J. Indian Dietetic Association Volume 40, No.1, pp. 17-22, 2017

EFFECT OF PHYTONUTRIENT CONTENT IN FRESH AND DRIED SELECTED SPICES

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Background:

Spices have a profound influence on the course of human civilization. Spices are increasingly revered not only for their culinary properties but also for their potential health benefits. Objective: Spice-derived compounds called phytonutrients are extremely effective in augmenting the body's mechanisms for combating toxins. This study was an attempt to prove spices, commonly used in our daily food has three times greater the amount of phytonutrient content. Method: The phytonutrient contents like Lycopene, Polyphenol, Total carotenes and Vitamin C in selected fresh and dried spices were determined in commonly consuming spices like Pepper, Cloves, Cardamom, Star Anise and Nutmeg grown in Kerala were analysed, by using UV spectrophotometry and calorimetric methods. Results: The Lycopene content was high in fresh pepper, compared with dried of 10.34 and 7.34µg/100g. Fresh Cloves contain 1.24 and further increased in drying of 7.82µg/100g, no values were obtained in Cardamom. A slight increase of Lycopene was noticed in dried Star Anise of 6.33 than fresh of 4.79µg/100g. Fresh Nutmeg contained 0.64µg/100g, it decreased in dried of 0.55µg/100g.Low amount of polyphenol content was present in dried Pepper of 1.27 than in fresh 2.48µg/100g.Dried Cloves contained high polyphenol of 18.3 than in fresh 9.73µg/100g. Cardamom contained 7.06 in fresh and in dried of5.61µg/100g.Nutmeg contained 4.16 in fresh and lost in dried of 0.25µg/100g. Carotene content in fresh Pepper was 533.5 and increased in dried of 551.08µg/100g. Amount of Cloves was 27.84 in fresh and decreased in dried of 20.54µg/100g. No value was recorded in carotene content in Cardamom. Star Anise has 15.34 in fresh and slight increase in dried of 18.34µg/100g. Nutmeg contains 28.36 in fresh and lost in dried of 21.38µg/100g. The Vitamin C content of Pepper was very low of 0.63 in fresh and 0.87mg/100g in dried. Cloves contained Vitamin C of 5.34 in fresh and

completely reduced in dried of 0.87mg/100g. Nutmeg contained 13.85 in fresh and decreased to 3.63mg/100g in dried. High amount of Vitamin C was found in Cardamom of 24.65 in fresh and slight decrease of 21.30 in dried. Star Anise contain low amount of 2.14 in fresh and slight loss in dried of 1.92mg/100g.Conclusion: Among the Spices analysed, fresh pepper contain high amount of Lycopene and Total Carotenes. Even though fresh Star Anise and fresh Cardamom contains high amount of polyphenol and Vitamin C, they are not available in market for consumption. Similarly, drying also had a good impact in the phytonutrient content especially Lycopene. The amount of Lycopene gained in ripened dried spices than green one.

Keyword: Phytonutrient, Lycopene, Polyphenol, and Total Carotenes.

Introduction

Spices have a profound influence on the course of human civilization. They permeate our lives from birth to death. In everyday life, spices succor us, cure us, relax us and excite us. Spices are non leafy parts which include buds (clove), bulbs (garlic, onion), fruits (red chilli, black pepper), stem (cinnamon), rhizomes (ginger) and other plant parts have been defined as plant aromatic or with strong taste used to enhance the taste of foods (Pundir et.al, 2010). Spices have shaped many events throughout the world. These valued commodities contribute not only flavours but also serve as colorants and preservatives in a wide variety of cultures. Today, spices are increasingly revered not only for their culinary properties but also for their potential health benefits (Christine Kaefer, 2011). Herbs and spices in fresh or dried form as equally beneficial, retained their antioxidant capacity and phenolic content during the drying process. The researchers concluded that processed herbs contribute significant amounts of antioxidant compounds to the diet (Henning et.al, 2011). Many of the phytonutrients found in spices act as potent preventive agents against cancer by defending DNA against free radicals and other toxins. They prevent the overproduction of toxic chemicals within the body, assist the body's detoxification processes and modulate a range of mechanisms involved in the development of cancer (Linda Melone, 2011). The aim of the present study was to screen and identify phytonutrient content in fresh and dried selected spices.

METHODOLOGY

Procurement of the sample

The present research was mainly concentrated on commonly consumed spices like Pepper, Cloves, Cardamom, Star Anise and Nutmeg grown in and around ”Arukani village ” and in ”Idukki district” in Kerala. Fresh spices were collected was mature and more over green in colour. The spices which are matured and harvested after ripening and processed to sun drying under the sunlight for 2 to 3 days was considered as dried sample were procured for analysis. Furthermore, all samples were homogenized, and dry samples were pulverized and solid samples were powdered in a mixer or in hand blender. Analytical aliquots were weighed at about 5g each.

Estimation of Polyphenol Content

Total phenolic content was determined spectrophotometrically according to the

Folin–Ciocalteu's method (Lachman et.al, 1998) with slight modification. Briefly, 0.5 ml of the sample was pipetted into a 10 ml volumetric flask containing 0.5 ml of Folin–Ciocalteu's reagent, 5 ml of distilled water and 1.5 ml of Na2CO3 solution (w = 20 %), and the volume was made up with distilled water. During the oxidation of phenolic compounds, phosphomolybdic and phosphotungstic acid, contained in the Folin– Ciocalteu's reagent, were reduced to blue-colored molybdenum and tungsten oxides. After two hours, the absorbance of blue coloration was measured at λ = 765 nm against a blank sample. The measurements were compared to a standard curve of prepared gallic acid solutions (50, 100, 150, 250, 500 mg L–1) and expressed as milligrams of gallic acid equivalents per 100 g ± SD. All measurements were performed in triplicate.

Estimation of Total Carotenes

For the carotenoid extraction, 25 ml of acetone was successively added until a paste was obtained. The paste was transferred to a sintered funnel (5 µm) coupled to a 250 ml Buchner flask and filtered under vacuum. This procedure was repeated at least three times until the sample was colorless. The obtained extract was transferred to a 500 ml separatory funnel containing 40 ml of petroleum ether. The acetone was removed through the slow addition of ultrapure water (Milli - Q - Millipore) to prevent the formation of emulsion. The aqueous phase was discarded, and this procedure was repeated four times until no residual solvent remained. The extract was then transferred with a funnel to a 50 ml volumetric flask containing 15 g of anhydrous sodium sulfate. The final volume was adjusted with petroleum ether, and the samples were analyzed at 450 nm. The total carotenoid content was calculated using the following (Ranganna, 2002).

Carotenoid content (µg/g)

$$= \frac{A \times V(ml) \times 10}{A^{1}1cm \times P(g)}$$

Where, A = absorbance; V = total extract volume; P = sample weight; and $A^{1}1cm$ =2592 (i.e., the β-carotene extinction coefficient in petroleum ether (Zakira,1990).

Estimation of Lycopene Content

Samples were first mashed, powdered and homogenized in a laboratory homogenizer. Approximately 0.5g of each food sample was weighed and 5ml of 0.05% (w/v) BHT in acetone, 5ml of ethanol and 10ml of hexane were added. The recipient was introduced into ice and stirred on a magnetic stirring plate for 15min. after shaking, 3ml of deionized water was added to each vial and the samples were shaken for 5 minutes on ice. Samples were then left at room temperature for 5 minutes to allow for the separation of both phases i.e. the polar and non-polar phases. Lycopene content of foods and tomato fruits was measured spectrophotometrically at 503 nm after an extraction with hexane (Sadler et al., 1990, Perkinsveazie et al., 2001 and Fish et al., 2002)

Estimation of Vitamin C

The direct calorimetric method is based on measurement of the extent to which a 2,6-dichlorophenol – indophenols solution is decolourized by ascorbic acid in sample extract and in standard ascorbic acid solutions. 10g of the sample was accurately weighed and blended with 2% HPO3. The solution was filtered and 2-10 aliquot of extract of HPO3 of the sample was titrated and the reading was

titrated within 15-20 sec. The red colour was measured at 518nm. The absorbance against concentration was spotted. The concentration of ascorbic acid was noted from the standard curve and the ascorbic content in the sample was calculated with the following formula AAmg/100g= Ascorbic acid content x volume made upto100ml of solution taken for estimation x 1000 x weight or volume of the sample taken (Loeffler,1942).

Results and Discussion

The result indicates that there are several thousand-fold differences in Phytonutrient content of foods. The developed spectrophotometric and calorimetric methods for the determination of the total carotenes, Polyphenol, Lycopene, vitamin C were used for the selected spices. The mean variations of raw data obtained from pepper, cloves, cardamom, star anise and nutmeg are presented in the table.

The Lycopene content of fresh pepper was higher 10.34 µg/100g compared to dried pepper. In dried cloves, an increased amount of Lycopene content was noticed. No values were reported in fresh and dried cardamom. Slight variation of Lycopene was observed in fresh and dried cloves, 4.79 µg/100g to 6.33 µg/100g. Nutmeg contained very less amount of lycopene in dried than in fresh.

The Polyphenol content of pepper was 2.48 µg/100g increased in dried, when compared to fresh. Fresh Cloves contain high amount of Polyphenol content of 18.3 µg/100g than in dried of 9.3 µg/100g. Cardamom reported only slight variation in fresh and dried spices. Fresh star anise had high amount of Polyphenol content which was 37.33 µg/100g, when

Table: Phytonutrient content of seed spices (Mean ± Standard deviation)

Phytonutrient	Spices	Fresh	Dried
Lycopene (µg/100g)	Pepper	10.34± 0.02	7.32 ± 0.07
	Cloves	1.24 ± 0.02	8.2 ± 0.01
	Cardamom	-	-
	Star Anise	4.79 ± 0.03	6.33± 0.05
	Nutmeg	0.64 ± 0.04	0.55 ± 0.04
Polyphenol (µg/100g)	Pepper	1.27 ± 0.01	2.48 ± 0.01
	Cloves	18.3 ± 0.02	9.73 ± 0.04
	Cardamom	7.06 ± 0.01	5.61 ± 0.02
	Star Anise	37.33 ± 0.03	28.58 ± 0.02
	Nutmeg	4.16 ± 0.02	0.26 ± 0.01
Total Carotene (µg/100g)	Pepper	533.5 ± 0.01	551.08 ± 0.01
	Cloves	27.84 ± 0.01	20.54 ± 0.01
	Cardamom	-	-
	Star Anise	15.34 ± 0.02	18.34 ± 0.01
	Nutmeg	28.36 ± 0.01	21.36 ± 0.04
Vitamin C (mg/100g)	Pepper	0.67 ± 0.02	0.87 ± 0.01
	Cloves	5.34 ± 0.03	0.88 ± 0.02
	Cardamom	24.65 ± 0.04	21.30 ± 0.03
	Star Anise	2.14 ± 0.02	1.92 ± 0.01
	Nutmeg	13.85 ± 0.01	3.63 ± 0.01

compared with dried cloves. Nutmeg also contained high Polyphenol content of 4.16 µg/100g, were totally lost in dried nutmeg.

Total Carotene content of pepper was very high in dried pepper of 551.08 µg/100g than green pepper. Fresh Cloves contained high carotene content and decreased in dried cloves. No values were reported in fresh and dried cardamom. Dried star anise contained high amount of Carotene content in dried than in fresh ones. Nutmeg had 28.36 µg/100g of carotene content than in fresh of 21.36 µg/100g. Overall Pepper had a high level of carotene content when compared to other spices.

Pepper contained very low amount of Vitamin C when compared with fresh and dried of 0.67mg/100g and only slight increase in dried pepper. In cloves the vitamin C content was high in fresh of 5.34 mg/100g, and huge loss was noticed in dried of about 0.88 mg/100g. Similarly dried nutmeg also reported a higher loss of Vitamin C content than fresh. Cardamom contained increased amount of vitamin C in fresh and a loss was reported in dried cardamom. Star Anise contained high amount of vitamin C in fresh, was slightly decreased in star anise. Nutmeg had reported high amount of vitamin C in fresh of 13.85 mg/100g. Lower values were reported in dried Nutmeg. Compared to other spices analyzed, cardamom and nutmeg contain higher amount of vitamin C.

Conclusion

Among the Spices determined, fresh pepper and dried star anise contain high amount of Lycopene. Fresh star anise and fresh cloves contained high amount of polyphenol. Cardamom and Nutmeg contained high vitamin C content, comparatively pepper contained very low amount of vitamin C content. Similarly, drying also had a good impact in the phytonutrient content especially Lycopene. Lycopene content was gained an increase in some ripened dried spices rather than green ones. Dried spices can be stored for six to twelve months. But fresh spices cannot be stored more than two days. People in spice growing areas use fresh spices by making decoction, and spice paste balls to cure all health related ailments such as cholesterol, diabetes, cancer etc. Even though, the fresh spices are rich in polyphenol content and vitamin C, they are not available in market for consumption. In India different states cultivate different types of spices. Each spice was responsible for its own phytonutrient content. People in other areas can also use available fresh spices in their daily life by marinating foods with fresh spice paste and by using spice decoction for leading healthy life. From this study it was proved that high phytonutrient content in spices can fight against all degenerative diseases. Based on this data further study can also be carry out by using these spice extract treating against specified human disease.

Acknowledgement

The author was thankful to the guide for their support in research and TUV SUD Laboratory for providing reagents and equipments to carry out the study. This paper was presented at the 48th Annual Conference of the Indian Dietetic Association.

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