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Development and Sensory Evaluation of Sunflower Seeds and Sunflower Meal Incorporated Ready to Eat Food Products.

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ABSTRACT

The present study was conducted to prepare the sunflower seed and sunflower meal fortified extruded products as influenced by different levels of sunflower seed and sunflower meal powder. Sunflower seed and sunflower meal fortified extruded products were prepared by fortifying sunflower seed and sunflower meal powder in different levels to the extruded product flour, whereas extruded product prepared out of without adding sunflower seed and sunflower meal powder were kept as control. Among the different treatments, 10 per cent sunflower seed and sunflower meal powder recorded highest scores for organoleptic parameters like colour, flavor, hardness, crispiness and mouth feel. 9 point hedonic scale also used to determine the acceptance of the product.

KEYWORDS : Sunflower seeds, Sunflower meal, Antioxidants.

INTRODUCTION

Adequacy in nutrient intake in terms of quantity and quality are one of the major determinants of health of a nation. India is undergoing nutrition transition and is facing the dual burden of malnutrition such as problem of under nutrition and micro nutrient deficiencies. Sunflower seeds are the one among that can address this problem unswervingly.

The sunflower is a plant in which every part can be beneficial: roots (recycling of nutrients and organic matter soil), stems (used of fodder), leaves (green manure, together with the stems), flowers (honey extraction) and seeds (oil production or food products). The sunflower seed has a high content of nutrients such as protein, dietary fiber, vitamins and minerals. It is also known that this seed is a good source of phytochemicals such as tocopherols, choline, betaine, lignan, phenolic acids and arginine. For this reason it is also considered a functional food. It is capable of preventing several diseases such as hypercholesterolemia, arterial hypertension, obesity and cancer due to its antioxidant capacity (Maria de Lourdes Reis Giada, 2011).

The cereal and legumes seeds have always had an outstanding place in human nutrition. It is known that about 70 % of the entire human food consumption is represented by seeds that comprise about 50 % and 70 % respectively of the total intake of proteins and calories by humans. Among the seeds most commonly consumed by humans are rice, wheat, barley, rye and beans. Nevertheless, other seeds may be incorporated as a supplement to the eating habit to enrich the nutritional value of the diet (Agriculture and Agri- food Canada, Sunflower seed: Situation & outlook, Bulletin, 2003).

There are basically two types of sunflower seeds that are commercially cultivated: a small black seed, rich in oil that is processed as sunflower oil and meal and another one that is thicker and white and black striped, also called confectionery varieties, may be consumed by humans by means of a variety of food products, in the form of beverages to breads, due to its high content of nutrients (Pandey P. H, 1988).

New nutrient data shows that sunflower seeds also contain a good amount of beneficial plant chemicals or photochemicals, thought to be advantageous to health. Sunflowers have been cultivated and harvested by many cultures for at least 4,500 years. They have been used for a variety of purposes that range from culinary to medicinal. Sunflower seeds are not only recommended for their low saturated, zero trans and high polyunsaturated and monounsaturated fat content. Sunflower seeds provide protein, fiber, vitamins, minerals and photochemicals. Sunflower meal is a by-product of industrial oil extraction of whole or dehulled seed (Stringhini et al., 2000). It can be used as an ingredient in feed production since it has high protein content. However, it also has a high insoluble fiber content which reduces digestible energy and low lysine content (Silva et al., 2002).

Sunflower meal is a by-product of edible oil industry. It is a rich source of vegetable protein and other nutrients with crude protein: 30.51, ether extract: 0.41, crude fiber: 18.51 and ash: 10.20 % (Jabbar, 1998). Due to its higher fiber contents, its use in poultry ration is limited but there is no such limitation for use of sunflower meal in ruminants feeding. Traditionally, farmers have been using the cotton seed cake or rape seed cake as a source of vegetable protein in livestock feeding. Due to its limited supply the cost of cotton seed cake has gone high. There is a need for replacing cotton seed cake with some other protein source (Jabbar M.A et al., 2008).

There are no toxic constituents and anti nutritional factors in sunflower meal (Theertha, 1990). Therefore, the defatted sunflower meal has been considered as a potential source of vegetable protein for human consumption.

MATERIALS AND METHODS

Sunflower seeds (Whole Sunflower seeds) and sunflower meal (after extraction of oil) were cleaned and dried for 10 hours and ground into powdered form, grounded sunflower seed powder were used for fortification in the extruded product flour. The treatments for preparation of sunflower seed and sunflower meal fortified extruded product were as follows.

Treatment details

T1 –Extruded product flour (Control)
T2 - Extruded product flour + 5% sunflower seed powder
T3 - Extruded product flour + 10% sunflower seed powder
T4 - Extruded product flour + 15% sunflower seed powder.
T5 - Extruded product flour + 5% sunflower meal powder
T6 - Extruded product flour + 10% sunflower meal powder
T7 - Extruded product flour + 15% sunflower meal powder.

The sunflower seed and sunflower meal fortified extruded product were prepared by mixing the extruded product flour with specified amount of sunflower seed and sunflower meal powder separately as mentioned treatments. All the ingredients such as maize, Sunflower seed / sunflower meal, salt, chilli powder and water were used. All the above mentioned ingredients were weighed separately and mixed together thoroughly in a blender for about 15 to 20 minutes. Then, the dry mixture was passed through a pre-conditioner. Steam was injected to start the cooking process, and the preconditioned mix (extrudate) was then passed through an extruder. The extruded product usually puffs and changes texture as it is extruded because of the reduction of forces and release of moisture and heat. The temperature for the extruder was adjusted to T1 52.3^0 C, T2 35^0 C, T3 100^0 C, T4 200^0 C. The extrudate was then cut to the desired length by blades at the output of the extruder, which rotate about the die openings at

a specific speed. The product was then cooled and dried and finally packed.

Organoleptic evaluation of sunflower seed and sunflower meal extruded product were carried out by a panel 15 semi-trained judges including staffs and post graduate students of Mother Teresa Women's University, Kodaikanal. The organoleptic characters viz., like colour, flavor, hardness, crispiness & mouth feel and 9 point hedonic scale also used to determine the acceptance of the product. These extruded product were evaluated on nine point hedonic scale (Ranganna, 1986). The mean score given by fifteen judges were used for statistical analysis.

RESULTS AND DISCUSSION

The data pertaining to organoleptic evaluation of sunflower seed and sunflower meal fortified extruded product was influenced by different treatments were presented in Tables 1 and 2.

The data reveals that there were significant differences among the control and 10 % treatment in sunflower seed and meal incorporation. Significantly higher score for hedonic scale was recorded in extruded product flour along with fortification with 10 per cent sunflower seed and meal powder. Level of Significance was found to be $p<0.05$ for flavor, $p<0.001$ for hardness, $p<0.05$ for hedonic 9 point scale among the control and 10 % incorporation of sunflower seed. Level of Significance among the control and 10% incorporation of sunflower meal was found to be $p<0.05$ for flavor, $p<0.05$ for crispiness.

CONCLUSION

Sunflower seed and sunflower meal extruded product and other ready to eat products can also be introduced in school feeding programmes to provide more nutritious meals. Early dietary The incorporation of sunflower seeds and meal in the preparation of ready to eat produts will indirectly improve the protein and vitamin- E intake of its consumers. The product has excellent market potential since it contain low carbohydrate, high protein, and sufficient amount of fiber, vitamin and mineral content.

TABLE 1 SENSORY EVALUATION OF SUNFLOWER SEED EXTRUDED PRODUCT

Variables	Sample/ Group	Mean±S.D	t- value			Significance		
			Control Vs 5%	Control Vs 10%	Control Vs 15%	Control Vs 5%	Control Vs 10%	Control Vs 15%
Colour	Control 5% 10% 15%	3.67±0.617 3.40±0.507 3.73±0.799 2.87±0.834	1.293	0.256	2.987	0.207 NS	0.800 NS	0.006 NS
Flavour	Control 5% 10% 15%	3.33±0.816 3.07±0.799 3.87±0.352 2.40±0.910	0.904	2.323	2.956	0.374 NS	0.028 P<0.05	0.006 P<0.001
Hardness	Control 5% 10% 15%	2.93±0.704 2.80±0.775 3.67±0.617 2.20±1.014	0.493	3.034	2.301	0.626 NS	0.005 P<0.001	0.029 P<0.05
Crispiness	Control 5% 10% 15%	3.33±0.900 3.13±0.834 3.73±0.458 2.20±0.941	0.631	1.535	3.371	0.533 NS	0.136 NS	0.002 P<0.001
Mouthfeel	Control 5% 10% 15%	3.33±1.047 3.00±0.655 3.87±0.352 2.27±1.033	1.046	1.871	2.810	0.305 NS	0.072 NS	0.009 P<0.001
Hedonic 9 point Scale	Control 5% 10% 15%	7.33±2.127 7.67±1.291 8.67±0.617 6.33±1.175	0.519	2.332	1.594	0.608 NS	0.027 P<0.05	0.122 NS

TABLE 2 SENSORY EVALUATION OF SUNFLOWER MEAL EXTRUDED PRODUCT

Variables	Sample/ Group	Mean±S.D	t- value			Significance		
			Control Vs 5%	Control Vs 10%	Control Vs 15%	Control Vs 5%	Control Vs 10%	Control Vs 15%
Colour	Control	3.67±0.617	2.156	0.695	2.655	0.040 P<0.05	0.493 NS	0.013 P<0.01
	5%	3.07±0.884						
	10%	3.80±0.414						
	15%	2.87±0.990						
Flavour	Control	3.33±0.816	0.226	2.323	2.615	0.823 NS	0.028 P<0.05	0.014 P<0.01
	5%	3.27±0.799						
	10%	3.87±0.352						
	15%	2.47±0.990						
Hardness	Control	2.93±0.704	0.271	4.111	2.200	0.788 NS	0.000 P<0.001	0.036 P<0.05
	5%	2.87±0.640						
	10%	3.80±0.414						
	15%	2.20±1.082						
Crispiness	Control	3.33±0.900	0.226	2.138	1.417	0.823 NS	0.041 P<0.05	0.167 NS
	5%	3.27±0.704						
	10%	3.87±0.352						
	15%	2.80±1.146						
Mouthfeel	Control	3.33±1.047	0.189	1.871	2.432	0.852 NS	0.072 NS	0.022 P<0.05
	5%	3.27±0.884						
	10%	3.87±0.352						
	15%	2.40±1.056						
Hedonic 9 point Scale	Control	7.33±2.127	1.242	1.948	1.922	0.224 NS	0.061 NS	0.066 NS
	5%	6.53±1.302						
	10%	8.47±0.743						
	15%	6.07±1.438						

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