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## PHARMACOGNOSTIC AND PHYTOCHEMICAL EVALUATION OF THE *FAGONIA ARABICA* STEM- A POTENT INDIAN MEDICINAL PLANT

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### Keywords:

*Fagonia arabica*, Pharmacognosy, Microscopy, Phytochemical screening, Physicochemical evaluation

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**ABSTRACT:** **Context:** Dhamaso, botanically known as a *Fagonia Arabica* is an important plant in Ayurveda and in folklore medicine, but little is known about its pharmacognostic evaluation. **Objectives:** In the present investigation, the detailed pharmacognostic study of *Fagonia arabica* stem is carried out to lay down the standards which could be useful in future experimental studies. **Materials and Methods:** The present study included macroscopy, microscopy, preliminary phytochemical screening, and physicochemical evaluation. **Results:** Macroscopy reveals the organoleptic properties of the stem, and the microscopic study shows the presence uni-seriate to tri-seriate medullary rays and brownish matter in pith region as diagnostic characters. Water-soluble ash value is more than acid insoluble ash indicates that the acid-insoluble siliceous matter was less than that of water-soluble ash. The preliminary phytochemical investigations indicate the presence of glycosides, flavonoids, saponins, sterols, carbohydrates, amino acids, etc.

**INTRODUCTION:** Herbal drugs play an important role in health care programs, especially in developing countries. Such herbal drugs are promising choice over modern synthetic drugs, as they show minimum/no side effects and are considered to be safe <sup>1, 2</sup>. Generally, herbal formulations involve the use of fresh or dried plant parts. Ancient Indian literature incorporates a remarkably broad definition of medicinal plants and considers 'all' plant parts to be potential sources of medicinal substances <sup>3</sup>.

However, a key obstacle, which has hindered the acceptance of alternative medicines in developed countries, is the lack of documentation and stringent quality control. There is a need for documentation of research work carried out on traditional medicines <sup>4</sup>.

With this backdrop, it becomes extremely important to make an effort towards the standardization of the plant material to be used as medicine. The process of standardization can be achieved by stepwise pharmacognostic and phytochemical studies <sup>5</sup>. These studies help in the recognition and authentication of the plant material. Identification and quality assurance of the starting materials is an essential prerequisite to ensure reproducible quality of herbal medicine, which will contribute to its safety and efficacy. Simple

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pharmacognostic techniques used in the standardization of plant material include its morphological, anatomical, and biochemical characteristics<sup>6</sup>. *Fagonia arabica* is a tropical herb belonging to family Zygophyllaceae, found in the entire Indian subcontinent and is commonly known as 'Dhamasa'. It is a green shrub of 1 to 3 feet height found on calcareous rocks distributed throughout the Mediterranean region of Africa, Afghanistan, India, and Pakistan<sup>7</sup>. Different parts of this herb have been used to cure various ailments, namely hematological, neurological, endocrinological, and inflammatory disorders<sup>8-13</sup>.

It has also been reported to contain a wide variety of antioxidants and triterpenoids saponins<sup>14, 15</sup>. Its infusion is effective as a cooling agent in stomatitis. It is known to purify blood purifier<sup>16</sup>. It is also used for skin diseases, smallpox and for endothermic reaction in the body<sup>17</sup>. The twigs of the plant are used as a remedy for snakebite and also applied externally as a paste on tumors and for the swellings of neck<sup>13, 14, 17</sup>.

In literature details of morphology, phyto-constituents, medicinal properties, and uses of *Fagonia arabica* is very sparse; therefore, in the present study, pharmacognostic and phytochemical standards of the leaves of *Fagonia arabica* are studied. These standards are of utmost importance not only in finding out Genuity but also in the detection of adulterants in marketed drug<sup>18</sup>.

## MATERIALS AND METHODS:

### Collection and Authentication of the Plant

**Material:** *Fagonia arabica* stem was purchased from Manthan trading, Surat, Gujarat. The sample was authenticated for its botanical identity by Botanist Dr. Murlikrishnan (BMCBT, Surat) and voucher specimen deposited in the herbarium of the institute. Dried stem pieces were made into coarse powder and passed powder through sieve no. 50# for further analysis.

### Pharmacognostical Evaluation:

**Morphological Evaluation:** The macroscopic characters such as size, shape, surface, fracture, color, odor, taste, etc. were studied for Morphological investigation<sup>19-28</sup>.

**Microscopic Evaluation:** For microscopical studies, freehand section of the stem was cut,

cleared, and stained with safranin according to the prescribed method<sup>19-28</sup>. The results were registered by botanical illustration and photos taken by means of the digital light microscope fitted with 1/3" CCD camera imaging accessory with Scopetek image 2000 image analysis software.

**Histochemical Analysis:** Histochemical analysis for oil, lignin, starch, tannin, and crystals also carried out<sup>29</sup>.

**Physicochemical Evaluation:** The foreign matter, ash values, extractive values, and foaming index were performed according to the official methods prescribed in Indian pharmacopeia and the WHO guidelines on quality control methods for medicinal plant materials<sup>30, 31</sup>.

**Phytochemical Screening:** The preliminary phytochemical tests for dried leaves powder were also carried out according to the standard procedures described by Kokate and Horborne<sup>32, 33</sup>. All the reagents used were of analytical grade obtained from Fine Chemicals Ltd., Mumbai, India.

## RESULTS AND DISCUSSION:

### Macroscopic Description:

Shape : Cylindrical  
 Size : Diameter - 0.6 to 0.8 cm  
           Length - Distinct nodes, internodes being 1.2 to 2 cm length  
 Surface : Glabrous and longitudinally striated  
 Fracture : Outer surface – short  
           Inner surface - fibrous  
 Colour : Yellowish-brown  
 Taste : Slightly bitter and mucilaginous  
 Odor : Not characteristic

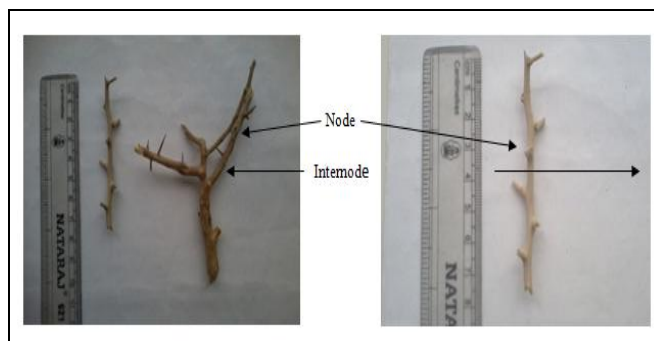


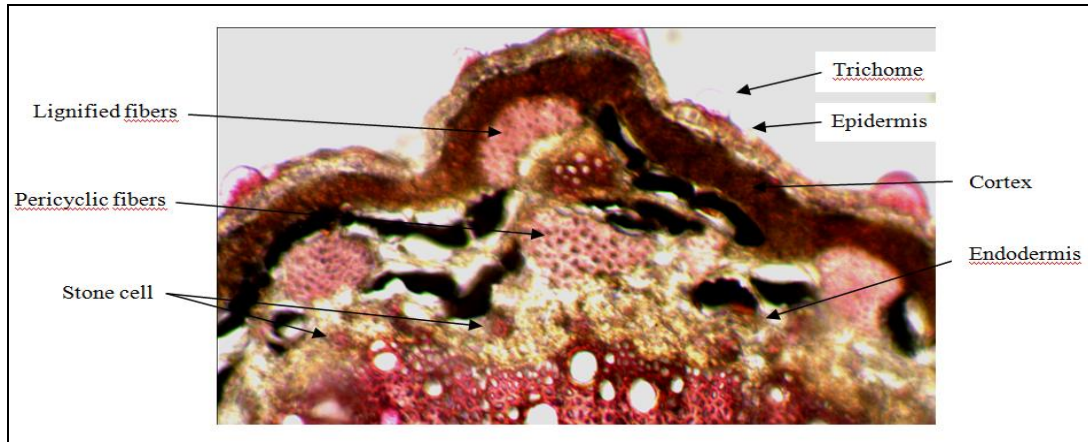
FIG. 1: MORPHOLOGY OF *FAGONIA ARABICA* STEM

**Microscopic Features:** Transverse section of *Fagonia Arabica* stem showed the following features:

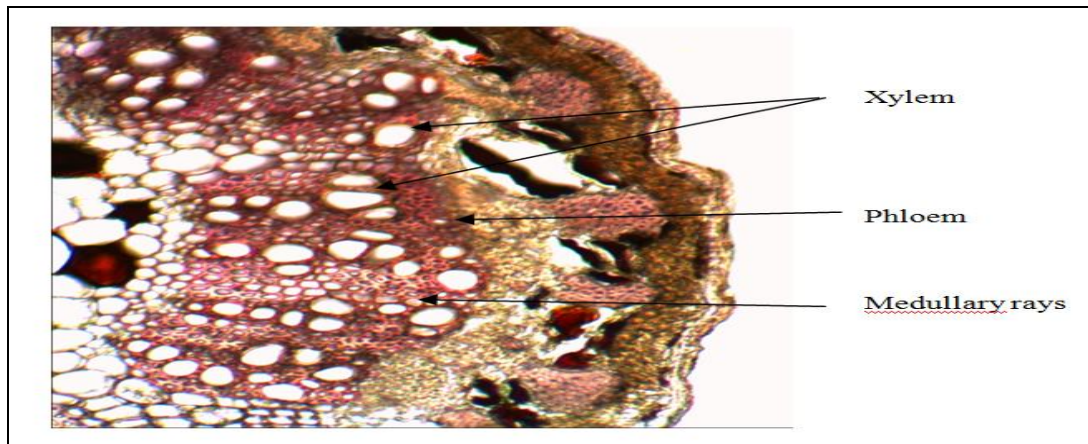
**Epidermis:** a layer of tangentially running cells of the epidermis with thick cuticle **Fig. 2A**.

**Cortex:** Epidermis is followed by 4-5 rows of compactly arranged tangentially running parenchymatous zone of cortex transverse with the group of small-sized, thick-walled lignified fibers.

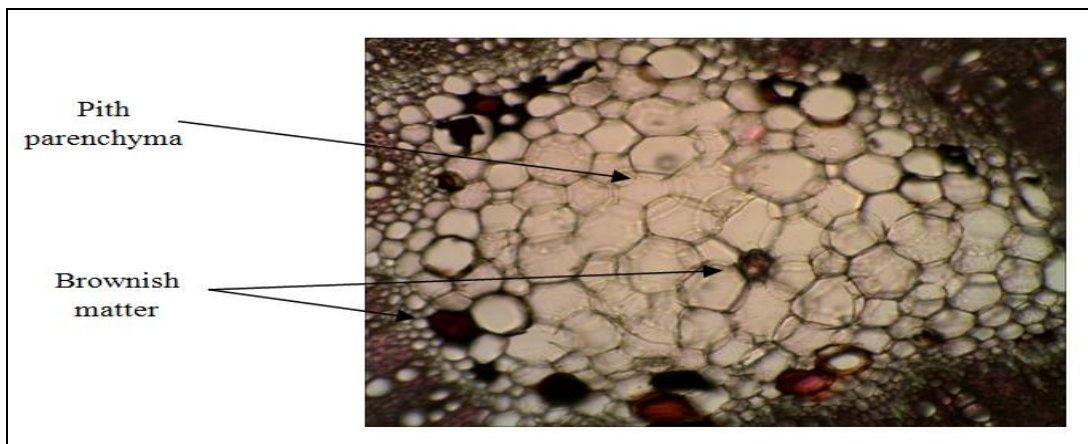
Occasionally, the layer of endodermis is seen encircling the pericyclic band, which consists of loosely arranged big sized parenchymatous cells embedded with discontinuous rows of groups of thick-walled fibers and few wide lumened stone cells **Fig. 2A**.



**FIG. 2A: TRANSVERSE SECTION OF THE EPIDERMIS**



**FIG. 2B: PHOTOGRAPH OF VASCULAR BUNDLE REGION**



**FIG. 2C: PHOTOGRAPH OF PITH REGION**

**FIG. 2: PHOTOGRAPHS OF TRANSVERSE SECTION OF FAGONIA ARABICA STEM (A) TRANSACTION OF THE EPIDERMIS AND CORTEX REGION, SHOWING EPIDERMIS, TRICHOME, HYPODERMIS, LIGNIFIED FIBRES, PERICYCLIC FIBRES, STONE CELLS; (B) VASCULAR BUNDLES REGION SHOWING PHLOEM, XYLEM, MEDULLARY RAYS; (C) GROUND TISSUE SHOWING PITH AND BROWNISH MATTER**

**Conducting Tissue (Vascular bundles):**

**Xylem:** Very wide, composed of isolated and radially arranged vessels, medullary rays, parenchyma, and thin-walled fibers **Fig. 2A**.

**Phloem:** Wide, parenchymatous, transversed with sieve tubes, parenchyma and uni- to triseriate medullary rays, cambium distinct **Fig. 2B**.

**Pith:** Consist of centrally located small crescent-shaped, loosely arranged parenchymatous cells. The brownish matter is also observed in pith cells, **Fig. 2C**.

**Histochemical Analysis:** The histochemical analysis of fruit powder confirms the presence of lignin, tannin, oil globules, and crystals **Table 1**.

**TABLE 1: HISTOCHEMICAL ANALYSIS OF POWDER OF FAGONIA ARABICA STEM**

S. no.	Reagent	Constituents	Color change	Result
1	Iodine	Starch	Blue	+
2	Ferric chloride solution	Tannin	Bluish black	+
3	Sudan iii	Oil	Red	+
4	Phloroglucinol +HCl	Lignin	Pink	+
5	Phloroglucinol +HCl	Calcium oxalate crystal	Effervescence	+

**TABLE 3: SUCCESSIVE EXTRACTIVE YIELDS OF FAGONIA ARABICA STEM**

Sr. no.	Solvent	Visible colour	Consistency	Average extractive yield (%)
1	Pet. ether	Dull yellow	Sticky	1.8%
2	Benzene	Buff yellow	Sticky	1.3%
3	Chloroform	Pale brown	Sticky	0.9%
4	Ethyl acetate	Brown	Sticky	2.7%
5	Methanol	Dark Brown	Less Sticky	14.2%
6	Chloroform: Methanol	Dark Brown	Less Sticky	9.4%

**TABLE 4: PRELIMINARY PHYTOCHEMICAL SCREENING OF FAGONIA ARABICA STEM**

S. no.	Class of compounds	Pet. Ether (60-80 °C)	Benzene	Chloroform	Ethyl acetate	Methanol	Chloroform: Water
1	Alkaloids	ND	ND	ND	ND	ND	ND
2	Flavonoids	ND	ND	ND	+	+	+
3	Saponins	ND	ND	+	+	+	+
4	Phytosterols	+	+	+	ND	+	ND
5	Carbohydrates	ND	ND	ND	+	+	+
6	Phenolic compounds & Tannins	ND	ND	ND	+	+	+
7	Protein and amino acids	ND	ND	ND	ND	+	+
8	Fixed oils	+	+	+	ND	ND	ND

+ - Present; ND - Not Detected

**CONCLUSION:** Herbal drug standardization is a fundamental part of establishing the correct quality, purity and correct identity of a crude drug. Before any drug can be included in the pharmacopeia,

**Physicochemical Evaluation:** The foreign matter, Loss on drying, Values likes (Total Ash, Acid insoluble ash, water-soluble ash), water-soluble extractive, Methanol soluble extractive, foaming index and swelling index Ash of stem powder are evaluated **Table 2**.

**TABLE 2: PHYSICO-CHEMICAL PARAMETERS OF FAGONIA ARABICA STEM**

S. no.	Parameter	% value
1	Foreign matter	0.76%
2	Loss on Drying	14%
3	Extractive value	
	A) Water-soluble extractive value	36.58%
	B) Alcohol soluble extractive value	22.18%
4	Ash values	
	A) Total ash value	6.4%
	B) Acid insoluble ash value	1.2%
5	Foaming index	228
6	Swelling index	1 ml

**Qualitative Phytochemical Screening:** The percentage yield of successive extractives was calculated, and results are shown in **Table 3**.

Preliminary phytochemical investigations showed the presence of glycosides, flavonoids, saponins, sterols, carbohydrates, and amino acids in **Table 4**.

these standards must be established. The majority of the information on the identity, purity, and quality of the plant material can be obtained from its macroscopy, microscopy and physio-chemical

parameters. These investigations can also help the manufacturers for the identification and selection of the raw material for drug production. These parameters also will serve as standard data for quality control studies of pharmaceutical preparations, which include *F. arabica* stem. These parameters can be measured as characteristic enough to decide and identify the authenticity of this drug in the herbal drug industry. As there is no record on phytochemical and Pharmacognostical study of *F. arabica* stem, the present research work was undertaken to evaluate some Pharmacognostical and phytochemical standards.

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