

Studies on *Asparagus racemosus* Willd. in healthcare formulations and analysis of quantitative standard in ordeal to Jharkhand

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Research Article

Abstract

The plant *Asparagus racemosus* Willd. is potentially used in indigenous system of medicine. The roots are used as ethnomedicine in various diseases and disorder like lactation, potency, epilepsy, diarrhea, gonorrhoea, menstrual problems, headache etc. It has been also used in the ailments like dyspepsia, aphrodisiac, antispasmodic and diseases of liver and kidney. The formulation of ayurvedic products like *Shatawari ghrita*, *Shatmulyadi loh*, *Shatawari panak*, *Narayan tail*, *Vishnu tail*, *Musli pak* are also prescribed for above disorders. It is highly potential and used as both general and female reproductive tonic. It has been considered as potent antioxidants, immune modulator and antitussive. It is also used for the treatment of nervous disorders, inflammations, hyperacidity and duodenal ulcer. The phytoconstituents and chemical potential like steroidal glycosides shatavarin I- IV, a polycyclic alkaloids asparagamine A, disaccharide; 9, 10-dihydrophenanthrene derivative racemosol, different terpenoids, saponin, amino acids, Isoflavones etc. occurs in the root. An analysis on quantitative standard of roots of the plants naturally occurs as well as cultivated in Jharkhand state has been presented in context of availability of medicinal plants as an ordeal to search the good materials. The study has great relevance to know the standard of the plant may use as raw materials for formulations of herbal products based on the plant.

Key Words: *Asparagus racemosus*; Primary healthcare; Quantitative standard; Jharkhand

Introduction

Asparagus racemosus Willd. (Asparagaceae; Liliaceae sens. lat.) is an ascending, spinous and much branched climber commonly known as *Satawari*, *Satawar* or *Satmuli* in Hindi and *Satawari* in Sanskrit; while it is called as in Assamese : *Satmull*; Bengali : *Satamuli*, *Satmuli*, *Shatamuli*; English : *Asparagus*, Gujrati: *Satawari*; Hindi : *Satawar*, *Satamul*; Kannada : *Ashadi poeru*, *Halavu Bau*, *Narayani*, *Makkala*; Malayalam : *Satawari Kizhangu*; Marathi : *Shatawari*; Punjabi : *Satawar*; Tamil : *Shimai-Shadvvari*, *Nilichedi Kishangu*; Telugu : *Sima-Shatawari* (dry Root), *Pippipichara*, *Pilliteegalu* (fresh Root) and Urdu : *Satawari*. It occurs throughout country in wild as well as cultivated for dried tuberous roots.

The roots are highly potential for man and women both. There are various meaning of *Satawari* like a women can *var* or marry with hundreds of man who use the plant. *Shatawari* means that possesses a hundred husbands and it is considered both a general tonic and a female reproductive tonic [1]. *Shatawari* is the main Ayurvedic rejuvenative tonic for the female, as is *Withania* for the male. *Shatawari* is however, used for sexual debility and infertility in both sexes. In another meaning that anybody can live hundreds of years become healthy and fit if he using the plant.

Usage in Ayurvedic formulations

The tuberous roots are mostly used in ayurvedic medicines for the preparation of *Shatawari ghrita*, *Shatmulyadi loh*, *Shatawari panak*, *Narayan tail*, *Vishnu tail*, *Musli pak*, *Shatawari kalpa*, *Phalaghrita*, *Brahma Rasayana* etc. The uses of *Shatawari* roots have been described in Bhavprakash Nighantu, Sushruta samhita and Dhanvantri Nighantu [2]. The Sanskrit name of the plant is *Shatawari*, *Shatmuli*. *Bahusuta*, *Atirasa*. The principal uses of the roots are in impotency, nervous disorder, epilepsy, gynecological disorders etc. in ayurveda and considered as *Rasayana* drugs to enhance vitality.

Tribal medicine

The tuberous roots of the plants are potentially utilized by the tribal people throughout India as anthelmintic, aphrodisiac, rheumatism, bleeding from nose, blood in urine, cough, diarrhea, dysentery, febrifuge, galactagogue, gastric complain, gonorrhoea, headache, impotency, leucorrhoea, menstrual complain, pleurisy, stomachache, tonic, ulcer on tongue, urine complain and wounds. The ethnobotanical names among different ethnic communities are *Devani*, *Moslammatige*, *Murmutte*, *Neermutlang-kilangu*, *Nili-chedi*, *Painajapri*, *Pillitegalu*, *Satawar*, *Satmul* and *Umudig* [3].

In composition of Herbal products

The roots extract of the plant is also in composition of herbal products per tablet are *Abana*® (10 mg; cardioprotection), *Ricalex* (40 mg; lactagogue), *Diabecon*® (20 mg), *Geriforte*® (20 mg; geriatric tonic), *Himplasia*® (80 mg), *Lukol*® (40 mg) and *Menosan*® (110 mg; treatment of menopausal, uterine weight) while *Eve Care*® (32 mg extract per 5ml; dysfunctional uterine bleeding) in syrup are some formulations containing *Asparagus racemosus* developed by Himalaya Herbal Healthcare, India [4].

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Phytoconstituents

The roots have chemical potential like steroidal glycosides shatavarin I- IV, a polycyclic alkaloids asparagamine A, disaccharide; 9, 10-dihydrophenanthrene derivative racemosol, different terpenoids, saponin and amino acids. Isoflavones, other shatvarins, a unique immuno- stimulant steroidal saponin acid from the roots have been isolated. The major active constituents of *Asparagus racemosus* are steroidal saponins (Shatavarins I-IV) that are present in the roots. Shatavarin IV is a glycoside of sarsasapogenin having two molecules of rhamnose and one molecule of glucose. Other active compounds such as quercetin, rutin (2.5% dry basis) and hyperoside are found in the flowers and fruits; while diosgenin and quercetin-3 glucuronide are present in the leaves reported the presence of sarsasapogenin) in natural plants of *Asparagus racemosus* as well as in *in vitro* cultures. DPPH autography-directed separation resulted in the identification of a new antioxidant compound from *Asparagus racemosus* named 'racemofuran'. Previously, the isolation and spectral data of a new isoflavone, 8-methoxy-5,6,4-trihydroxyisoflavone 7-*o*- β -d-glucopyranoside, was reported from the roots of the plant. The isolation and characterization of a polycyclic alkaloid called 'Asparagamine' from *Asparagus racemosus* that exhibited a unique cage-type structure and remarkable anti-oxytocic activity. Later, a new 9, 1-dihydrophenanthrene derivative named 'Racemosol' was isolated from the ethanol extract of roots. Its structure was elucidated by spectroscopic analysis as 9, 10-dihydro-1, 5-dimethoxy-8-methyl-2, 7-phenanthrenediol. The sarsasapogenin and kaempferol have been isolated from the woody portion of tuberous roots of the plant [5-7].

Biological activity

The activity has been observed in the roots are as estrogenic, neurological disorder, anti-diarrhoeal, anti-dyspepsia, adaptogenic, anti-ulcerogenic, antioxidant, cardio-protection, anti bacterial, immunoadjuvant, antitussive, styptic, geriatric etc. Studied regarding the effect of *Asparagus racemosus* on *Amlapitta* (hyperacidity), *Grahani* (ulcerative colitis), *Parinam shool* (septic ulcer) and *Vataj shool* (spastic colon) and observed an amelioration of symptoms [8]. Antiulcerogenic action of an ayurvedic herbo-mineral formulation '*Satavari mandur*' (SM) was also investigated for its efficacy in the treatment of cold restraint stress-induced gastric ulcer in rats [9]. The role of *Asparagus racemosus* as an immune-adjutant in traditional therapy is well documented and therefore it can be applied to evade the toxic side effects of synthetic chemotherapeutic drugs without compromising on its anti-tumour activity. Interestingly, in Ayurvedic medicine, AIDS is thought to be a disease of decreased '*ojas*', defined as the essential energy of the body. *Satavari* is said to aid in the formation of '*ojas*' and has been used in immune therapy. It is in situations like these

that the function of *Asparagus racemosus* as an immunoadjuvant can be scrutinized for use in adjuvant therapy in the management of HIV.

Cultivation practices

The cultivation of the plant is suitable for hot humid climate, temperature 10-50°C, average rainfall 2500, sandy loam soils with good drainage facility and no water stagnation [10]. For propagation the land should be ploughed well twice or thrice in June-July or prior to the onset of the monsoon and in August, the land should be ploughed again and compost should be added at the rate of 6 tons per acre and mixed well with the soil. About 12 kg seeds are required for 1 hectare area and the size of bed is 10x1m, filled with a mixture of soil and compost in the ratio of 3:1 and seeds sown should be covered with soil. The sowing month is May and seedlings transplanted by August. Seedlings one month old and about 8-10cm high can be transplanted to the main field in a distance of about 60x60cm. The sprouted tubers are also perfect which can be sown again. The discs emerging from stems or roots are separated from the mother plant and transplanted to poly bags and the plants are transplanted to the main field within 20 days. In an interval of minimum seven days irrigation is necessary of initial establishment while light irrigation can be provided at monthly interval. Rust diseases are often infectious for plants which can be controlled by spraying Bordeaux mixture. The flowering period is February-March while in the end of April fruits become appear. After about 18 months, the plants begin to turn yellow indicative of the time for uprooting the plant and separating the discs. Fresh tubers have a moisture content of 90% and therefore before drying, the outer skin of the tubers should be removed and cleaned. For good quality tubers should be dried in shade. About 10 kg seeds /per hectare are required for sowing.

Evaluation of Quality standard in ordeal of Jharkhand

The maintenances of parameters of quality of root materials of *Asparagus racemosus* are most essential to get best therapeutic action. There are several parameters dealing about the quality standard of Indian Medicinal Plants, however in the present study some basic parameters as provided by ICMR (Indian Council of Medical Research, New Delhi) have been evaluated among different places of samples of Jharkhand [11]. Indeed, Jharkhand is one of rich state for medicinal plant diversity. The plant genetic resource of *Asparagus racemosus* is naturally occurs in forest areas. The farmers who have taken advanced training for the cultivation of medicinal plants are also started to cultivate the plants. The tribal medicine men and local *vaidyas* also use the plants for the treatment of various diseases and disorders like to improve mother milk, gynecological disorders and as potency. The roots of the plants are being sold in rural market and most of the materials are often collected from wild or forest and rural areas.

Evaluations of samples

In the present study about 20 samples of roots *Asparagus racemosus* have been evaluated for their quality parameters. Out of 20 samples 11 samples are naturally growing from forest areas of Dumka (SN1), Deoghar (SN2), Jamtara (SN3), Ranchi(SN4), Gumla (SN5), Sahibganj (SN6), Plamau (SN7), Giridih (SN8), Jamshedpur (SN9), Lohardagga (SN10), Bishunpur (SN11); 08 samples (SO1-SO8) are from the farmers who have cultivated the wild plant genetic resources of *Asparagus racemosus* naturally occurs in small scale and followed the organic cultivation in the areas of Deoghar, Godda, Dumka, Pakur, Sahibganj, Ranchi, Bokaro and Hazaribagh and 01 samples are JS-1 which is a released variety of Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur cultivated in the premises of Birsa Agricultural University, Kanke, Ranchi [Fig.1-2]. The above samples were properly washed with water, cut into small pieces and shade dried and standard phytochemical methods followed for analytical works according to ICMR (Indian Council of Medical Research).

Quantitative Standards of ICMR

The quantitative standards according to the ICMR to evaluate quality standards of *Asparagus racemosus* roots are should be Foreign matter: not more than 1.0 %; Total ash: not more than 5.0 %; Acid-insoluble ash: not more than 0.6 %; Ethanol-soluble extractive: not less than 9.0 %, Water soluble extractive: not less than 34.0 %, Loss on drying: not more than 8.0%.

Results and Discussion

It has been observed [Table-1] that there are variations in colour among the samples of roots of *Asparagus racemosus* like creamish yellow, light yellow, yellowish cream while the parameters of ICMR (Indian Council of Medical Research) is creamish yellow. The foreign matter should be not more than (1%), but except the samples viz. SN2, SN6, SN7 and SO5 all the samples are well maintained the standard. The only two samples like SN3 and SN6 are only contain more than 0.1% ash as their ash have been weighed 5.1%. There is one sample SN9 having acid insoluble ash quantity 0.62 % which is only excess 0.2% and hence the parameters related to acid insoluble ash have been found perfect. The only two samples SN1 and SN5 have ethanol soluble extractive 9.1% and 9.5% which are more than parameters of 9.0 % and all the samples range the percentage 8.5-9.0. The water soluble extractives ranges 32.5 % to 34.1% while ICMR standards are 32% and the above percentage of extracts are near the quantitative standard as desired. The standard are 8% for loss on drying while it was 8.1%-9.4 % has been observed in all the tested samples. It is very much clear from the above data on quantitative percentage of *Asparagus racemosus* in comparisons of quantitative standards of ICMR and observed that the roots which is natural as well as cultivated in Jharkhand have almost nearby suitable for manufacturing of

products as required in ayurvedic medicine and others herbal products having large demand.

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Table: 1: Quantitative standard of roots samples of *Asparagus racemosus* occurs in Jharkhand

Parameters/Samples	Colour	Foreign Matter (%)	Total ash (%)	Acid-insoluble Ash (%)	Ethanol-soluble extractive (%)	Water soluble extractive (%)	Loss on drying (%)
ICMR	Creamish yellow	1.0	5.0	0.60	9.0	34.0	8.0
SN1	Light yellow	0.9	4.6	0.50	9.1	33.2	8.5
SN2	Creamish yellow	1.1	4.9	0.41	8.5	32.5	9.1
SN3	Yellowish cream	0.8	5.1	0.43	8.66	34.1	8.4
SN4	Creamish yellow	0.7	4.6	0.44	8.95	30.7	8.9
SN5	Creamish yellow	0.9	4.8	0.46	9.2	33.5	8.2
SN6	Light yellow	1.2	5.1	0.49	8.11	33.6	8.4
SN7	Yellowish cream	1.1	4.9	0.41	8.95	34.1	9.2
SN8	Creamish yellow	0.8	4.6	0.52	8.67	33.4	8.5
SN9	Yellowish cream	0.7	4.3	0.62	8.88	33.9	8.3
SN10	Light yellow	0.9	4.9	0.45	8.79	32.4	8.4
SN11	Yellowish cream	0.8	4.6	0.49	8.78	33.3	8.9
SO1	Creamish yellow	1.0	5.0	0.48	8.66	34.0	9.4
SO2	Light yellow	0.8	4.9	0.56	8.90	33.5	8.2
SO3	Yellowish cream	1.0	5.0	0.59	8.77	34.2	8.6
SO4	Creamish yellow	0.9	4.9	0.54	9.0	33.9	8.8
SO5	Yellowish cream	1.2	4.6	0.52	8.97	32.8	8.0
SO6	Light yellow	0.7	4.8	0.56	8.68	33.5	8.1
SO7	Yellowish cream	0.9	5.0	0.59	9.0	32.8	8.3
SO8	Creamish yellow	0.8	4.9	0.55	8.94	33.3	8.1
JS-1	Light yellow	0.9	4.6	0.54	8.77	34.1	8.2

Abbreviation: SN- sample natural growing; SO- sample organic cultivation; JS-1: variety of Jawaharlal Nehru Krishi Vishvavidyala, Jablapur

Fig.1. *Asparagus racemosus*Fig.2. *Asparagus racemosus* Roots (Crude material)