



ISSN: 0975-833X

## RESEARCH ARTICLE

### DEVELOPMENT AND OBJECTIVE EVALUATION OF SUNFLOWER SEED FORTIFIED COOKIES

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#### ARTICLE INFO

##### Article History:

Received 07<sup>th</sup> June, 2015

Received in revised form

21<sup>st</sup> July, 2015

Accepted 07<sup>th</sup> August, 2015

Published online 16<sup>th</sup> September, 2015

##### Key words:

Sunflower seeds, Antioxidants.

#### ABSTRACT

The present study was conducted to prepare the sunflower seed fortified cookies as influenced by different levels of sunflower seed powder. Sunflower seed fortified cookies were prepared by fortifying sunflower seed powder in different levels to the cookies flour, whereas cookies prepared out of without adding sunflower seed powder were kept as control. The colour and texture profile analysis of the sunflower seed incorporated cookies and control cookies without the incorporation of sunflower seed were analyzed. The instrumental results in the present study shows that the L, a, b values of 20 proportions were much similar to that of control cookies among the three proportions. The Texture Profile Analysis (TPA) of the cookies revealed that as the increased level of sunflower seed resulted in increased force.

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**Citation:** Dr. Yamunadevi Puraikalan and Dr. Sabitha, N., 2015. "Development and objective evaluation of sunflower seed fortified cookies", *International Journal of Current Research*, 7, (9), 19927-19930.

#### INTRODUCTION

Globalization has greatly influenced the food choices of Indians leading to radical changes in their dietary habits which have resulted in increased consumption of sugar and fat based foods (Government of India, 2008). Food based approaches focus on whether natural foods or processed foods in recognizing the essential role that food plays in good nutrition. In the recent years, a wide range of ready to eat/ ready to cook processed foods is being marketed due to increased consumer demands. Sunflower seed are cheap, readily accessible and available all year round and immensely nutritious. Sunflower seed are packed with vitamins, including vitamin B<sub>1</sub> and B<sub>5</sub>, vitamin E and folate. They also provide a healthy dose of important minerals like copper, magnesium, selenium and phosphorous. The fats present in sunflower seed are also good quality, heart healthy fats that can help increase high density lipoprotein cholesterol and protect the heart and cardiovascular system. Of these nutrients, vitamin E in particular is a powerful antioxidant, helping preserve cardiovascular health. The utilization of sunflower seed in ready to eat products as the supplementation vehicle for different nutrients is progressing day by day. The bakery products in particular bread and cookies are used as main supplementation vehicle for nutrition purposes. Bread and cookies prepared from refined flour is nutritionally much poorer and does not adequately meet the requirements for many macro or micro-nutrients.

Also, wheat protein lacks the balance of essential amino acids such as lysine, threonine and valine. Therefore, there have been many on-going investigations on enhancing the nutritive value of bakery products to fulfill the expanding demands of modern dietary habits, considering the products protein, mineral, vitamins and/or fiber contents. Various bread types enriched with combinations of whole oil seed are being readily accepted by consumers (Nadeem *et al.*, 2010). The development of new products is a strategic area of the food industry. Consumers are demanding foods that show two main properties, with the first dealing with the traditional nutritional aspects of the food, whereas, as a second feature, additional health benefits are expected from its regular ingestion. These kinds of food products are often called nutraceutical foods. In a rapidly changing world, with altered food habits and stressful lifestyles, it is more and more recognized that a healthy digestive system is an essential factor in determining the overall quality of life (Brouns *et al.*, 2009). The incorporation of sunflower seed into cookies is important to meet a void in research and to increase the nutrient content especially protein, energy, vitamin B complex, antioxidants, total phenol, flavonoids and vitamin E. The purpose of the present research was to develop and evaluate the colour and texture profile analysis of the cookies incorporated with sunflower seed in three different proportions.

#### MATERIALS AND METHODS

Sunflower seeds (Whole Sunflower seeds) were cleaned and dried for 10 hours and ground into powdered form, grounded

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sunflower seed powder were used for fortification in the cookies flour. The treatments for preparation of sunflower seed fortified cookies were as follows.

### Treatment details

T1 – Cookies flour (Control)

T2 – Cookies flour + 10% sunflower seed powder

T3 - Cookies flour + 20% sunflower seed powder

T4 - Cookies flour + 30% sunflower seed powder.

The sunflower seed fortified cookies were prepared by mixing the cookies flour with specified amount of sunflower seed powder as mentioned treatments. All the ingredients such as butter, granulated sugar, water, whole egg, maida, baking powder, vanilla essence and salt were used. Butter and granulated sugar were mixed together in a planetary mixture for creaming of 15 minutes, and then water and whole egg were added.

Weigh and sieve the maida flour, baking powder, vanilla essence, salt and sunflower seed powder were added together in desired quantities and baked to a temperature of 180°C for 15 minutes.

### Colour analysis of cookies

The colour of the cookies was determined by the color hunter colorimeter. The colour of the cookies was evaluated by measuring the L (100 = white and 0 = black), a {red (+) and green (-)} and b {yellow (+) and blue (-)} value with a standard white tile (ISO 11037, 1999). The colour and texture profile analysis was replicated for three times.

### Texture Profile analysis of cookies

Texture analysis of sunflower seed incorporated cookies and sunflower meal incorporated cookies were done by Texture

**Table 1. Colour analysis of sunflower seed incorporated cookies**

Variables	Sample	Mean ±S.D	t- value			Significance		
			Control Vs 10 %	Control Vs 20 %	Control Vs 30 %	Control Vs 10 %	Control Vs 20 %	Control Vs 30 %
L	Control	52.33± 0.58	3.74	1.82	5.84	0.02	0.14	0.004
	10%	54.00±0.54						
	20%	51.68±0.19						
	30%	50.28±0.15						
a	Control	5.23±0.01	2.21	4.89	117.95	0.10	0.008	0.000
	10%	5.67±0.36						
	20%	5.19±0.01						
	30%	3.98±0.01						
b	Control	5.48±0.04	0.21	2.98	61.99	0.84	0.040	0.000
	10%	5.46±0.18						
	20%	5.57±0.01						
	30%	3.65±0.02						

NS-Not Significant

**Table 2. Texture profile analysis of sunflower seed incorporated cookies**

Variables	Sample	Mean ± S.D	t- value			Significance		
			Control Vs 10 %	Control Vs 20 %	Control Vs 30 %	Control Vs 10 %	Control Vs 20 %	Control Vs 30 %
Force(g)	Control	6009.23±0.001	2186.24	4714.58	6669.74	0.0000	0.0000	0.0000
	10%	5990.14±0.01						
	20%	6005.38±0.001						
	30%	6014.68±0.001						
Area	Control	412.19±0.001	10515.78	499.60	14361.96	0.0000	0.0000	0.0000
	10%	327.30±0.001						
	20%	412.60±0.001						
	30%	285.53±0.002						
Time difference (Sec)	Control	1.81±0.001	26.82	182.80	73.48	0.0000	0.0000	0.0000
	10%	1.37±0.02						
	20%	2.050.002						
	30%	1.75±0.001						
Hardness (N)	Control	6009.23±0.001	2186.24	4714.58	1646672.33	0.0000	0.0000	0.0000
	10%	5990.14±0.15						
	20%	6005.38±0.001						
	30%	4911.45±0.00						
Springiness (%)	Control	0.25±0.001	135.41	36.98	424.25	0.0000	0.0000	0.0000
	10%	0.15±0.00						
	20%	0.15±0.004						
	30%	0.00±0.00						
Cohesiveness (%)	Control	0.99±0.00	1.98	34.59	788.74	0.118	0.0000	0.0000
	10%	1.00±0.001						
	20%	0.99±0.00						
	30%	0.63±0.00						
Gumminess	Control	6008.56±0.001	16181.07	1220.54	1277.49	0.0000	0.0000	0.0000
	10%	5992.39±0.001						
	20%	6004.58±0.005						
	30%	3139.13±3.89						
Chewiness	Control	1528.60±6.24	181.01	37.04	424.23	0.0000	0.0000	0.0000
	10%	948.43±0.00						
	20%	907.10±2.83						
	30%	0.00±0.00						
Resilience (%)	Control	1.27±0.00	493.12	188.50	758.07	0.0000	0.0000	0.0000
	10%	1.62±0.001						
	20%	1.21±0.000						
	30%	1.76±0.001						

nalyzer (Make Stable Micro System, U.K, Model TA –XT2). Texture analysis of cookies was done by two methods such as Texture Analysis (TA) and Texture Profile Analysis (TPA) test. TA test was done for measuring cutting force of cookies and TPA test for hardness, cohesiveness, gumminess, chewiness, resilience and springiness (ISO 11036, 1994). The cutting speed of the texture analyzer was 0.1 mm/s and the speed of the probe was 1.0 mm/s before and after the measurement at the cutting test. The cutting force was measured and the specific cutting force was calculated from the ratio of the maximum cutting force to the cutting diameter at the cutting method. At the compression tests the penetration speed was 0.2 mm/s with different probes depending on the material of the tested sample. However, the speed of the probe was 1.0 mm/s before and after the measurement respectively.

## RESULTS AND DISCUSSION

The colour of the sunflower seed cookies was determined by the color hunter colorimeter and the results are shown in the Table 1. It can be depicted from the Table 1 that mean value for L was found to be  $52.33 \pm 0.58$  for control cookies, 10 per cent of SFS cookies had  $54.00 \pm 0.54$ , 20 per cent had  $51.68 \pm 0.19$  and 30 per cent had  $50.28 \pm 0.15$ . The mean value for "a" was  $5.23 \pm 0.01$  for control cookies,  $5.67 \pm 0.36$  for 10 per cent proportion, 20 per cent proportion had  $5.19 \pm 0.01$  and 30 per cent had  $3.98 \pm 0.01$ . It can be observed that 20 per cent proportion had a nearer value for "a" when compared with control cookies. The mean value for "b" was  $5.48 \pm 0.04$  for control cookies,  $5.46 \pm 0.18$  for 10 per cent proportion, 20 per cent proportion had  $5.57 \pm 0.01$  and 30 per cent had  $3.65 \pm 0.02$ . From the  $L^*$ ,  $a^*$  and  $b^*$  values among three proportions, it can be observed that 20% incorporation had a similar parameters to that of control cookies.

### Texture profile analysis of cookies

The Table 2 shows the texture profile analysis of SFS cookies of three different proportions. From the Table 2 it can be seen that the control cookies had a mean value of  $6009.23 \pm 0.001$  for force (g) variable. 10 per cent level of incorporation of SFS had  $5990.14 \pm 0.01$ , 20 per cent level of proportion had  $6005.38 \pm 0.001$  and 30 per cent proportion had  $6014.68 \pm 0.001$  of mean value. It can be noted that increase in incorporation of SFS leads to increased mean value for force. Maache-Rezzoug *et al.* (1998) investigated the effect of fat content in the texture of biscuits and found that an increase in fat content resulted in greater friability, and in a less crispy product. Texture attributes, such as hardness, crispness and fracturability of grain-based foods are important to consumers and to manufacturers (McManuis, 2001). Texture evaluation is an important step in developing a new food product or optimizing process variables (Meullenet *et al.*, 1998). Texture, flavor, taste, and appearance of a food are considered important to sensory acceptability and are important to foods that are considered crunchy, crisp, or bland in flavor (Bourne, 1982).

Area value of control cookies was found to be  $412.19 \pm 0.001$ ; 10 per cent proportion had  $327.30 \pm 0.001$ . 20 per cent incorporation of SFS had  $412.60 \pm 0.001$  and 30 per cent had  $285.53 \pm 0.002$ . Among the three proportions, 20 per cent level

of incorporation had area values nearer to that of control cookies and it was found to be significant at  $p < 0.001$  level of significance. The time difference (Sec) between the force and area were found to be greater in 20 per cent level of incorporation of SFS into cookies. Texture of the cookies can be evaluated with the hardness variable, control cookies had a mean hardness value (N) of  $6009.23 \pm 0.001$ ,  $5990.14 \pm 0.15$  for 10 per cent proportion, 20 per cent proportion had  $6005.38 \pm 0.001$  and 30 per cent proportion had  $4911.45 \pm 0.00$ . Hardness is the textural property which attracts more attention in evaluation of baked goods, because of its close association with human perception of freshness (Karaoglu and Kotancilar, 2009).

## Conclusion

The present research shows that there exists potential for sunflower seed flour incorporation into baked products. This would be of economic importance in many developing countries such as India in promoting the utilization of sunflower seed. Health concerns related to baked products consumption are often attributed to the higher amount of fat content in the product. Furthermore, fortification of commercial cookies with essential micro nutrients like vitamins and minerals, fiber and other flours which enhance their nutritional attributes can be targeted to ensure better nutrition to the people. Hence the present study throws light on the benefits of sunflower seed to the community by incorporating it in the cookies. The food industry should focus on the production of value-added products with sunflower seed for achieving sustainable development in health and nutrition.

## Acknowledgements

I am thankful to Indian Institute of Crop Processing Technology, Ministry of Food Processing Industries, Government of India, Thanjavur, Tamilnadu, India for helping me to carry out the research work at the institute.

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