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Nutrient composition and antioxidant activity of raw and processed bottle gourd varieties

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ABSTRACT

Bottle gourd (Lagenaria siceraria) also known as bottle squash is a delicious vegetable. Many fresh fruits, vegetables, spices and green and black tea have been found to contain natural antioxidants such as ascorbic acid, flavonoids, phenolic compounds like ferulic acid and catechins and can contribute significantly in scavenging free radicals if taken regularly in the diet. The present study aimed at assessing the effect of different processing methods and parts of the bottle gourd on antioxidant activities as well as determining the antioxidants present in different cultivars (organic and conventional) and developing value added products (tutte- fruity) from bottle gourd. Organic and conventional bottle gourds were used for the current study. The samples were collected from two different places of Coimbatore District. Organic bottle gourd was obtained from a certified organic farm located in Udumalpet. Conventional bottle gourd was purchased from a local market. Nutrient composition was determined in both the varieties with respect to fibre, vitamin- C, calcium, phosphorus and iron. Antioxidant activity was estimated using DPPH, FRAP and total phenols method. Shelf- life study was carried out for both the varieties and value addition of bottle gourd was done by preparing tutte- fruity and organoleptic evaluation was carried out. There was no significant difference between the fibre content of organic pulp and skin when compared to conventional pulp and skin. Organic whole bottle gourd showed slightly high values in fibre content than conventional sample. Calcium content of raw, boiled and steamed bottle gourd skin was high (12.50mg). This may be due to accumulation of calcium in skin portion. In all the three assays organic bottle gourd showed highest radical scavenging activity (331.4µM TE/g) when compared to conventional one (305.83µM TE/g). The difference between the values may be because of utilization of pesticides and fertilizers in conventional practice. Tutte- fruity prepared from the conventional bottle gourd was found to be similar to the commercially available ones. Thus inclusion of bottle gourd in our daily diet will promote health and well being through its micronutrients.

Introduction

Pre and post harvest loss of fruit and vegetables is a major problem in India. By adopting some of the simple and low cost energy techniques for proper management of fresh fruits and vegetables at pre and post harvest level for marketing and processing in India, a fair portion of fruits and vegetables at present going waste can be easily salvaged to upgrade our nutritional standards and ensure more remunerative returns to the growers and reasonable prices to the consumers (Anju, et al., 2009).

Vegetables play an important role in the economy of India, because it is the second largest vegetable producing country in the world next to China. Bottle gourd (Lagenaria siceraria) is one of the important vegetable crops which belong to family the Cucurbitaceae. Bottle gourd has its origin in Africa and India and is cultivated all over the world. It has high medicinal value and hence used in some Ayurvedic medicines. Bottle gourd is a good source of vitamin- B- complex and ascorbic acid. It is rich in pectin and also contains various saponins, fatty oils and alcohols. It has a cooling effect on the human body and is also useful in prevention of constipation. Bottle gourd plant is cultivated throughout the year in different places in different seasons. Hence the supply is not uniform through the year in one particular place and steps should be taken to preserve them by extending the shelf life in fresh form or in the processed form (Deore, et al., 2008).

Antioxidants act against oxidant to minimize the damage made by them. Antioxidants in fruits and vegetables play a big role in minimizing cell damage by combining with and neutralizing free radicals. Broadly antioxidants are the substances that when present at low concentrations compared to those of an oxidizable substrate significantly delays or prevent oxidation of that substrate. The oxidizable substrates include almost every thing found in foods and living tissues including proteins, lipids, carbohydrates and DNA (Frei, B., (1994).

The non- edible portions from various fruits and vegetables (mainly seeds and peels) have been shown as good sources of antioxidants. However their use is limited due to lack of knowledge about their molecular composition, active ingredients in the source material and the availability of relevant toxicity data (Naik, et. al., 2008)

The current study focused on assessing the effect of different processing methods and parts of the bottle gourd on antioxidant activities as well as determining the antioxidants

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present in different cultivars (organic and conventional) and developing value added products (tutte- fruity) from bottle gourd.

Materials and Methodology

Organic and conventional Bottle gourds were used for the current study. The samples were collected from two different places of Coimbatore District. Organic bottle gourd was obtained from "Maha Organic Farms" located in Udumalpet, Tamil Nadu, India. Conventional bottle gourd was purchased from local market in Sitra. The samples collected were stored in the refrigerator and then used for compositional analysis.

Nutrient Analysis of Both the Varieties

Fibre content of raw skin, pulp and whole bottle gourd varieties were analyzed manually by taking 2g of each of the samples. Vitamin- C content of raw boiled and steamed samples was analyzed using Dye method (AOAC, 2000).

Ash solution was prepared for both the varieties of bottle gourd. Ash solution was prepared for raw, boiled and steamed bottle gourd skin, pulp and whole and was used to analyze calcium, phosphorus and iron content. Calcium content was determined using Clark and Collip method (1925). Phosphorus content was analyzed using 0.5ml ash solution by Fiske and Subba Row method (1925). Iron content was determined by Wong's method (1928). Results were compared among organic and conventional bottle gourds. (AOAC, 2000).

Antioxidant Activity:

Antioxidant activity of organic and conventional bottle gourds were analyzed by using three methods i.e., DPPH, FRAP and total phenolic content. One gram each of the organic and conventional, raw, boiled and steamed, whole, pulp and skin were ground separately using a small quantity of ethanol and made up to 25ml. A small quantity of the extract was centrifuged and used for various methods to find its antioxidant activity.

DPPH (1, 1- Diphenyl- 2- Picrylhydrazyl) scavenging activity was carried out by the method of Blois (1958) with slight modification. The results obtained were expressed as percentage scavenging activity. (AOAC, 2000).

Ferric Reducing Antioxidant Power (FRAP) assay was done according to Benzie and Strain (1996) method with minor modification. The results were expressed in µM trolox equivalents (TE)/ g fresh mass. Total phenolic content of both the varieties of bottle gourd was found using the method of Bray Thorpe (1954). The measurement was compared to a standard curve of Gallic acid. (AOAC, 2000).

All results were statistically analyzed using for paired't' test comparing the values of organic and conventional bottle gourds.

Sensory Evaluation of Tutte- fruity

Tutte- fruity was prepared using conventional bottle gourd and was subjected to sensory evaluation for taste, texture, flavor, appearance and overall acceptability using the score card. The scoring scale was used fair- 1, good- 2 and excellent- 3. 15 semi-trained panel members were present and evaluated the product.

Shelf- life study was done for organic and conventional bottle gourd. Both the samples weighing half a kilo gram each put into polythene covers and placed in the vegetable basket of the refrigerator. The samples were inspected on alternate days to observe any changes in color and texture.

Results and discussion

A.nutrient analysis

Fibre content of organic and conventional was similar with regard to skin, pulp and whole (1g). Vitamin- C content of raw skins of both the varieties was highest (8.85mg) when compared to whole and pulp (2.95mg) of the corresponding variety. A reduction (5.9mg) in vitamin C content of boiled and steamed samples was observed.

The raw, boiled and steamed skin of both the bottle gourd varieties showed highest calcium (12.5mg) content compared to that of conventional boiled whole and pulp (5.95mg). And organic steamed pulp showed lower calcium content (5.21mg) compared to that of conventional steamed pulp (6.25mg).

The phosphorus content of conventional bottle gourd was higher (37.6mg) compared to that of the organic bottle gourd (21.6mg). Phosphorus content of raw boiled and steamed skins was higher (37.6mg) compared to that of pulp and whole of bottle gourd.

Iron content of conventional samples was higher compared to that of organic bottle gourd. Conventional boiled skin showed highest of iron content (11.25mg) compared to other samples and conventional boiled pulp showed second highest in iron content (5.119mgs). The increase in value may be because of the processing method and utensil used in boiling the samples.

The vitamin C content of organic and conventional raw skins are highest when compared to other pulp and whole parts of bottle gourd and also in boiled and steamed sample. Vitamin C is a good reducing agent and hence is oxidized rapidly in air.

Even cooking also results in loss of vitamin C. A reduction in vitamin C content of boiled and steamed samples was observed. It is for this reason that when vegetables become dry and stale or cut and exposed to air most of the vitamin C originally present is destroyed. Whenever possible fresh raw vegetables should be used for obtaining enough Vitamin C. Heating and dying of fresh vegetables usually leads to destruction of most or all of the Vitamin C originally present. Review of existing literature demonstrate inconsistent differences in the nutritional quality of conventionally and organically produced vegetables with the exception of potentially higher levels of certain minerals, ascorbic acid and less nitrates in organic foods (Tarwadi, and Agte,., (2005)

B.Antioxidant Activity

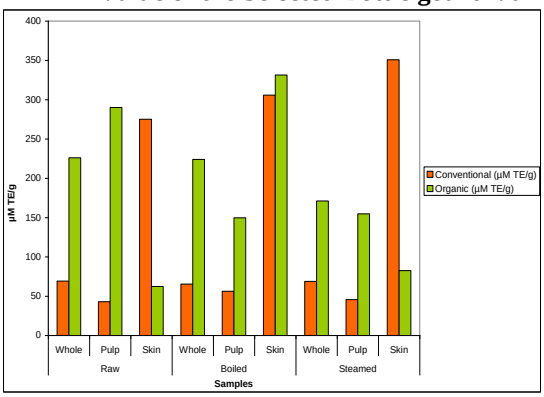
Antioxidant activity of raw, boiled and steamed samples of the selected varieties of were found using DPPH, FRAP assay and Total Phenolic content. In DPPH assay, the scavenging activity was found to be higher in organic bottle gourd than the conventional bottle gourd. Skin of bottle gourd showed highest scavenging activity (84.86%) than the whole and pulp (20.73%). In FRAP assay, a measure of antioxidant power was assessed in the selected bottle gourd varieties and results were expressed in micro molar trolox equivalents. Organic bottle gourd showed highest antioxidant activity when compared to conventional bottle gourd. Conventional steamed skin extracts showed highest (350.83µM TE/g) antioxidant activity when compared to other extracts of conventional bottle gourd (68.8783µM TE/g). Total phenolic content of organic boiled skin extract had more antioxidant activity (19.86mM of GAE) because of processing. Organic bottle gourd showed highest antioxidant activity (22.55mM of GAE) when compared to conventional bottle gourd (21.61 mM of GAE). Organic steamed skin extract showed highest total phenols content. Increased antioxidant activity of organic bottle gourd extracts may be because of the use of natural fertilizers.

Shelf- life study of organic bottle gourd was higher (30days) than that of the conventional bottle gourd (15days) when stored in the refrigerator.

Sensory evaluation of tutte- fruity

The tutte- fruity prepared using bottle gourd and sugar to increase the shelf- life of processed form of bottle gourd was determined for its acceptability by sensory evaluation which was carried out based on preference. According to organoleptic evaluation of the prepared tutte- fruity the panel of judges opined that the study sample was similar to the commercially available tutte- fruity which is generally made from papaya.

Figure – I FRAP Value of the Selected Bottle gourd Varieties



Conclusion

Bottle gourd contains many useful nutrients and rich in antioxidants which can be consumed by all the population throughout the year. Organic bottle gourd is safer than conventional because of pesticides and chemical fertilizers which may harm the health of the people are not used. Thus inclusion of bottle gourd in our daily diet will promote health and well being.

References

1. Anju, K.D. Shrama, K.D. and Surekha, A., (2009). Functional constituents and processing of pumpkin: A review. J. Food. Sci. Technol. 46(5), 411-417.
2. Deore, P.M., Kotecha, P.M. and Pawar, V.D., (2008) Studies on Processing of Bottle gourd into Juice and powder, J. Food. Packer 30(4): 116-120.
3. Frei, B., (1994) Natural antioxidants in human health and diseases. Academic Press, San Diego Pp: 50-54.
4. Naik. M.S., Jayaprakash, G.K., and Singh, R.P., (2008). Antioxidant activity of custard apple (Annona squamosa peel and seed extracts, J. Food. Sci. Technol. 45(4): 349-352.
5. AOAC, (2000) Official Methods of Analysis, 17th edition, Association of official Analytical Chemists, Vol. 1, Washington. DC, p: 33.
6. Tarwadi, K and Agte, V., (2005) Antioxidant and micronutrient quality of fruit and root vegetables from Indian subcontinent and their comparative performance with GLVs and fruits. Journal of the Science of Food & Agriculture. 85(9): 1469-1476.

Table – I Vitamin- C Content of the Selected Bottle gourd Varieties

Processing Methods	Parts used	Conventional (mg)	Organic (mg)
Raw	Whole	5.90	5.90
	Pulp	2.95	2.95
	Skin	8.85	8.85
Boiled	Whole	2.95	2.95
	Pulp	2.95	2.95
	Skin	2.95	5.90
Steamed	Whole	2.95	2.95
	Pulp	2.95	2.95
	Skin	2.95	2.95

Table – II DPPH Value of the Selected Bottle gourd Varieties

Processing Methods	Parts used	Conventional (% scavenging)	Organic (% scavenging)
Raw	Whole	9.41	17.24
	Pulp	9.80	12.93
	Skin	40.88	87.06
Boiled	Whole	12.25	20.94
	Pulp	6.96	9.26
	Skin	37.64	78.34
Steamed	Whole	10.29	25.92
	Pulp	9.60	20.73
	Skin	57.25	84.86