ISSN: 2456-6640

International Journal of Ayurveda
(A Monthly Scientific Journal of Kiban Research Publications)
www.kibanresearchpublications.com

RESEARCH ARTICLE

Asparagus Racemosus Willd Roots: Antioxidant Properties of Sri Lankan Origin

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Abstract: The roots of *Asparagus racemosus* Willd (Family: Asparagaceae) are widely used in Ayurveda, Siddha and Unani medicines. It has a broad spectrum of therapeutic effects including anti-diarrheal, hepatoprotective, diuretic, antibacterial, anti-cancer and immunostimulant and antioxidant activities. However, no scientific investigations were done to prove the antioxidant properties of *A. racemosus* grown in Sri Lanka. Therefore, an attempt was made to evaluate the *in vitro* antioxidant activities for hot water extract of *A. racemosus*. Results revealed that saponins, phenolic compounds, alkaloids and flavonoids were present in the plant. Antioxidant activities of FRAP (Ferric reducing antioxidant power), ORAC (Oxygen radical absorbance capacity), DPPH (1, 1-diphenyl-2-picrylhydrazyl**)** and ABTS [2, 2-azino-bis (3 ethylbenzothiazoline-6-sulfonicacid) diammonium salt] were 5.51 ±0.06, 13.39 ±0.37, 0.42±0.01, 6.35±0.14 mg Trolox equivalents/g of extract respectively. In addition, hot water extract of *A. recemosus* was rich in phenols and flavonoids. In conclusion, *A. recemosus* grown in Sri Lanka showed moderate antioxidant activity and can be used as a potential source of antioxidant against free radical associated diseases.

Keywords: *Asparagus racemosus Willd, Antioxidants, Phytochemicals, Sri Lanka.*

Article received: 20 August 2018 **Revised: 25 August 2018** **Published: 30 August 2018**

Introduction

Asparagus racemosus Willd is an important medicinal plant belongs to the plant family *Asparagaceae* [1-2]. The roots of the herb are used in Ayurveda, Siddha and Unani medicine. The roots are more or less smooth when fresh, and start to develop longitudinal wrinkles upon drying.

Mature roots are 5-15 cm in length and 2 cm in thickness. Color of the roots are in silvery white or ash externally and white internally [3]. According to scientific investigations *A. racemosus* has shown many bioactivities including anti-diarrheal [4-5], hepatoprotective [6-7], diuretic [8], antibacterial [9], anti-cancer [10-12], immunostimulant [13-14] and antioxidant activities [15-18]. However, it is well known that environmental factors including temperature, humidity, light, water and minerals influence the secondary metabolites, nutrients and bioactivities of the plants [19]. Examples include the variations of (a) nutritive values of Soybean grown in Brazil, Argentina and United States [20], (b) nutrient composition of cereal grains in Argentina, Brazil, China, Ukraine, and United States [21] and (c) phytochemicals, total phenol content and antioxidant activity of *Aloe vera* in different states of India [22].

Moreover, antioxidant properties were evaluated for *A. racemosus* grown in different countries including Bangladesh [15],

Thailand [16] and India [17-18]. There were similarities as well as differences in antioxidant properties of *A. racemosus* roots with respect to their origin. Further, no reported data was found for antioxidant activity of *A. racemosus* grown in Sri Lanka.

Therefore, it is worth to evaluate antioxidant properties of *A. racemosus* grown in Sri Lanka as its roots are heavily used in Ayurveda, Siddha and Unani medicinal systems.

Materials and Methods

Collection and Identification of Plant Material

Roots of *A. racemosus* were collected from home gardens in Gampaha district, Sri Lanka between October to December 2014. The plant materials were identified and authenticated by Prof. M.H.A. Tissera, Head of Dravyaguna Department, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya, Sri Lanka. Voucher specimen (AR –R1) was deposited in Dravyaguna Department, Institute of Indigenous Medicine, University of Colombo, Sri Lanka.

Preparation of Hot Water Extract

Small pieces (60 g) of *A. racemosus* roots were added to a vessel containing 1.92 L of distilled water and reduced the volume up to 240 ml under mild heat. Finally, extract was filtered and filtrate was concentrated under vacuum and freeze dried (yield: 14.5 % w/w).

Physiochemical Screening

Phytochemical tests were performed to detect secondary metabolites such as saponins, phenols, flavonoids, glycoside and alkaloids in hot water extract of *A. racemosus* according to standard methods.

Investigation of Antioxidant Properties

Antioxidant properties of hot water extract of *A. racemosus* was investigated using *in vitro* antioxidant assays: (a) total flavonoid content[23] (b) total polyphenolic content [24] (c)1,1-diphenyl-2-picrylhydrazyl (DPPH) assay [25] (d) 2, 2-azino-bis (3 ethylbenzothiazoline- 6- sulfonicacid) diammonium salt (ABTS) assay [26] (e) Oxygen radical absorbance capacity (ORAC) [27] and (f) Ferric reducing antioxidant power (FRAP) [28].

Results and Discussion

Antioxidant activity of *A. racemosus* hot water extract was evaluated by using *in vitro* assays: TPC, TFC, FRAP, DPPH and ABTS radical scavenging activity and ORAC (Table 1). When DPPH radical react with an antioxidant, its purple color is disappeared and gives pale yellow color at 517 nm [29].

In ABTS assay, green blue color of the ABTS radical will be converted to colorless when presence of antioxidants [30]. ORAC value is directly proportional to degree of antioxidant power [29] and FRAP assay can be used to measure the antioxidant power of compounds [31]. In the present study, Trolox equivalents of hot water extract of *A. racemosus* was significantly higher in ABTS assay than that of DPPH assay. This may be that DPPH assay is capable of measuring only the hydrophilic antioxidants whereas ABTS assay measures both hydrophilic and lipophilic antioxidants [26].

Physiochemical screening studies revealed the presence of secondary metabolites such as saponins, phenolic compounds, flavonoids and alkaloids in the hot water extract of *A. racemosus*. Similar results were obtained for *A. racemosus* grown in Bangladesh [15].

However, values of FRAP, DPPH and ABTS and ORAC cannot be compared with A. *racemosus grown* in other countries because variations in (a) antioxidant standard (b) type of extract (eg. hexane, methanol, ethanol, water, etc), (c) expression of results (e.g. EC_{50} value, % inhibition, mg Trolox equivalents/g of extract, etc).

Most of the time ascorbic acid was used as the antioxidant standard instead of Trolox. Hot water extract of A. *racemosus* roots was rich in phenols and flavonoids. The total flavonoid and phenolic contents of *A. racemosus* were 5.62 ± 0.22 mg quercetin equivalents/g of extract and 10.23 ± 0.60 mg gallic equivalents/g of extract respectively.

Total phenolic content in the extract was estimated using the Folin-Ciocalteu reagent and total flavonoid content in the extract was measured by aluminium chloride colorimetric method. It can be concluded that, *A. recemosus* grown in Sri Lanka showed moderate antioxidant activity and can be

used as a potential source of antioxidant against free radical associated diseases such as inflammation, diabetes mellitus, cancer, etc.

Table 1: *In vitro* antioxidant activities of *Asparagus racemosus* Willd grown in Sri Lanka

	***In vitro* antioxidant assays**			
	FRAP (mg Trolox equivalents/g of extract)	ORAC(mg Trolox equivalents/g of extract)	DPPH (mg Trolox equivalents/g of extract)	ABTS (mg Trolox equivalents/g of extract)
Hot water extract	5.51 ± 0.06	13.39 ± 0.37	0.42 ± 0.01	6.35 ± 0.14

Data presented as mean ± SEM.
FRAP, ORAC, DPPH and ABTS: n=6/ each

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