Physico-chemical and Phytochemical Investigation of Asparagus racemosus Wild

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Abstract

Asparagus racemosus Wild., often called Satawar, Satamuli, or Satavari, is a Liliaceae plant that grows at low elevations all over India. The plant's dried roots are used as a medicine. The drug's ulcer-healing effects are thought to be caused by strengthening the mucosal resistance or cytoprotection. The roots are claimed to be tonic, diuretic, and galactgogue. It has also been recognised as one of the treatments for AIDS symptoms. Some Ayurvedic doctors have used A. racemosus successfully to treat neurological disorders, inflammation, and a few infectious diseases. The present work was taken to evaluate the physico-chemical and phytochemical profile of aerial part of the selected plant.

Key Words: Asparagus racemosus Wild., Extraction, Phyto-chemical Screening

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Introduction

A common medicinal plant in India's tropical and subtropical regions is Asparagus racemosus (Willd.). This plant's therapeutic uses have been documented in the Indian and British Pharmacopoeias as well as in conventional medical systems like Ayurveda, Unani, and Siddha. Different components of this plant were used to produce crude, semi-pure, and purified extracts, all of which were beneficial for therapeutic uses. This plant contains a large number of bioactive phytochemicals, principally saponins and flavonoids, which have been extracted and identified. Individually or in combination, these compounds are responsible for a variety of pharmacological effects. Numerous studies have been conducted on different parts of A. racemosus, this plant has developed as a drug by pharmaceutical industries. A detailed and systematic study is required for identification, cataloguing and documentation of plants, which may provide a meaningful way for promoting traditional knowledge of the medicinal herbal plant. [1-3]The aim for the present work is to evaluate the physico-chemical and phytochemical profile of aerial part of the selected plant.

Material and Methods

Selection, Collection and authentication of herb

The aerial parts of Asparagus racemosus Wild. was collected from local area of Kolkata, (WB) and was identified & authenticated by Botanist.

Physicochemical Evaluation of herb

The dried parts were subjected to standard procedure for the determination of various physicochemical parameters. [4-5]

Determination of foreign organic matter (FOM)

Accurately weighed 100 g of the drug sample and spread it out in a thin layer. The foreign matter should be detected by inspection with the unaided eye or by the use of a lens (6X). Separate and weigh it and the percentage present was calculate.

Determination of moisture content (LOD)

Place about 10 g of drug (without preliminary drying) after accurately weighing in a tared evaporating dish and kept in oven at 105^0 C for 5 hours and weigh. The percentage loss on drying with reference to the air dried drug was calculated.

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Determination of ash value

The determination of ash values is meant for detecting low-grade products, exhausted drugs and sandy or earthy matter. It can also be utilized as a mean of detecting the chemical constituents by making use of water-soluble ash and acid insoluble ash.

Total ash

Accurately about 3 gms of air dried powder was weighed in a tared silica crucible and incinerated at a temperature not exceeding 450^{0}C until free from carbon, cooled and weighed and then the percentage of total ash with reference to the air dried powdered drug was calculated. The percentage of total ash with reference to the air-dried drug was calculated.

Acid insoluble ash

The ash obtained in the above method was boiled for 5 minutes with 25ml of dilute HCl. The residue was collected on ash less filter paper and washed with hot water, ignited and weighed. The percentage of acid insoluble ash was calculated with reference to the air dried drug.

Water soluble ash

The ash obtained in total ash was boiled for 5 minutes with 25 ml of water. The insoluble matter was collected on an ash less filter paper, washed with hot water and ignited to constant weight at a low temperature. The weight of insoluble matter was subtracted from the weight of the ash. The difference in weights represents the water soluble ash. The percentage of water soluble ash with reference to the air dried drug was calculated.

Determination of swelling index

Swelling index is determined for the presence of mucilage in the seeds. Accurately weigh 1 g of the seed and placed in 150 ml measuring cylinder, add 50 ml of distilled water and kept aside for 24 hours with occasional shaking. The volume occupied by the seeds after 24 hours of wetting was measured.

Determination of extractive value

This method determines the amount of active constituents extracted with solvents from a given amount of medicinal plant material. It is employed for materials for which as yet no suitable chemical or biological assay exists.

Cold maceration

Place about 4.0g of coarsely powdered air-dried material, accurately weighed, in a glass-stoppered conical flask. Macerate with 100ml of the solvent specified for the plant material concerned for 6 hours, shaking frequently, then allow to stand for 18 hours. Filter rapidly taking care not to lose any solvent, transfer 25 ml of the filtrate to a tared flat-bottomed dish and evaporate to dryness on a water bath. Dry at 105°C for 6 hours, cool in a desiccator for 30 minutes and weigh without delay. Calculate the content of extractable matter in mg per g of air dried material. For ethanol-soluble extractable matter, use the concentration of solvent specified in the test procedure for the plant material concerned; for water-soluble extractable matter, use water as the solvent.

Extraction of selected herb

Sample were shattered and screened with 40 mesh. The shade dried coarsely powdered plant material (250gms) were loaded in Soxhlet apparatus and was extracted with petroleum ether, chloroform, ethanol and water until the extraction was completed. After completion of extraction, the solvent was removed by distillation. The extracts were dried using rotator evaporator. The residue was then stored in dessicator and percentage yield were determined. [6-7]

Preliminary phytochemical screening of extract

The various extract obtained after extraction were subjected for phytochemical screening to determine the presence of various phytochemical present in the extracts. The standard procedures were adopted to perform the study. [6-8]

Test for carbohydrates

Little amount of extracts and add small amount of distilled water were taken to dissolve it and then filtered. The filtrate was introduced for different tests to detection the presence of Carbohydrates.

Reagents	Procedure	Observation
Molisch's Test	Add 2-3 drops of 1% alcoholic α - napthol solution to extract after that add 2 mL of Con sulpuric acid.	Purple to violet ring at the junction of two liquids

Fehling Test	To a little quantity of filtrate, add 1mL of Fehling's reagent	Brick Red precipitates

Test for glycosides

Little amount of extracts and add small amount of distilled water were taken to dissolve it and then filtered. The filtrate was introduced for different tests to detection the presence of Glycosides.

Reagents	Procedure	Observation
Legal's Test	To the sample add 1 mL of pyridine and few drops of sodium nitropruside solutions and then it was made alkaline with sodium hydroxide solution.	Pink to red color
Borntrager's Test	Sample was treated with chloroform and then the chloroform layer was separated. To this equal quantity of dilute ammonia solution was added.	Ammonia layer acquires pink color
Baljet's Test	To the sample add 1 mL of picric acid	Orange color

Test for alkaloids

To a little portion of the extracts few drops of dil. HCl was added and stirred separately and then filtered. This filtrate was used for the existence of alkaloids.

Reagents	Procedure	Observation
Dragendroff's Reagent	Alkaloid existence was identified by adding little quantity filtrate with 1mL of Dragendorff's reagent	Reddish brown precipitates
Wagner;s Reagent	To a little quantity of filtrate, add 1mL of Wagner's reagent	Reddish brown precipitates
Mayer's Reagent	1mL of Mayer's reagent was added to little quantity of filtrate	Cream color precipitates
Hager's Reagent	To a little quantity of filtrate, add 1mL of Hager's reagent	Yellow color precipitates

Test for proteins and free amino acids

Small quantities of the sample was dissolved in few ml of water and treated with following reagents.

Reagents	Procedure	Observation
Million's reagent	to a small amount of extracts, small amount of distilled water and Millon's reagent wait to dissolve	red color
Ninhydrin reagent	to a small portion of extracts, small amount of distilled water added and then add Ninhydrin reagent mix well	Violet color
Biuret's test	to a small portion of extracts, small amount of distilled water added and then add equivalent amount of 5% sodium hydroxide solution & 1% copper sulphate solution	pink or purple color

Test for tannins and phenolic compounds

A small quantity of the sample was taken separately in water and test for the presence of phenol compounds and tannins was carried out with the following reagents.

Reagents	Procedure	Observation
Ferric chloride sol. (5%)	To a little amount of extracts, distilled water was added wait to dissolve and then dilute Ferric chloride solution (5%) was introduced.	Violet, blue or green color
1% Gelatin sol. in 10% NaCl	To a little amount of extracts, distilled water was added wait to dissolve and then 1% solution of gelatin having 10% sodium chloride was introduced.	white precipitate
Lead acetate sol. (10%)	To a little amount of extracts, distilled water was added wait to dissolve and then 10% lead acetate solution added	white precipitate

Test for flavonoids

Reagents	Procedure	Observation
Alkaline Reagent Test	To the test solution add few drops of magnesium hydroxide solution	intense yellow colour is formed which turns to colourless on addition of few drops of dilute acid
Shinoda's Test	Small quantities of the sample was dissolved in alcohol, to them piece of magnesium followed by conc. hydrochloric acid drop wise added and heated.	Appearance of pink, crimson red, green to blue color

Tests for fixed oils and fats

Reagents	Procedure	Observation
Spot Test	A small quantity of sample was separately pressed between two filter papers.	Appearance of oil stain on the paper
Saponification Test	Few drops of 0.5 N alcoholic potassium hydroxide were added to a small quantity of sample along with a drop of phenolpthlein, the mixture was heated on a water bath for 1-2 hours	formation of soap or partial neutralization of alkali

Tests for phytosterols and triterpenoids

Reagents	Procedure	Observation
Libermann-burchard Test	Treat the sample with few drops of acetic anhydride, boil and cool. Then add con. sulphuric acid from the side of test tube	Brown ring is formed at the junction two layers Upper layer turns green- steroids Upper layer turns deep red - triterpenoid
Salkowski Test	Treat the sample with few drop of conc. sulphuric acid	Red color at lower layer -steroids Yellow color at lower layer -triterpenoids.

Test for saponins

Foam Test

To a little amount of extracts, alcohol was added in a test tube and shakes it vigorously and an occurrence of foam shows existence of Saponins.

Test for mucilage and gums

Small quantities of sample was added separately to 25 mL of absolute alcohol with constant stirring and filtered. The precipitates was dried in oil and examined for its swelling property for the presence of gum and mucilage.

To the sample add ruthenium red solution, pink color shows presence of mucilage.

Test for waxes

To the test solution add alcoholic alkali solution, waxes get saponified.

Results and Discussion

The aerial parts of Asparagus racemosus Wild. was dried and the powdered plant material was used further to reveal various parameters. The dried plant part was subjected to standard procedure for the determination of various physicochemical parameters. The results were presented in table 1. The shade dried coarsely powdered plant materials were extracted with ethanol. The extracts obtained were evaluated for pH, color and % yield. The results are presented in table 2. The phytochemical screeing of all ethanolic extract were performed and the results were shown in table 3.

Table 1: Physicochemical Evaluation of aerial parts Asparagus racemosus Wild.

S/No.	Parameters	ARAP
1.	FOM	0.90
2.	LOD	1.12
3.	TA	7.4326
4.	AIS	1.1214
5.	WSA	4.2874
6.	SI	1.01
7.	WSEV	8.4176
8	ESEV	5.2752

Note: All values are expressed as Mean, n=3; ARAP= Asparagus racemosus Wild. aerial parts

Table 2: Estimation of % yield of aerial parts Asparagus racemosus Wild.

S/No.	Extract	Parameters			
		Nature of Extract	Color	pH	% Yield (w/w)
1.	PEEARAP	Sticky solid	Light green	6.9	2.14
2.	CEARAP	Sticky solid	Green	7.0	4.89
3.	EEAEAP	Semi solid	Dark Green	7.04	10.42
4.	AEARAP	Solid Powder	Dark Green	7.01	14.18

Table 3: Preliminary phytochemical screening ethanolic extract of aerial parts Asparagus racemosus Wild.

S/No.	Extract	Phytochemicals									
		Carbohydrates	Glycosides	Alkaloids	Protein & Amino acid	Tannins & Phenolic compounds	Flavonoids	Fixed oil and Fats	Steriods & Triterpenoids	Waxes	Mucilage & Gums
1.	PEEARAP	-	-	-	+	-	+	-	+	-	-
2.	CEARAP	-	-	-	+	-	+	-	+	-	-
3.	EEAEAP	+	-	-	+	+	+	-	+	-	-
4.	AEARAP	+	-	-	+	+	+	-	+	-	-

Abbr.: + = Present; - = Absent

Conclusion

The aerial parts of Asparagus racemosus Wild. were estimated for the presence of LOD. FOM, SI, TA etc and were found in limit. The maximum

percentage was found to be 14.18 % w/w. Preliminary phytochemical process revealed the presence of carbohydrates, protein, phenolic compounds, flavonoids, Steriods & Triterpenoids.

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