



ESTIMATION OF TOTAL ANTIOXIDANT ACTIVITY OF ASPARAGUS RACEMOSUS PRESERVES

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Abstract

Traditional medicine all over the world is revalued by an extensive activity of research on different plant species. Plants produce a lot of antioxidants to control the oxidative stress caused by sunbeams and oxygen, these can represent a source of new compounds with antioxidant activity. Plants contain free radical scavenging molecules such as phenolic compounds, vitamins, minerals and saponins which act against oxidative stress.

Shatavari (*Asparagus racemosus*) is a very important herb in ayurveda medicine. It is rich in many minerals like (iron, calcium, Phosphorous, magnesium, manganese, zinc) and vitamins like (vitamin C, folate, thiamine). It is rich in shatavarins which are steroidal saponins and racemofuram an antioxidant. It is widely grown all over India and is exported to develop plant based estrogens. The tribal community of India boils and consumes these fleshy roots; they also use the root and leaves for treatment of a wide array of ailments.

From the market survey conducted no products of *Asparagus racemosus* seemed to be available in the market. The root is just used in ayurvedic preparations. The preserves developed were jam, jelly, squash and pickle. Jam, jelly and squash were prepared using jaggery instead of sugar. The best selected variation was taken as standard and analyzed for its antioxidant activity, phenolic content, iron and fibre content. Shelf life was analysed for the preserves using variations with class I preservatives as test group and standard with class II preservatives as control.

The results obtained showed that the mean scores of variations of jam, jelly, squash obtained were highest for variation III made by root to jaggery in the ratio 1:1 and pickle variation II. Antioxidant activity of *Asparagus racemosus* in different cooking methods were analysed: result as follows, *Asparagus racemosus* sautéd for 10 minutes in 10 ml of oil gave the highest total antioxidant activity as 217.8µg/g, whereas by steaming process 168.81µg/g, boiled *Asparagus racemosus* showed 164.4µg/g. *Asparagus racemosus* in raw form showed 161.76µg/g. Total antioxidant activity of developed preserves from *Asparagus racemosus* revealed that pickle 577.5µg/g had the maximum antioxidant activity trailed by jam 287.5µg/g, jelly 100µg/g and squash 80µg/g. The phenolic content of the analyzed preserves developed from *Asparagus racemosus* showed that jam 160mg/g had the utmost value followed by pickle 141.75mg/g, jelly 139.52mg/g and squash 133.75mg/g. The amount of iron present in developed preserves from *Asparagus racemosus* exhibited highest iron content for pickle as 5.09mg/100g, compared to jam 2.57mg/100g, squash 1.64mg/100g and jelly 1.64mg/100g. Amount of fibre estimated presented the following results, pickle had the maximum value 7.12g, trailed by jam 4.12g squash and jelly had the same fibre content 0.03g.

Key words : Shatavari, sautéd, jam, jelly and squash.

Introduction

Plants are an integral part of nature; it reflects the creative powers of God. These are designed with a specific purpose and are life sustaining forces on earth (Rege *et al.*, 1999). Primitive ethnic groups living in various colonies of the universe by trial and error made use of the plants in their region for treating various ailments (Nagasampagi, 2006).

Among the civilization, India has been known to be a

rich repository of medicinal plants (Prajapati *et al.*, 2003). Eighty percent of the population of developing countries relies on traditional medicines for primary health. In the Western countries 40 percent of population use herbs to treat illness (Skiller, 2002). About 40 percent of modern monomolecular drugs are derived directly or indirectly from secondary metabolites with antioxidant properties present in extracts of plants (Giachetti and Monti, 2005 and Akinmoladun *et al.*, 2007). The instant rising demand of plant based drugs is unfortunately creating heavy pressure on some selected high value medicinal plant

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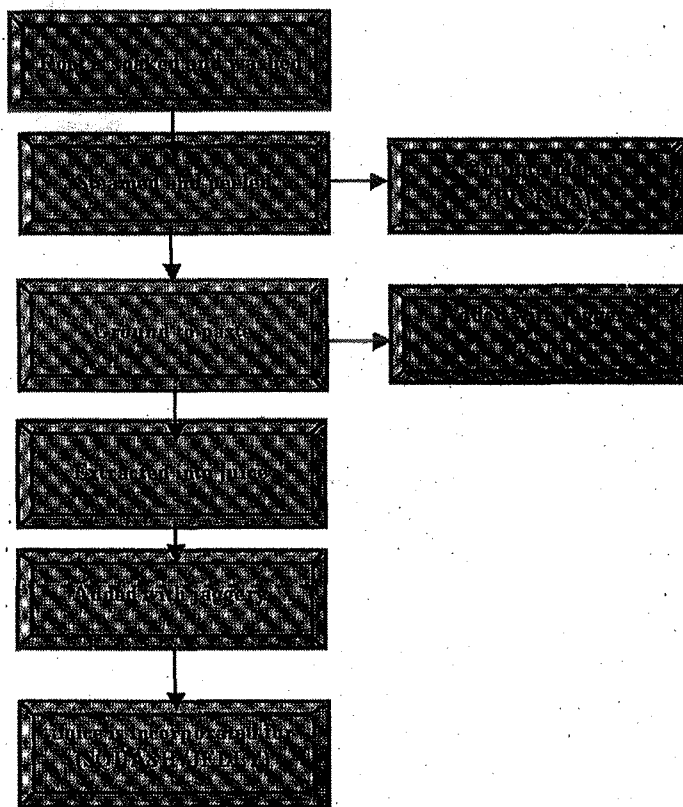


Fig. 1 : Methods adopted for developing the preserves.

population in the world due its harvesting. This phenomenon is leading to continuous erosion of forest and forest products (Samal *et al.*, 2004).

Tribal's and Ayurvedic texts use *Asparagus racemosus* root for the treatment of various ailments gonorrhoea, piles, diabetes, rheumatism, cough diarrhea, dysentery, headache, increase in breast milk during lactation, gastric ulcers, digestive disorders, respiratory diseases and weakness (Williamson, 2002 and Caldecott, 2000). A number of Phytochemical were discovered from the *Asparagus racemosus* root such as, *Steroidal saponins* (Sharma *et al.*, 2009), *isoflavones* (Saxena and Chourasia, 2001), *racemosol* (Sekine, 1997), *alkaloids* and antioxidant like *racemofuran* (Kamat *et al.*, 2000).

Twenty two percent proteins, 6.2 percent fat, 3.2 percent carbohydrates, 0.36 percent vitamin B, 0.04 percent vitamin C and traces of vitamin A were found in *Asparagus root*. Minerals like zinc, copper, manganese, iron, cobalt, sodium, potassium, calcium and lithium were analyzed (Negi *et al.*, 2009). *Asparagus racemosus* is used to develop plant based estrogens and is used in the treatment for various ailments. Due to its multi use the demand for *A. racemosus* is on the rise, however supply is inadequate and erratic. Destruction harvesting

combined with habitat destruction in the form of deforestation has aggravated the problem (Bopana and Saxena, 2007).

With increase in urbanization, rise in middle class purchasing power and change in food habits there is increase demand in factory made preserves like jams, jelly, squashes, pickles, chutneys, frozen and dehydrated fruits and vegetables (Khetarpaul, 2005). Advantages of food preservation is that it helps to increase shelf life of the food, increase supply, lowers spoilage, adds to variety in diet, maximizes availability throughout the years, preserved for natural calamities, eases the preparation of meals, is ready to eat, minimizes wastage, stabilizes the price of food, equal availability to all and adds to growth of economy of the country (Subbulakshmi and Udipi, 2001).

Considering the above discussed points about *Asparagus racemosus* belonging to family Liliaceae was selected for the present investigation is aimed at developing and analyzing preserves made using the root.

Materials and Methods

A. Development and standardisation of selected preserves

A market survey was done in order to find out the availability of the products from *Asparagus racemosus*.

The pre preparation of root is done by first soaking the root, then washing it, followed by steaming the root

Table 1 : Formulation of selected preserves using *asparagus racemosus*.

Ingredients for jam	Variations		
	I	II	III
A.r* Paste (g)	60	60	60
Jaggery (g)	20	40	60
Ingredients for jelly			
A.r* juice (ml)	60	60	60
Jaggery (g)	20	40	60
Water (ml)	10	10	10
Ingredients for squash			
A.r* Juice (ml)	60	60	60
Jaggery (g)	20	40	60
Water (ml)	10	10	10
Ingredients for pickle			
A.r* Pieces (g)	30	30	30
Chilly powder (g)	2.5	5	7.5
Salt (g)	2.5	5	7.5
Oil (ml)	15	30	45

(A.r. - *Asparagus racemosus*).

Table 2 : Available products of *Asparagus racemosus*.

S. no.	Product name	Form	Quantity	Cost (Rs.)
1	Abana Tablet	60 Nos.	560.00	
2	Diabecon	Tablet	60 Nos.	600.00
3	Evecare	Capsules	30 Nos.	520.00
4	Shatavari	Capsules	60 Nos.	570.00
5	Herb powder	Powder	500g	700.00
6	Shatavari	Tablets	60 Nos.	330.00
7	Shatavari gulam	Gulam	500g	140.00
8	Dhanvantharam	Kashayam	200g	94.00
9	Sowbhagyasundi	Lehyam	250g	89.00
10	Sukumaran	Lehyam	250g	144.00
11	Vidaryadi	Lehyam	500g	182.00
12	Baladhtryadi	Thailam	200ml	137.00
13	Narayana	Thailam	200ml	131.00
14	Prabhanjam	Thailam	200ml	76.00
15	Amrutha prasa ghritham	Gulam	500g	215.00
16	Marma gulika	Powder	10 pkts.	26.00

till two whistles and peeling it. For preparation of pickle, the root is diced into four centimeters thick pieces, for jam the root is ground to paste, to prepare squash and jelly the root paste is strained to obtain the juice. The preparation of jam, jelly and squash is one by addition of jaggery instead of sugar in order to increase its nutritive value.

For the development of the selected preserves from *Asparagus racemosus* the following methods were adopted to convert the medicinal plant into preserve as shown in fig. 1.

The preserves were made by different ratios of ingredients to the root, in order to standardize it as shown below. The variation that received the highest was taken as standard.

B. Objective assessment of selected preserves

Method of evaluation that depends on some measures other than human sense is called objective method of evaluation (Manay, 2008). The preserves were analysed for its total antioxidant activity (FARP Method), phenolic content (Folin-ciocalteau Method), iron (Alkali treatment Method) and fiber (Atomic absorption spectrometer Method).

Shelf life of the preserves was studied by preparation of test group and control group. The test group consists of the developed three variations with class I preservatives (jaggery, salt and oil) and control consists of the standard variation with class II preservative (sodium benzoate and citric acid).

C. Subjective assessment of preserves by the selected subjects

Sensory evaluation deals with measuring, analyzing and interpreting the qualities of food as they are perceived by the senses of sight, taste, touch and hearing (Brown, 2006). Sensory evaluation consists of judging the quality of food by a panel of 15 female judges was selected from the age group of 20-25 years. The developed preserves were evaluated using 5 point hedonic rating scale and scorecard was used to measure acceptability of preserve ranging from very good to very poor (Manay, 2008) to find the most acceptable preserves.

Results and Discussion

The products available of *Asparagus racemosus* seemed to be found only in ayurveda shops. Some of the available products are shown in table 2.

The selected plant for the research was used only for preparation of medicine, thus it was not found in supermarkets or local shops. Half kilogram of the fresh *Asparagus racemosus* root costs about Rs. 10-Rs. 50.

A. Standardization of selected preserves

Sensory evaluation was done for the various sensory characteristics appearance, color, flavor, texture and taste. Based on the scores obtained, the mean scores were calculated.

1. Total mean scores obtained for the formulated preserves

The total mean scores obtained for the different variations of the preserves are portrayed in table 3.

Variation III of jam, jelly and squash obtained maximum scores (4.6, 4.6, 4.5) and variation II got highest score for pickle (4.7). Variation III of jam, jelly and squash was chosen as standard due to its highest total mean and variation II of pickle.

B. Objective assessment of preserves

1. Antioxidant activity of *Asparagus racemosus* using different cooking methods

Table 4 ascribes the antioxidant activity of *Asparagus racemosus* in different cooking methods.

This table 4 that cooking in 10 ml of oil gave the highest antioxidant activity (217.18) followed by steaming, boiling and raw form.

2. Nutrient analysis of the selected preserves

Chemical analysis of the selected preserves was estimated in laboratory.

Total antioxidant activity of developed preserves from

Table 3: Total mean scores obtained for the formulated preserves.

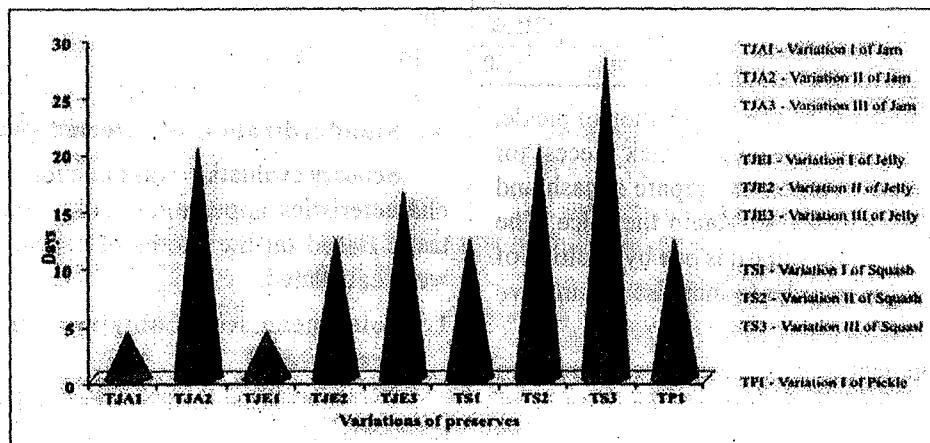
Variations	Jam	Jelly	Squash	Pickle
	Mean±S.D	Mean±S.D	Mean±S.D	Mean±S.D
I	3.8±0.25	3.8±0.10	3.8±0.21	3.9±0.10
II	4.2±0.15	4.1±0.26	4.3±0.10	4.7±0.22
III	4.6±0.20	4.6±0.15	4.5±0.11	4.6±0.11

Table 4: Total antioxidant activity of *Asparagus racemosus* using different cooking methods.

S. no.	Cooking Methods	Time (minutes)	Total antioxidant activity (µg/g)
1.	No cooking	-	161.76
2.	Boiling	10	164.47
3.	Steaming	10	168.81
4.	Sautéing (10ml of oil)	10	217.18

Table 5: Objective assessments of the formulated preserves.

S. no.	Preserves	Total antioxidant activity (µg/100g)	Phenolic Content (mg/100g)	Iron (mg/100g)	Fiber (100/g)
1.	Jam	287.5	160	2.57	4.12
2.	Jelly	100	139.52	1.64	0.03
3.	Squash	80	133.75	1.64	0.03
4.	Pickle	577.5	141.75	5.09	7.12

**Fig. 1:** The fungal contamination of the developed preserve.

Asparagus racemosus revealed that pickle 577.5µg had the maximum antioxidant activity tailed by jam 287.5µg, jelly 100µg and squash 80µg. Whereas the phenolic content of the *Asparagus racemosus* preserves showed that jam 160mg had the utmost value followed by pickle 141.75mg, jelly 139.52mg and squash 133.75mg.

In case of iron present in developed preserves from *Asparagus racemosus* exhibited that pickle has highest iron content 5.09mg, compared to jam 2.57mg, squash 1.64mg and jelly 1.64mg. For the fiber estimated presented the following results, pickle had the maximum value 7.12g, tailed by jam 4.12g squash and jelly had the same fiber content 0.03g.

C. Shelf life of the developed preserves

Shelf life of the various preserves was checked for one month. Following are the graphical representation of the shelf life of the various preserves.

Analysis of shelf life of jam gave the following results. Variation I got spoiled in 4 days, variation II within 12 days and variation III showed a change in one characteristic that is texture; it hardened on storage for a long time.

Shelf life of different variations of jelly I, II and III, showed deterioration in its sensory attributes within 4th, 12th and 16th day. Sensory characteristics of squash of variations I, II and III exhibited changes in appearance, color, texture and odor by 12th, 20th and 28th day. Variation I of pickle deteriorated within 12 days, whereas the rest of the variations showed no changes in the sensory attributes.

Fungal growth was the last stage of deterioration of the preserves. The fungus that appeared on the preserves was *Aspergillus niger*. All variations of jelly and squash were attacked by the fungus only variation I and II of

jam and variation I of pickle got spoiled. The control group did not develop any fungal contamination due to addition of class II preservatives.

Conclusion

Medicinal plants possess a lot of unidentified nutrients that can pose to increase the longevity of man. Plants are an important source of nourishment for both animals and humans and it is a healer since it poses the code to cure many diseases. Thus conservation of plants should be an important step and planting of basic herbs in one's garden is essential and the first step to conservation is the preservation of it. *Asparagus racemosus* is a herb that grows in varied climatic conditions and in any soil. The plant possesses a lot of health benefits as reviewed by ayurvedic doctors especially for the female population. Thus herbs and herbal charms are highly effective for curing many diseases. "We are what we eat" is a quote stating that our body solely depends on our food intake. We would benefit if the food we eat is also our medicine whether the body is in a healthy state or unhealthy state.

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