



PHARMACOGNOSTICAL STANDARDISATION OF ROOT TUBERS OF *ASPARAGUS RACEMOSUS* WILLD.

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ABSTRACT

Asparagus racemosus is herbaceous perennial plant. It is the most important rasayana herb in Ayurvedic medicine which grow in low forest areas throughout India. Their medicinal usage has been reported in the Indian and British Pharmacopoeias and in indigenous systems of medicine. *A. racemosus* plant contain steroidal saponins, isoflavones, asparagamine and polysaccharides, which play a major role in treatment of diarrhoea and dysentery. The plant also has potent antioxidant, antitussive, immunostimulant, antidyspepsia, galactagogue also as antiulcers and anticancer activity. The present article provides pharmacognostical and physico-chemical details of the root tubers of *A. racemosus*. This helps in laying down standardisation and pharmacopoeial parameter.

Keywords: *A. racemosus*, heavy metal, pharmacognosy, physico-chemical, phytochemical, root tubers.

INTRODUCTION

A. racemosus is commonly called Satavari, Satawar or Satmuli in Hindi; Satavari in Sanskrit; Shatamuli in Bengali; Shatavari or Shatmuli in Marathi; Satawari in Gujarati; Toala-gaddalu or Pilli-gaddalu in Telugu; Shimaishadavari or Inli-chedi in Tamil; Chatavali in Malayalam; Majjigegadde or Aheruballi in Kannada; Kairuwa in Kumaon; Narbodr or Satmooli in Madhya Pradesh; and Norkanto or Satawar in Rajasthan.¹ The genus *Asparagus* includes about 300 species around the world. Out of the 22 species of *Asparagus* recorded in India. *A. racemosus* Willd. (Liliaceae), is the one of the most regularly used as Rasayana in traditional system of medicine.² *A. racemosus* is a much-branched, spinous under shrub found growing wild in tropical and sub-tropical region of India.³ The most well-known other species is edible i.e. *A. officinalis*, commonly referred to as just *Asparagus*. Other members of the genus are grown as *ornamental plants*. The most popular ornamental species are *A. plumosus*, *A. densiflorus*, and *A. sprengeri*.⁴ In India, *A. racemosus* (Shatawar) translates to "she who possesses 100 husbands", referring to the herbs rejuvenating effect upon the reproductive organs of female.⁵ *A. racemosus* is considered to possess many therapeutic potentials like Medhya Rasayana (Memory enhancer), Vajikaran (Aphrodisiac), Medhya (Nervine tonic), Vayasthapanav (Anti-aging), Jwar (Antipyretic), Kustha (Leprosy), Atisar (Diarrhea), Ykshma (Tuberculosis), Mutrakrishya (Urinary infection), Apsmar (Epilepsy), Pradar (Leucorrhea), Grabhshrav (Miscarriage), Arsha (Piles) and Timir (Loss of vision) etc. *A. racemosus* is useful in several diseases postulated to be induced by stress.⁶

MATERIALS AND METHODS

Collection and identification of plant material

The roots & rhizome of *A. racemosus* were collected from Khari Baoli market, New Delhi, India and authenticated at National Institute of Science Communication and Information Resources (NISCAIR), Pusa Road, New Delhi, by Dr. H.B. Singh, Head, Raw material Herbarium and Museum Division (RHMD), NISCAIR, New Delhi. Voucher specimen (NISCAIR/RHMD/Consult/-2010-11/1586/186) was deposited in NISCAIR, Delhi for further reference.

Preparation of extracts

The roots & rhizome of *A. racemosus* were dried in shade and powdered in mixture grinder. The powdered roots & rhizome was dried in hot air-oven below 50°C then subjected to successive Soxhlet extraction by solvents in increasing order of polarity viz. petroleum ether (60-80°C), chloroform and methanol and water. Each extract was concentrated by distilling off the solvent and then evaporating to dryness on the water-bath.

Solvents

Petroleum ether (60°-80°C) (RANKEM), chloroform (CDH) and methanol (CDH), all of LR grade, were employed for extraction of the plant material.

Recovery of solvents

Solvents from extracts were recovered under reduced pressure using rotary vacuum evaporator (SHIVAKI LABTECH), and the dried extracts were preserved in a vacuum desiccator containing calcium chloride.

Chemical and Reagents used

Pet. ether, Chloroform, Methanol, Ethanol, Hexane, Ethylacetate, n-Propanol, Butanol, NaOH, Wagner reagent, Mayer reagent, Dragendorff's reagent, Hager reagent, Iodine Solution, Lead acetate, FeCl₃, Ninhydrine reagent, Conc. H₂SO₄, Glacial acetic acid, alpha naphthol, toluene. All the chemical and reagents used were of LR grade from CDH, LOBACHEM and RANKEM. Companies.

PHARMACOGNOSTIC INVESTIGATION

Macroscopic evaluation of *A. racemosus* roots & rhizome

Complete morphological studies were performed on the basis of their external features. The roots & rhizome of *A. racemosus* were observed and reported their size, shape, Color, taste, odour and their surface characteristics etc. The purpose of the study was to establish detailed information for the identification of *A. racemosus* species.

Microscopic evaluation of *A. racemosus* roots & rhizome

The microscopy of intact as well as powdered roots & rhizome of *A. racemosus* was performed using projection microscope fitted with CCD Camera (Microne optic microscope, IS: 4381, ISI, Model, TMC-III).

PHYSICO-CHEMICAL EVALUATION

Moisture content

The moisture content of roots & rhizome of *A. racemosus* were determined by azeotropic distillation method following the procedure given in Indian Pharmacopoeia (1996). The experiment was done intriplicate. Toluene was used in the determination of moisture content.⁷

Ash value

Total ash, and water soluble ash of roots & rhizome of *A. racemosus* were determined according to the procedure given in the Indian Pharmacopoeia (1996). Ash was prepared in crucibles using a muffle furnace.⁷

Extractive value

Ethanol and water soluble extractive values of dried powdered roots & rhizome of *A. racemosus* were determined according to the procedures given in the Indian Pharmacopoeia (1996).⁷

Foaming index

Many medicinal plant materials contain saponins showed foaming properties which were determined according to the procedures given in the W.H.O. guideline.⁸

Crude fibre content

Crude fibre is the residue of resistant tissue of powder drug which useful in distinguishing between similar drugs were determined according to the procedures given in the practical Pharmacognosy.^{9, 10}

Phytochemical screening

All the extracts of roots & rhizome of *A. racemosus* were screened for different classes of phytoconstituents using standard procedures given in the practical Pharmacognosy.⁹

Fluorescence analysis

Fluorescence analysis of powder drug and Powder drug (Extract) reaction of *A. racemosus* with different reagent were determined according to standard procedures.¹¹

Heavy metal analysis

Preparation of samples by acid digestion method

Accurately weighed about 2 g of sample were taken in Kjeldahl flask then added the mixture of $\text{HNO}_3:\text{HClO}_4$ (4:1) in the flask and heated continuously till the solution become colorless. The sample was then transferred in a 25 ml volumetric flask and the volume was made-up with distilled water. Reagent blank was synchronously prepared according to the above procedure. The standards of Lead (Pb), cadmium (Cd), arsenic (As) and mercury (Hg) were prepared as per the protocol in the manual and the calibration curve was developed for each of them. Then samples were analyzed for the presence of Pb, Cd, As and Hg using Atomic Absorbance Spectrophotometer (AAS) (EC Electronics Corporation of India Limited AAS Element AS AAS4141).¹²

RESULTS AND DISCUSSION

Macroscopic evaluation of roots & rhizome *A. racemosus*

In macroscopic study, roots occur in cluster at the base of the stem. Root are tuberous, 10 to 30 cm in length and 0.1 to 0.5 cm thick, tapering end at both side with longitudinal wrinkles; colour cream; taste sweetish, odour; characteristics.

Microscopic evaluation of roots & rhizome *A. racemosus*

Different snaps were taken which shows an outer layer of piliferous cell, composed of small, thin-walled, rectangular asymmetrical cell, a number of cell elongated to form unicellular root hair: cortex consist of 25 to 29 layers, stone cells present in either singly or in groups, raphides of calcium oxalate present in the region: 2 or 3 layers of the stone cells encircle the endodermis: endodermis composed of thin-walled cells of parenchyma: pericycle present below endodermis: stele exarch and radial in position: xylem composed of vessels, tracheid and parenchyma: xylem vessels have pitted thickening: phloem consists of usual element: pith composed of circular to oval cells, of parenchyma, a few cells slightly lignified.

Physicochemical evaluation of roots & rhizome *A. racemosus*

The percentage value of various physical parameter including, Moisture content, Ethanol soluble extractive, Water soluble extractive, Foaming index, Total ash, Water soluble ash, Crude fibre content were given in table-1, phytochemical study, fluorescence analysis, powder drug (Extract) reaction of *A. racemosus* with different reagent were given in table 2, 3 and 4 respectively and heavy metal analysis of Pb, Cd, As and Hg present in roots & rhizome of *A. racemosus* were given in table-5.

Table 1. Physical evaluation parameter roots & rhizome of *A. racemosus*

S.NO.	Parameter	Value
1	Moisture content	6.1. w/w
2	Ethenol soluble extractive	17.4. /w/w
3	Water soluble extractive	46.2. /w/w
4	Total ash	7.43. /w/w
5	Water soluble ash	4. /w/w
6	Crude fibre content	6.5. /w/w
7	Foaming index	<100

Table 2. Preliminary phytochemical study of various extracts of *A. racemosus*

Phyto-constituent	Pet.Ether Extract	Chloroform Extract	Methanolic Extract	Water Extract
Carbohydrate	-	+	+	+
Protien	-	-	-	-
Amino acid	-	-	-	-
Steroid	-	+	+	-
Saponin glycoside	+	+	+	+
Antraquinone glycoside	-	-	-	-
Flavonoid	-	-	+	-
Phenol & Tanin	-	-	-	-
Alkaloid	-	+	+	-
Mucilage	-	-	-	+

+ve = present, -ve = absent

Table 3. Fluorescence analysis of dried roots & rhizome powder of *A. racemosus*

Chemical reagent	U.V. Light at 254 nm	U.V. Light at 366 nm
NAOH in Methanol	Green	Yellow brown
NAOH in Water	Dark blue	Light blue
Benzene	Brownish purple	Brown
Acetone	Dark brown	Brown
Ethyl acetate	Black	Bluish brown
Chloroform	Black	Bluish black
Dil. HNO ₃	Black	Black
Con. HNO ₃	Brown	Purple brown
Distilled Water	Brown	Brown black
50% HCL	Light brown	Dark brown
Dil. HNO ₃	Brown	Black
Dil. H ₂ SO ₄	Black	Dark brown

Table 4. Powder drug (Extract) reaction of *A. racemosus* with different reagent

Reagent	Pet. Ether extract	Chloroform extract	Methanolic extract	Water extract
Con. HCL	Orange brown	Light brown	Light yellow	Brown
Con. HNO ₃	Yellowish brown	Light yellow	Light yellow	Brown
Con. H ₂ SO ₄	Dark brown	Orange brown	Dark brown	Dark brown
Glacial acetic acid	Yellow brown	Light yellow	Light yellow	Brown
Iodine sol.	Red	Red	Red	Red brown
NAOH in methanol	Yellow brown	Light brown	Light cream	Brown
NAOH in Water	Brown	Cream	Light cream	Light brown

Table 5. Heavy metal analysis of crude drug of roots & rhizome of *A. racemosus*

S.No.	Heavy metals	Concentration (ppm*)
1	Mercury	2.15
2	Lead	28.15
3	Arsenic	1.17
4	Cadmium	0.523

*ppm implies parts per million

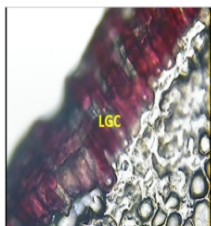


Figure 1: Lignified cell (LGC)



Figure 2: Parenchyma cell



Figure 3: Fibre



Figure 4: Raphides of calcium oxalate

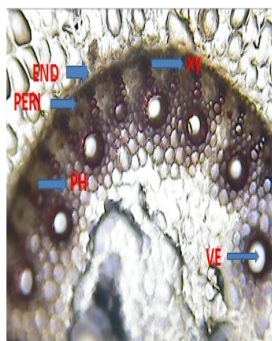


Figure 5

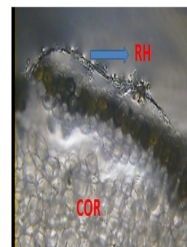


Figure 6

Abbreviations:

END:-endodermis, PERI:-pericycle, XY:-Xylem, PH:-phloem, VE:-vessels, RH:-root hair, COR:-cortex


CONCLUSION

The present study on pharmacognostic standardisation, phytochemical and heavy metal analysis of roots & rhizome of *A. racemosus* provide important information which may help in authentication and detection of adulteration for quality control of raw material. This could also serve in the identification and preparation of a monograph of the plant

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