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RESEARCH ARTICLE

EFFECT OF PHYTONUTRIENT CONTENT IN DIFFERENT TYPES OF COOKING METHODS OF SEED SPICES

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ABSTRACT

The aim of the study is to determine the phytonutrient content in fresh and dried seed spices and compare with various traditional cooking methods. Spices may be derived from parts of the plant: bark, buds, flowers, fruits, leaves, rhizomes, roots, seeds, stigmas and styles or the entire plant tops. The phytonutrient contentslike lycopene, polyphenol and total carotenes in fresh, dried, roasted, paste, and decotion of seed spices were determined by using ethanol and acetone solution. Commonly consumed seed spices like sesame, pepper, coriander seeds, poppy seeds and mustard used in Kerala and Tamilnadu were studied, by using UV spectrophotometry and calorimetric methods. Cooking caused a significant change in some components of the proximate nutrients. Lycopene content was increased in dried spices when compared to fresh spices. Polyphenol content increased to some extent in roasted and dried spices. An increase in total carotene content was observedin dried and roasted spices. When spice were blended and made into a paste there was loss of flavour and aroma and spice oil oozes out and there is reduction in phytonutrient content.

INTRODUCTION

Spices have always been important in history. Spices belonged to the most valuable items of trade in the ancient and medieval world, providing the incentive for exploration and most great sea voyages of discovery (Johanna, 2003). Spices and condiments are basically adjuncts that impart a flavour and taste to the foods when they are added. They not only improve palatability but also perform a very important task of preserving foods for long periods. This is made possible because of the antibacterial properties of spices (Tainter *et al,* 1993). There are about 20 seed spices grown in India. The most prominent among them are cumin, coriander, fennel, fenugreek, ajwain, dill, nigella, celery, aniseed and caraway (Spice Board of India). Apart from adding colour, flavour and taste, consumption of spices provide infinite health benefits. For thousands of years aromatic plant materials have been used in food preparation and preservation (Govindarajan, 1985). Phytonutrients are a class of nutrients that are thought to have health-protecting properties. The prefix 'phyto' is from the Greek and means plant, and it is used because phytonutrients are obtained only from plants. Phytochemicals derived from the plants to this day remain the basis of several medications used for the treatment of a wide range of diseases. Throughout the world, botanists and chemists active search the plant kingdom for new phytochemicals. Over 40% of medicines now prescribed in the Unites States contain chemicals derived from plants. Spices that are considered phytonutrients are beneficial to healthhave high medicinal value and therapeuticproperties and used as medicine in olden days. When dried spices and herbs (such as whole allspice and bay leaves) were added in cooking, they release their flavors slower than crumbled or ground ones. 'Alice Henneman, (2014)'describes when fresh and dried spices and herbs were added several hours before serving uncooked foods, it release the flavors and blends easily with foods. Freshly ground spices (such as black pepper and nutmeg) provide more flavor than dried one. Powdered spices are generally not roasted. This is because in their powdered form, spices have a vastly increased surface area, which means that those volatile aromatics escape far more easily, and the spices are more prone to burning (Sankhe, 2014).

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MATERIALS AND METHODS

Sample Collection

Present research is mainly concentrated on commonly consumed spices like Pepper, Mustard, near "Arukani", border of Kerala and in Thanjavur and Coimbatore district in Tamilnadu. Fresh spices are analysed as they are plucked from the trees and plants. The dried samples were directly dried under the sunlight. Roasted spices are plain roasted in a pan with little heat for 5-10 minutes, till it becomes slight brown, further enhances its flavor. The spices will turn a shade or too darker. Decotion can be prepared by boiling 10 gm of spices in 100ml water and it was condensed to 50ml.

Estimation of Lycopene Content

Lycopene was determined according to the method of Nagata and Yamashita. The dried ethanolic extract (100 mg) was vigorously shaken with 10 ml of acetone–hexane mixture (4:6) for 1 min and filtered through What man No. 4. The absorbance of the filtrate was measured at 453, 505, 645 and 663 nm. Contents of and lycopene were calculated. (Ranganna, 2012).

Estimation of Polyphenol Content

The Folin–Ciocalteau method20 was used for the determination of the polyphenol. 0.5 mL of Folin-Ciocalteau reagent was added and the contents. After 3 min, 1.5 mL Na2CO3 solution of concentration 5 g/L was added and made up to a total volume of 10 mL distilled water. After keeping the samples at 50 °C (water bath) for 16 min in sealed flasks and subsequent cooling, their absorbance were read at 765 nm against distilled water as the blank. A calibration curve was constructed using gallic acid standard solutions (0–100 mg/L). The concentration of poly phenol is expressed as the gallic acid equivalent (GAE) per 1 g of fresh sample. All samples were prepared in triplicate (Sunita Madaan, 1997).

Estimation of Total Carotenes

Total Carotenoid contents were determined according to the method of Ranganna, (2002). The samples were taken in a pestel and mortar, grinded using acetone. Extraction was repeated for 2-3 times until the extract becomes colourless. The extracts were pooled and filtered. The filtrate was transferred to a separating funnel and added 10-15 ml of petroleum ether. The pigments got transferred into the petrol eumether phase by diluting the acetone with water containing 5% sodium sulphate. Petroleum ether extracts were pooled and volume was made up to 25 ml with 3% acetone in petroleum ether. Absorbance at 452 nm was measured spectrophotometrically.

RESULTS AND DISCUSSION

The developed spectrophotometric and calorimetric methods for the determination of the, total carotenes, polyphenol and lycopene were appliedin seed spices. The mean variation of raw data obtained for Sesame seeds, Pepper, Coriander seeds, Poppy seeds and Mustard are presented in the table. Hypothesis states there was no difference in the lycopene content of fresh and seed spices. The Lycopene content in Sesame seeds increased in dried seeds and paste, when compared to fresh sesame. In roasted seeds and paste, only a slight decrease and increase in the value was recorded. The observed t value of fresh and sesame seeds was 1.0097 which reject null hypothesis and recorded that there was significant. In Black pepper the lycopene content was increased in roasted seeds than in fresh seeds, and decreased in dried and paste. The extract gained little Lycopene content.

The t value of fresh and dried pepper was 0.0174, hence the result falls in 5 percent significance. No results of lycopene content were detected in coriander seeds and poppy seeds. The lycopene content of dried mustard was higher than in fresh seeds. Slight variation was noticed in mustard paste and extract. In roasted seeds the values increased from (31.64 to 38.65 µg/100g) compared with fresh mustard. The t value of fresh and dried mustard 1.29006E-06, which reject the null hypothesis and there was significance. The polyphenol content of fresh sesame seeds was (26.34 µg/100g) and only a slight increase was noted in roasted seeds. The t value of fresh and dried value is 0.0251.The reported values are moreover similar to the total phenol content of unroasted sesame seeds 28.95±0.01, the study conducted by Jannat.B.et.al, 2010. The polyphenol content in pepper decreased in dried, roasted, paste and extract samples, when compared with fresh pepper seeds (2.34 mg/100g). Tangkanakul *et al.*, 2009, studied the total phenol content of pepper as to be 447.23±10.38 mg GAE²/100g, that does not coincided the obtained value. The t value of fresh and dried pepper was 1.092, which shows 5 percent significance. The polyphenol content of coriander seeds was high in roasted seeds and paste. Valentina *et al.*, 2013, found the total phenolic content of coriander seeds was17.04mg GAE/100g and these values are higher than that observed(8.52mg/100g) in the present findings. The t value of fresh and dried coriander seeds is 1.7494. Fresh poppy seeds contained (9.1mg/100g), and only slight variation was noticed in all other cooking methods. The polyphenol content offresh mustard seeds was (36.21mg/100g).

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

Phyto nutrient	Spices	Fresh	Dried	Roasted	Paste	Extract
	Sesame seeds	9.68±0.10	14.73±0.06	12.68±0.04	13.42±0.01	11.08±0.05
Lycopene (µg/100g)	Pepper	10.27±0.06	7.66±0.12	16.7±0.09	8.7±0.02	13.43±0.16
	Mustard	31.64±0.26	41.44±0.05	38.65±0.19	27.31±0.02	25.83±0.16
Polyphenol	Sesame seeds	26.34±0.16	24.78±0.09	28.32±0.12	23.3±0.04	24.26±0.02
(mg/100g)	Pepper	2.34±0.08	1.09±0.19	1.14±0.05	1.5±0.03	1.89±0.03
	Coriander Seeds	6.23±0.12	8.52±0.04	12.36±0.07	9.43±0.07	7.12±0.06
	Poppy Seeds	9.1±0.16	8.07±0.06	8.97±0.15	7.45±0.07	6.87±0.06
	Mustard	36.21±0.06	44.14±0.06	48.06±0.03	40.12±0.03	20.23±0.04
Total Carotene	Sesame seeds	4.32±0.15	3.76±0.15	4.96±0.02	4.65±0.18	4.01±0.25
	Pepper	533.6±0.23	551.1±0.01	563.5±0.01	410±0.02	478±0.09
	Coriander Seeds	213.7±0.09	222.6±0.02	235.7±0.09	210.8±0.75	208.67±0.04
	Mustard	162.03±0.14	178.78±0.02	132.00±0.27	126.21±0.41	122.56±0.03

In roasted seeds a slight increase was observed. But the polyphenol content get decreased in the extract. The t value of Poppy seed of fresh and dried contains 2.194, which rejects the null hypothesis and result in significant level. Total carotene content in sesame seeds revealed little difference between the samples. The carotene content of fresh and dried sesame content contain the t value of 0.059, which isconsiderably to be statistically significant. Dried and roasted pepper contained (561µg/100g) carotene compared with fresh pepper (533.6µg/100g). The t value of fresh and dried spices was

2.58264E-06, which was significance.The obtained table values are higher when compared by GunYeon *et al.*, 2012, (91.6±0.58). Roasted coriander seeds contained high amount of total carotene when compared with fresh and dried. The total carotene content of poppy seeds was not detected. The coriander seeds contain the t value of 2.54784E-06 which was significant. Dried mustard contained more carotene of (178.78µg/100g) than fresh mustard (162.03µg/100g). According to Madhurima, 2013, the carotene content in mustard was 12.6-45.2µg/100g was very less than resulted values. The t value of carotene content of fresh and dried mustard is 2.53594E-06, which was significant. Among spices studied, mustard contained higher values of lycopene and polyphenol and pepper showed higher values of total carotene.

Conclusion

Among the seed spices analysed, mustard contained more amounts of lycopene, polyphenol, and total carotene.With reference to phytonutrients, lycopene was more in mustard, polyphenol in mustard followed by sesame seeds and total carotene in pepper followed by coriander seeds. The phytonutrient content did not varied much in sesame seeds, when they were subjected to different cooking methods. In case of pepper fresh seedcontained more phytonutrient. Coriander seeds reported lesser values of phytonutrients in fresh seeds compared to cooked samples. Drying and roasting had a good impact in the phytonutrient content of mustard seeds. Polyphenols were found to increase in roasted seeds except in pepper. Total carotene content increased in dried and roasted seed spices except mustard. Lycopene content increased in roasting and drying process, but only a slight variation was noticed. In preparing spice extract high temperature was applied and boiled for longer periods which could be the reason for lesser values reported in extracts. Even though fresh spices were not in use for cooking purposes, they are used for medicinal purpose and have high phytonutrient properties.

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