Research Article

PHARMACOGNOSTICAL STUDIES ON ROOTS OF *AERVA JAVANICA*

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ABSTRACT

The indigenous plant which is selected in the present study was *Aerva javanica* belonging to family *Amaranthaceae*. *A. javanica* roots and flowers are reported to possess medicinal properties against rheumatism and kidney problems. *A. javanica* is used as Pasanabheda means one which breaks the kidney stone and in Gujarati it is commonly known as Patharphod. To establish pharmacognostical and phytochemical quality control parameters of root of *A. javanica.* Pharmacognostical evaluation including examination of morphological and microscopical characters, determination of quality control parameters such as ash values, extractive values, moisture content and foreign matter were carried out. Phytochemical screening including qualitative chemical examinations was also carried out. Hence, the present attempt was undertaken to investigate the pharmacognostical studies of *A. javanica* root. The study revealed the presence of cork, indistinct phellogen, 6 to 7 layer of phelloderm present in the periderm region with secondary structures of stellar region in the root of the *A. javanica*. In the crude powder structures mainly observed were cork, fibers, calcium oxalate crystals, vessels with bordered pits and ray cells. Phytochemical screening of root of *A. javanica* showed the presence of phytoconstituents like flavonoids, alkaloids, tannins, etc. The morphological, physicochemical and histological study to establish the authenticity of *A. javanica* root and can help to identify the plant from its other species.

Keywords: *Aerva javanica,* macroscopic characters, microscopic characters, physicochemical studies, phytochemical studies.

INTRODUCTION

Ancient literature has prescribed various herbs for the cure of kidney disease. The term "Pasanabheda" has been cited in the literature to identify the group of plants which have been extensively used in the indigenous system of medicine to dissolve urinary calculi and stones like *Coleus aromaticus, Aerva lanata, Aerva javanica, Rotula aquatica, Kalanchoe pinnata, Ocimum basilicum.* The plant *Aerva javanica* belonging to the family *Amaranthaceae* is a tall and woolly under shrub found plentiful in rainy season. This plant is used as Pasanabheda means one which breaks the kidney stone[1]. In Gujarati it is commonly known as Patharphod. Roots and flowers are reported to possess medicinal properties against rheumatism and kidney troubles[2]. The selected plant is also reported as anthelmintic, diuretic, demulcent[3]. It is used for the treatment of headache[4]. The decoction of the plant is administered to remove swellings[5-6]. Applied to acne like conditions of the face [7]. It contains kaempferol, sterol, triterpenes, flavanoids, ß-sitosterol, α-amyrin, palmitic acid, stearic acid, linoleic acid, myristic, oleic acid, palmitoleic acid, aervanone, alkaloids, and an acylated iso-rhamnetin glycoside as phytoconstituents[8-9]. The *Aerva javanica* root is not evaluated pharmacognostically. Therefore, the present study was undertaken to evaluate the pharmacognosy of root of *A. javanica*.

MATERIALS AND METHODS

Plant material

Fresh roots of *A. javanica* were collected from Bhavnagar District, Gujarat, India. The authentification of the plant was established and voucher specimen (202) deposited in the Department of Pharmacognosy and Phytochemistry, KBIPER, Gandhinagar, Gujarat, India. Identification of this plant was done by taxonomist Dr. A.S. Reddy, department of bioscience, S.P. University, V.V. Nagar, Gujarat, India. It was shade dried and reduced into coarse powder and stored in air tight container which was used for the present work.

Chemicals and instruments

Compound microscope, glass slides, cover slips, watch glass and other common glass ware were the basic apparatus and instruments used for the study. Solvents viz. petroleum ether, benzene, chloroform, acetone, 95% ethanol, n-butanol and reagents viz. phloroglucinol, glycerin, hydrochloric acid (HCl), chloral hydrate and sodium hydroxide were procured from Ranbaxy Fine Chemicals Ltd., Mumbai, India.

Macroscopic and Microscopic analysis

Fresh roots of *A. javanica* was studied and identified by their morphological characters as per literature. For microscopical studies free hand section of the fresh root were taken, cleared with chloral hydrate solution and studied according to Schulz maceration method. The lignified elements were visualized by staining the section with a drop of hydrochloric acid and phloroglucinol[10]. Photomicrographs were shot for histological observation (Labomed). The powder of dried root bark analysis was done according to the method of Brain and Turner[11] and Kokate[12].

Physicochemical parameters

A powder of the dried roots of *A. javanica* were used for physicochemical studies, such as determination of the ash values, extractive values, loss on drying and foreign organic matter were performed according to the official methods prescribed[13] and the WHO guidelines on the quality control methods for medicinal plant materials[14].

Phytochemical analysis

An extract of the dried roots of *A. javanica* was subjected chemical tests to check the presence of various phytoconstituents like, alkaloids, flavonoids, phenolics, saponins, carbohydrates, steroids, triterpenoids, carotenoids, amino acids, tannins, phenolics, coumarins and anthraquinones by using standard procedures described by Kokate[15] and Harborne[16].

Quantitative Estimation

Quantitative Estimation of tannins, flavonoids and phenolics were performed in the extract of roots of *A. javanica*.

RESULTS AND DISCUSSION

Any medicinal plant requires detailed study prior to its use because; the therapeutic efficacy is absolutely dependent on the quality of the plant material used. The original and basic approach towards Pharmacognosy includes morphological study, study of the cell structures and organization and study of tissue system, which still holds a key in the identification of the correct species of the plant and also to help us to differentiate between closely related species of the same genus. It is also first step to standardize a drug, which is the need of the day. A detailed pharmacognostical investigation of the root of *A. javanica*, was carried out to establish its correct identity through its pharmacognostical study.

Macroscopic characters of root of *A. javanica*

The plant is a perennial hairy, tomentose, erect to scandent dioecious under shrub up to 1 m height. The roots of *Aerva javanica* are thinner, long, splits into two branches, yellowish brown in color as shown in figure 1a and b.

Figure 1a: Morphology of *Aerva javanica*

Figure 1b: Morphology of root of *Aerva javanica*

Microscopic characters of root of *A. javanica*

The Transverse section of root of *Aerva javanica* presented circular outline with typical cork and other secondary features. Following tissues seen from the periphery to the center are cork, phellogen and phelloderm and stellar region. Cork is consists of bands of smaller and larger cells. Smaller cells are unlignified up to 3-4 rows in radial depth occasionally filled with brown matter. Larger cells are unlignified cells up to 5-6 rows in radial depth enclosing some cells with crystals. The cork formation causes rupturing of the epiblema. Phellogen is indistinct. Phelloderm consists with 6 to 7 layers of tangentially elongated cells and contains prisms of calcium oxalate. In the stellar secondary region, anomalous thickening occurs during the secondary growth forming concentric rings of meristematic tissue giving rise to concentric bands of xylem and phloem alternately, or at some time interxylary phloem as shown in figure 2. The root powder is slightly yellowish brown in colour with a characteristic odour. In the powder study of root of *A. javanica* showed cork, fibers, prism of calcium oxalate crystals, vessels with bordered pits cells as shown in figure 3.

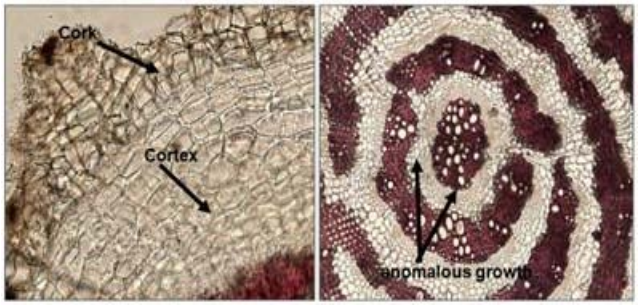

Figure 2: Microscopic transverse section of root of *Aerva javanica*

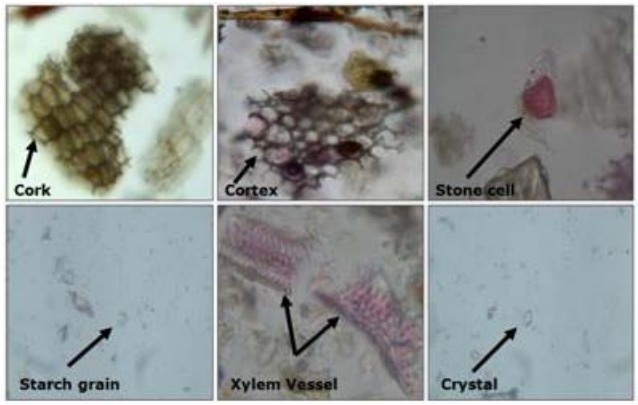

Figure 3: Microscopy of powder study of root of *Aerva javanica*

Physicochemical studies: Extractive values are primarily useful for the determination of exhausted or adulterated drugs. The water soluble, alcohol soluble and ether soluble extractive values have been tabulated in as shown in table 1. The results of fluorescence analysis of the drug powder were presented in as shown in table 2. Ash values of a drug give an idea of the earthy matter or the inorganic composition and other impurities present along with the drug. The quality control parameters of roots of *A. javanica* such as total ash, acid insoluble ash, sulphated ash and water soluble ash were carried out as shown in table 3.

Table 1: Extractive values of different extracts of roots of *A. javanica*

Solvent	Colour and Consistency	Average value of Extractive (w/w)
Petroleum Ether (60-80°)	Brown (sticky)	0.616 %
Benzene	Greenish light brown (sticky)	0.356 %
Chloroform	Light brown (sticky solid)	0.361 %
Acetone	Light brown (sticky solid)	0.444 %
Methanol	Reddish dark brown (sticky semi- solid)	7.316 %
Chloroform water	Dark brown (sticky solid)	9.368 %

Table 2: Fluorescence analysis of different extracts of roots of *A. javanica*

Extract	White light	UV light (254 nm)
Petroleum ether (60-80°)	Brown	Green fluorescence
Benzene	Greenish light brown	Green fluorescence
Chloroform	Dark green	Green fluorescence
Acetone	Light brown	Green fluorescence
Ethanol	Reddish dark brown	Green fluorescence
Water	Dark brown	Green fluorescence

Table 3: Determination of quality control parameters of roots of *A. javanica*

Quality control Parameters	Root of *A. javanica* %w/w
Ash Values	
Total ash	05.76 %
Acid insoluble ash	01.15 %
Water soluble ash	0.825 %
Nitrated ash	05.30 %
Carbonated ash	05.40 %
Extractive values	
Hot extraction	
Ethanol soluble extractive	20.00 %
Cold maceration	
Ethanol soluble extractive	16.00 %
Water-soluble extractive	18.75 %
Ether soluble extractive	00.30 %
Foreign matter	00.03%
Loss on drying	09.82 %
Foaming index	Nil
Tannin content	11.90 %

Preliminary phytochemical screening: Preliminary phytochemical screening revealed the presence of terpenes, phytosterols, phenolic compounds, carbohydrates, flavonoids and minute amount of alkaloids as shown in table 4.

Table 4: Preliminary phytochemical screening of different extracts of roots of *A. javanica*

Phytochemical Test	Petroleum ether (60-80°)	Benzene (C_6H)	Chloroform ($CHCl_3$)	Acetone	Ethanol (EtOH)	Aqueous (H_2O)
Alkaloids	-	-	+	+	+	+
Glycosides	-	-	-	-	+	+
Phytosterols	+	-	+	+	+	-
Fixed oils & fats	-	+	-	-	-	-
Saponins	-	-	-	-	-	-
Phenolic compounds	-	-	-	-	+	+
Tannin	-	-	-	-	+	+

Quantitative Estimation

Quantitative Estimation of flavonoids and phenolics were performed in the extract of roots of *A. javanica*. Total phenolic content of alcoholic and aqueous extract of root of *A. javanica* was found to be 0.52 mg/ml and 0.81 mg/ml respectively and total flavonoid content was 0.12 mg/ml and 0.10 mg/ml respectively.

CONCLUSION

The present study on pharmacognostical evaluation of *A. javanica* will provide useful information for its identification. Macro, micro and physiochemical standards discussed here can be considered as the identifying parameters to substantiate and authenticate the indigenous plant.

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