.75, 0.86, 0.93, 0.98

Quantitative study of different extracts of different parts of Adhahapushpi

Leaf: Methanol extract has higher Gallic acid compared to water and Alcohol extracts.

Methanol extract > Alcohol > Water.

Root: Gallic acid was not traced out in Methanol extract. Water extract has higher Gallic acid compared to Alcohol extracts.

Stem: Gallic acid was not traced out in Methanol extract. Water extract has higher Gallic acid compared to Alcohol extracts.

Fruit: Alcohol extract has higher Gallic acid compared to water and Methanol extracts.

Alcohol extract > Water > Methanol.

Table 16. Total Phenolic contents (Gallic acid).

Type of cold Extract	Leaf	Root	Stem	Fruit
Water	43.65(+/-0.19) mg/gm Extract	56.48(+/-0.94) mg/gm Extract	43.40(+/-0.36) mg/gm Extract	33.33(+/-0.57) mg/gm Extract
Methanol	73.21(+/-0.38) mg/gm Extract	-	-	29.50(+/-0.56) mg/gm Extract
Alcohol	50.48(+/-0.47) mg/gm Extract	34.70(+/-0.25) mg/gm Extract	37.95(+/-0.25) mg/gm Extract	76.83(+/-0.19) mg/gm Extract

Table 17. Total Flavanoid contents (Quercetin acid).

Type of cold Extract	Leaf	Root	Stem	Fruit
Water	15.26(+/-0.65) mg/gm Extract	4.49(+/-0.10) mg/gm Extract	7.62(+/-0.45) mg/gm Extract	17.31(+/-0.63) mg/gm Extract
Methanol	16.41(+/-0.91) mg/gm Extract	0.40(+/-0.28) mg/gm Extract	-	-
Alcohol	18.69(+/-0.36) mg/gm Extract	2.63(+/-0.54) mg/gm Extract	3.41(+/-0.21) mg/gm Extract	14.78(+/-0.58) mg/gm Extract

Leaf: Alcohol extract has higher Quercetin compared to water and Methanol extracts.

Alcohol extract > Methanol > Water.

Root: Water extract has higher Gallic acid compared to Alcohol extracts.

Water extract > Alcohol > Methanol.

Stem: Quercetin was not traced out in Methanol extract. Water extract has higher Gallic acid compared to Alcohol extracts.

Fruit: Quercetin was not traced out in Methanol extract. Water extract has higher Gallic acid compared to Alcohol extracts.

DISCUSSION

Ayurvedic drugs are the promising source of health fraternity. Most of them are having the origin in folklore and tribal practice. It is more worth when the same tribal or folklore medicines are standardised botanically and pharmacognostically. Adhahapushpi, *Trichodesma Indicum Linn. R. Br.* is one of such drugs and needs to be standardised; so in present study, each part of the plant is studied in detail.

Organoleptic characters (Figure 1 and Table 1) *Trichodesma Indicum Linn. R. Br.*

Revealed that the leaves are simple, opposite decussate, sessile, with obtuse apex, entire margin, and pinnate venation. Surface of leaves are covered with prominent white tubercles rich with hairs. They are 3–10.0 cm long and 0.5–3 cm in width. The shape of leaf is ovate or oblong lanceolate with narrow base; Midrib distinct; The stem are found to be green in colour, light brown when dry, surface clothed with hair, odourless, tasteless hairy surface, branches clothed with spreading trichomes. They are 50 cm long and 0.2 to 0.3 cm in width. The Inflorescence: terminal on stem and branches. Flowers: axillary, calyx: green, hairy 1: 13 cm long. Corolla: funnel shaped, lobes tailed. Fruits: ellipsoid, enclosed by calyx.

Nutlets: black, 4 in number; Oblong, ovoid, 5 mm long and wide.

Transverse section of Different parts of Adhahapushpi (*Trichodesma Indicum Linn. R. Br.*) (Figures 2–5)

The leaf is a dorsi-ventral and hypo-stomatic with anisocytic stomata. It has amoeboid outlined epidermal cells. It has thick epidermal trichomes and the midrib is deeply grooved on ad-axial side with a semi-circular ad-axial part. It has well defined vein islets and once or twice forked vein termination on its venation pattern. The TS studies of the young stem displayed thin layer of narrow rectangular epidermal cells thick trichomes and vascular bundles, primary, secondary xylem cylinders with phloem and vessels up to 40 µm wide. The TS studies of the young root showed central medullary rays, solid central secondary xylem cylinder with thin layer of secondary phloem. It also has lignified xylem fibres. It also showed presence of starch granules and oil globules.

Powder microscopy (Figures 6–8): Evaluation of powder microscopy of leaf showed presence of spiral vessels, trichome, stomata and prismatic crystal of calcium oxalate. Stem powder microscopy showed presence of spiral vessels, pitted vessels, prismatic crystal of calcium oxalate, trichome and oil globules.

Fruit powder microscopy showed presence of trichome and spiral vessels, oil globule, starch grain and trichome.

Physicochemical analysis (Table 2): The quantitative ash content value suggests the presence of inorganic component in all the parts of Adhahapushpi (*Trichodesma Indicum Linn. R. Br.*).

The quantitative solubility of ash was checked in dilute acid solution and water. The solubility of ash of all the parts except fruit in dilute acid solution was found lower than water.

Extract values: Each part of drug are checked for extractive values using different solvents (water, alcohol, chloroform, toluene and methanol)

Leaf: The water soluble extractives were found higher than alcohol soluble extractives.

Stem: The water soluble extractives > Methanol soluble extractives > Chloroform soluble extractives > Alcohol soluble extractives > Toluene soluble extractives.

Root: The Toluene soluble extractives > Water soluble extractives > Alcohol soluble extractives > Methanol soluble extractives > Chloroform soluble extractives.

Flower: The water soluble extractives were found higher than alcohol soluble extractives.

Fruit: The Water soluble extractives > Methanol soluble extractives > Alcohol soluble extractives > soluble extractives > Chloroform soluble extractives.

Preliminary Phytochemical Screening of *Adhahapushpi* (*Trichodesma Indicum* Linn. R. Br.) Extracts

The medicinal plants are rich in secondary metabolites, a varied group of chemicals, which include alkaloids, glycosides, amines, insecticides, steroids, flavonoids, and related metabolites, which have been widely used in drug and pharmaceutical industry [19]; so, different parts of *Adhahapushpi* were evaluated for presence of secondary metabolites.

Plant phenolic and carotenoid compounds are known for their invaluable effects on human health and they are present in many varieties in plants and vegetables [20]. Another large family of phytochemicals is Flavonoids which are also called bioflavonoids present in fruits and vegetables and act as antioxidants [21]. Flavonoids are renowned for their free radical scavenging potency, which underlines their antibacterial, anti-inflammatory, anti-thrombotic and vasodilator activities [22]. Phenols and flavonoids are known for their antioxidant and free radical scavenging property [23].

Plant based alkaloids are the biggest class of phytochemicals and show evidence of many therapeutic effects like antioxidant, analgesics, muscle relaxants, antibiotics, anticancer and also responsible for antiprotozoal, cytotoxic and antimicrobial properties [24]. Tannins are the compounds which are water-soluble and also phenolic in nature, and are used as healing agents in many diseases like leucorrhoea, rhinorrhea, diarrhea and also hinder the growth of many organisms like fungi, yeasts, bacteria, and viruses [25]. The presence of glycosides shows improvement in cardiac arrhythmia and heart related diseases. It is reported that terpenoids are the most widespread chemically different groups of natural products and have activities like antioxidant, anticancer, anti-inflammatory, sedative, cytotoxic activity etc.

Different extracts of different parts of the plant *Adhahapushpi* are confirmed for the presence of carbohydrates, reducing sugars, proteins, amino acids, steroids, monosaccharides, flavonoids and tannins. This supports the plant's anti-oxidant, radical scavenging and anticancer activities.

TLC Profile (Tables 11–15)

The TLC method is best choice for the identification of secondary metabolite present in plants. Here, the different R_f values indicate the presence of different nature of phytoconstituents in single extracts. Different R_f values of the compound also reflect an idea about their polarity. This info will help in selection of suitable solvent system for auxiliary separation of compound from these plant extracts.

Quantitative Study of Different Extracts of Different Parts of *Adhahapushpi* (Tables 16 and 17)

Quercetin, a flavonoid has unique biological properties that benefit to overall health and disease resistance, including anti-carcinogenic, anti-inflammatory, antiviral, antioxidant, and psychostimulant activities [26]. Similarly Gallic acid and its derivatives can inhibit the oxidation and rancidity of oils and fats ascribed to their free radical scavenging and antioxidant nature [27]. Quantitative estimation of Quercetin and Gallic acid in different extracts of the plant *Adhahapushpi*, supported the plant's tribal use in cancer.

CONCLUSION

The medicinal plant *Adhahapushpi* (*Trichodesma Indicum* Linn. R. Br.) is mentioned in Ayurvedic Samhita and Nighantu and used as medicine for different ailments such as cough, diarrhoea, joint pain

and tribally used to treat breast cancer. However it is not included in Ayurveda pharmacopeia of India; so, the study is aimed to conduct pharmacognostic and preliminary phytochemical study of each part of the drug.

The study showed microscopic and phytochemical properties which will help in identification and standardisation of *Adhahapushpi* (*Trichodesma Indicum* Linn. R. Br.). The study reveals specific identifying characteristics for the particular crude drug which will be of significant use in identification and control to adulteration of the raw drug and can serve as a reference for any further investigations.

ACKNOWLEDGMENT

I am thankful to the Department of Dravyaguna Vignana, Alvas Ayurvedic Medical College and Central Research Facility KAHER's Shri B M Kankanawadi Ayurved Mahavidyalaya Belagavi, Karnataka, for their kind support in carrying out the study.

CONFLICTS OF INTEREST

We have no conflicts of interest, neither financial nor personal or any other kind.

AUTHORS' FUNDING

The authors have no funding to report.

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