

UV-VIS SPECTROSCOPIC STUDY ON PHYTOCONSTITUENTS OF *ASPARAGUS RACEMOSUS* WILLD ROOT TUBER

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ABSTRACT

"*Asparagus racemosus* Willd. is a well known medicinal plant which has been consumed for long back to cure various ailments". It is rich in medicinally important phytoconstituents as a potential source of compounds possessing beneficial biological activities. These phytoconstituents reflect their fingerprints under spectroscopic characterizations such as UV-Vis, Photoluminescence, FT-IR and Raman studies. Thus, the present study is focused to understand the UV-Vis characteristics of *Asparagus racemosus* Willd. juice and powder as well as to identify the contained phytoconstituents. The work was undertaken to appraise the UV-Vis spectroscopic analysis of *Asparagus racemosus* Willd. root tuber in two different forms; juice and powder. The UV-Vis spectra of the root tuber extracts prepared in forms of juice and powder were recorded in the range 200-900 nm.

The study confirmed the presence of tannins and flavonoids (phenolic compounds). Tannins and/or flavonoids contained plants have already been used to improve human health and life by curing numerous diseases.

KEYWORDS: *Asparagus racemosus*; Tannins; Flavonoids; UV-Vis Spectroscopy.

INTRODUCTION

Herbal medicines are promising choice over modern medicines. Herbal medicines showing less or no side effects are considered to be safe. Generally, herbal formulations involve use of fresh or dried plant parts. Traditionally, medicinal plants have been used as richest bioresources of drugs; therefore man has been using plant extracts to protect himself against several ailments and also to improve his health and life-style. The different phytoconstituents present in medicinal plants such as flavonoid, alkaloid, phenol and tannins, carboxylic acids, terpenes, amino acids and inorganic acids are some prominent useful compounds present as secondary metabolites. Secondary metabolites are used in anti-feeding activity, toxicity or acting as precursors to physical defense systems. The phytoconstituents of a plant are present in a specific level with specific distinctiveness and properties.^[1,2] Natural products, either as pure compounds or as standardized plant extracts, offer unlimited opportunities for new drug.^[1,3] Therefore, the analysis of these chemical constituents would help in determining various biological activities of plants. Scientific investigations of such crude drugs are very important aspect in preparation, safety and efficacy of herbal product. *Asparagus racemosus* Willd. commonly known as ‘Shatavari’ is shown in Fig 1. It is a well known Ayurvedic drug. Its scientific classification is also shown in table 1.



Fig. 1: *Asparagus racemosus* Willd plant.

Table 1: Scientific classifications of *Asparagus racemosus* Willd.

Table 1: Systematic Position (Classification)	
Kingdom	Plantae
Division	Angiosperms
Class	Monocotyledons
Order	Asparagales
Family	Asparagaceae (Liliaceae)
Genus	<i>Asparagus</i>
Species	<i>racemosus</i>

The plants of *Asparagus* are woody climber growing to 1-2 meter in length.^[6-8] The plant grows in tropical and subtropical dry and deciduous forests. The plant is a spinous under-shrub with tuberous, fusiform succulent roots (30-100 cm long and 1-2 cm thick) appearing in silvery white or ash colored externally and white internally. These roots are the vital part of *Asparagus* which find use in various medicinal preparations.^[9-12] *Asparagus* has been reported in the 'Kashyap Samhita' (classic Ayurvedic text), that promotes maternal health and noted its meticulous use as a galactagogue (enhances breast milk secretion in lactating mothers).^[13] 'Charak Samhita' by Charak and 'Ashrang Hridayam' by Vagbhata, the two main texts on Ayurvedic medicines, list *Asparagus racemosus* Willd as part of the formulas to treat disorders affecting women's health.^[14-18] 'Shatavari' is also known as the "Queen of herbs" because this amazing herb used as a female reproductive tonic and other health related problems like nervous disorders, dyspepsia, diarrhea, bronchitis, hyperacidity, inflammation, liver diseases, female infertility, menopause related problems. It also works as post partum tonic by increasing milk production and normalizing the uterus and the changing hormones. 'Shatavari' is also used in the treatment of ailments like leucorrhoea and menorrhagia etc. *Asparagus* also reported as 'Medhya' the plants which increase intelligence and promote learning power as well as memory.^[18-19] The tuberous roots of 'Shatavari' are most important part of plant and it is used by different traditional system of medicine for the treatment of various human ailments.^[20, 21]

A variety of techniques can be used to determine and estimate the presences of phytoconstituents in medicinal plants. Spectroscopic methods have been firmly established as a key technological platform to identify and to characterize the biomolecules presents in medicinal plants. The phytoconstituents always resemble their fingerprints (unique signature) under spectroscopic characterizations *viz.* UV-Vis, Photoluminescence, FT-IR and Raman studies. Thus, the present study is focused to understand the UV-Vis characteristics of *Asparagus racemosus* Willd. as well as to identify the contained phytoconstituents. Among the spectroscopic techniques, ultraviolet-visible spectroscopy (UV-Vis) has become the most important analytical instrument in the modern day laboratory. It refers to absorption or reflectance spectroscopy. UV-Vis spectrophotometry is related to the spectroscopy of photons in the UV-visible region. UV-visible spectroscopy uses electromagnetic radiation in the visible ranges or its adjacent ranges. The color of the chemical(s) directly affects the absorption in the visible ranges. Molecules undergo electronic transitions in these ranges of the electromagnetic spectrum.^[2, 4, 5] UV-Vis spectroscopic studies help in identification and

authentication of the phytoconstituents of medicinal plants. This information may be act as reference for correct knowledge and also help as a tool to detect adulteration of that particular medicinal plant. In the present investigations, the *Asparagus* in juice as well as powder forms was subjected to phytochemical screening by using UV-Vis spectroscopic technique to identify phytoconstituents.

MATERIALS AND METHODS

Collection and preparation of plant material

Fresh root tubers of *Asparagus racemosus* Willd. were collected from the Ayurvedic garden (Bhaishajyodyan) of Department of Dravyaguna, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University (IMS-BHU), Varanasi-221005 (U.P.), India. Voucher specimen is deposited in the herbarium of the Department of Dravyaguna, (IMS, BHU), Varanasi. Herbarium code number is DG/KND/1/2015. Root tubers were washed thoroughly in running tap water to remove soil particles and adhered debris followed by sterile distilled water. Two different routes to prepare samples of root tuber in two different forms juice (liquid) and powder (solid) were employed.

For the juice sample, fresh root tubers were peeled off while still fresh and cut in to small pieces. These pieces of root tuber were crushed with the help of mortar pestle to form paste like sample. The paste thus obtained was pushed and filtered to collect the juice. The obtained juice was stored in air tight plastic tubes at room temperature for characterizations. In case of powder sample, fresh root tubers were peeled off by sharp knife and then left in shade until its complete internal drying. After drying, these were crushed mechanically and gently by mortar pestle till the fine powder was obtained. The powder of root tubers was filtered by mesh (size no. 80) to find more fine powder of roots. The obtained powder sample was stored in air tight plastic tubes at room temperature for characterization. For the dilution purpose of juice as well as powder sample the distilled water was used as a solvent.

Sample characterization

To record the UV-Vis spectra of the juice and powder samples of 'Shatavari' the sample were scanned in the wavelength range 200–900 nm by using UV-Vis spectrometer (Perkin Elmer Lambda 25). UV-Vis spectrometer used for characterization is double beam spectrometer in which deuterium lamp is used for UV radiation and tungsten-halogen lamp is employed for visible (Vis.) radiation.

RESULTS

Figs. 2 and 3 exhibit the UV-Vis spectra of samples of *Asparagus racemosus* Willd. root tuber prepared in two different forms juice (liquid) and powder obtained via two different routes respectively as described already in sample preparation section of the manuscript. Absorption peaks with their absorbance are shown in Table 2. The UV-Vis profile of juice sample showed the peaks at 262 nm with the absorption 1.11 A. However, the profile of powder sample showed the peaks at 274 nm with the absorption 1.16 A as shown in Table 2. The results obtained in UV-Vis spectra revealed the existence of several medicinally important phytoconstituents.

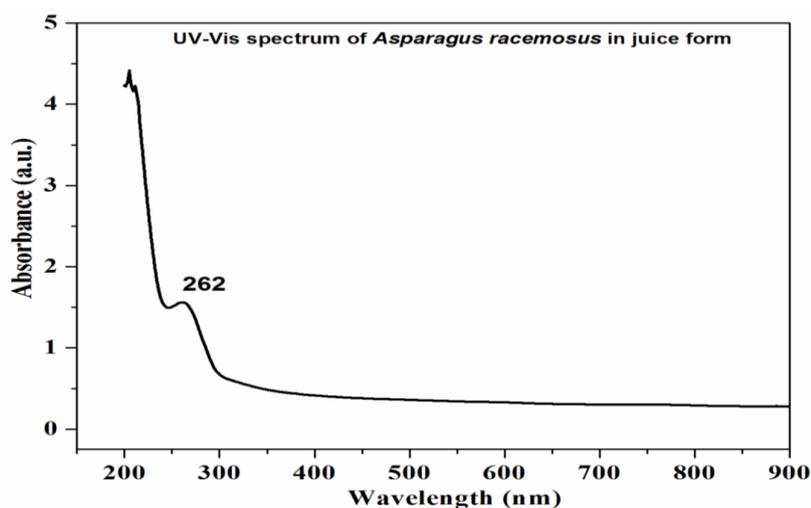


Fig.2: UV-Vis spectrum of *Asparagus racemosus* Willd. root tuber prepared in juice (liquid) form.

Table 2: UV-Vis peak values of *Asparagus racemosus* Willd. root tuber in liquid (juice) and powder Sample.

Juice Sample		Powder Sample	
Wavelength(nm)	Absorption(A)	Wavelength(nm)	Absorption(A)
262	1.12	274	1.16

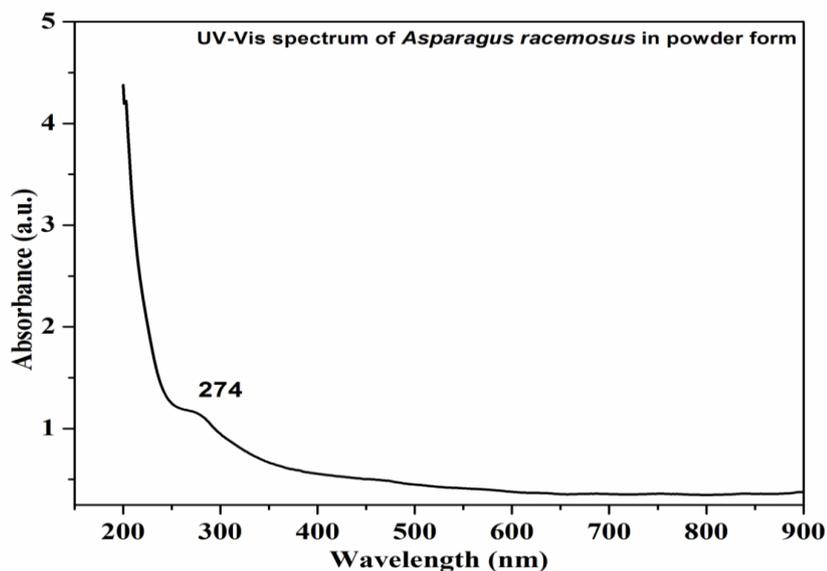


Fig. 3: UV-Vis spectrum of *Asparagus racemosus* Willd. root tuber prepared in powder form.

DISCUSSION

The UV-Vis profiles (Figs.2 and 3) of the root tubers extracts prepared in form of juice and powder are recorded successfully in the wavelength range of 200-900 nm and studied carefully. UV-Vis spectrum of juice sample shows a major band at 262 with absorbance ~1.12 A. However, powder sample shows absorption band at 274 nm with absorbance value 1.16 A. UV-Vis spectroscopy of the *Asparagus racemosus* Willd. samples confirms the presence of tannins and/or flavonoids in both the juice as well as in powder form of the samples. Tannins (phenolic compounds) and flavonoids (poly-phenolic compounds) typically exhibit their presence in the range of 230-290 nm.^[22-25] under UV-Vis scanning. In present investigation, the absorption bands at 262 nm in juice sample and at 274 nm in powder sample appear due to the presence of flavonoids (flavonols).^[25, 26] Phytochemicals containing tannins have been used for the treatment of chronic diseases. Tannins: phenolic compounds have already been reported as potential free radical scavengers.^[25, 28] The tannins contained plants are found to have significant activity in prevention of cancer-like horrific nosogenic disease. Not only this, these plants are also used potentially in treatment of intestinal disorders^[23-28] Another kind of compound which has been traced in *Asparagus racemosus* Willd is the Flavonoids in form of flavonols. Flavonols are polyphenolic compounds having two benzene rings joined by a linear three carbon chain (C2, C3, C4), represented as the C6–C3–C6 system.^[29] Flavonoids may be present in forms of Isoflavones, Flavonones, Flavones 3 (Apigenin and Luteolin), Flavonols (Kaempferol and Quercetin), Chalcones and Aurones 3,

Anthocyanins as a phytoconstituent.^[29] Flavonoids are known to possess a wide range of biological activities such as antioxidant, anti-inflammatory, antimicrobial along with the anticancerous activities.^[23, 27-31] Flavonoids are also known for maintaining vascular permeability. Above discussion shows the significance of *Asparagus racemosus* Willd for human life and the presence of these phenolic compounds; tannins as well as flavonoids enhance the ponderosity of *Asparagus racemosus* Willd for human health and life. Presence of these compounds has also been detected already in FT-IR spectra of *Asparagus* in our previous work.^[8] In IR patterns, strong bands at 3402 and 3432 cm^{-1} in powder and juice respectively are appearing due to O-H stretching mode of (H-bonded) phenolic compounds (i.e. tannins, flavonoids, etc).^[8, 32] Thus, the presence of tannins and flavonoids in *Asparagus* clearly explores the potential uses of *Asparagus racemosus* Willd in pharmaceutical industries.

CONCLUSION

In order to identify the phytoconstituents of *Asparagus racemosus* Willd. root tuber in juice as well as in powder form the phytochemical screening has been carried out by using UV-Vis spectroscopic technique. A careful examination of UV-Vis spectral profiles of *Asparagus racemosus* Willd. root tuber samples (juice and powder) confirms the presence of tannins and flavonoids in both the forms. Tannins and flavonoids are very useful in treatment of chronic and intestinal disorders diseases. Since, tannins (phenolic compounds) are potential free radical scavengers thus, the *Asparagus racemosus* Willd. root tuber (tannins contained plant) in powder as well as in juice form may also be used to prevent several diseases including cancer-like horrific nosogenic disease.. This study may also be very useful in making a monograph for further research on *Asparagus racemosus* Willd.

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CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this research article.

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