

Development and Nutritional Evaluation of Pumpkinseed (*Cucurbita Moschata*) Flour Incorporated Cookies

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ABSTRACT

Pumpkin seeds are nutritionally dense food but commonly discarded as waste. Keeping in view the economic and nutritional benefits of pumpkinseeds, the pumpkinseed flour can be incorporated cookies in diet to enhance the nutritional status of people. These pumpkinseed flour incorporated cookies were prepared from the seeds. Cookies were prepared from different blends of refined wheat flour and pumpkinseed powder in the respective ratios of 90:10, 80:20, 70:30. The cookies were analyzed for their physical properties, proximate analysis, antioxidant activity and sensory properties. The acceptance of these cookies were evaluated by a sensory panel of 20 subject experts having normal health. Acceptability was measured by applying a 9-point hedonic rating scale and the feedback provided by the sensory panel. The study indicates that 30 percent (70:30 Variation-3) pumpkinseed flour incorporated cookies had better physical and sensory properties (color, appearance, texture, taste etc.). Nutritive values of these cookies were also calculated.

Keywords –Pumpkin seed, acceptability, nutritive value, antioxidant activity, hedonic rating scale, sensory panel

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I. INTRODUCTION

Today's consumers are conscious of their diet, and many prefer eating healthy foods. Biscuits represent a fast growing segment of food in India because of consumer demands for convenient and nutritious food products. The consumers demand has increased for the quality food products with taste, safety, convenience and nutrition. Thus nutrition has emerged as an added dimension in the chain of food product development. Biscuits are a popular foodstuff consumed by a wide range of population due to their varied taste, long shelf life and relatively low cost(1,2). Because of competition in the market and increased demand for healthy, natural and functional products, attempts are being made to improve the nutritive value of biscuits and functionality by modifying their nutritive composition. Such efforts are very often achieved by increasing the ratio of whole grain raw materials other than wheat or different types of dietary fibres in basic recipes with an attempt to increase biscuits protein and mineral content for quality and availability or increased dietary fibre content. In many studies, authors postulated that Whole grains contains the phytochemicals including phenolics, carotenoids, vitamin E, lignans, β -glucan, inulin, resistant starch, sterols, and phytates, may provide desirable health benefits beyond basic nutrition to reduce the risk of chronic diseases(3). A healthy and well-nourished person depends on healthy food system. Today, malnutrition imposes high cost on the society. Malnutrition comes in many forms and under nutrition is most prevalent form of malnutrition in developing countries. One out of every five children are stunted and around 165 million children in the world are malnourished (4). Moreover, about 2 billion people in the world lack vitamins and minerals which are essential for healthy life (5). Pumpkin seeds are popular that can be found hulled or semi – hulled at most grocery stores. Pumpkin most valuable elements are included in its part which is most commonly disregarded as waste, namely pumpkin seeds. The world pumpkin production in 2012 was 25 million tons, and the crop is spread throughout the world, including the production of small farmers and large producers to supply local markets (7). The species offers, in addition to pulp, seeds, which can be used in foodstuffs. Pumpkin seed is used in the East in the preparation of breads, cakes and cereals; however, this is not enough to prevent the waste of this material, which can have a beneficial effect on metabolism, physiology and

human nutrition since it is rich in fiber, natural source of protein and phytosterols (8). Therefore, the inclusion of waste seeds flour in the formulation of food products is an alternative to provide nutritional enrichment and to reduce costs in waste treatment. The present study entitled was carried out with the following objectives.

Objectives

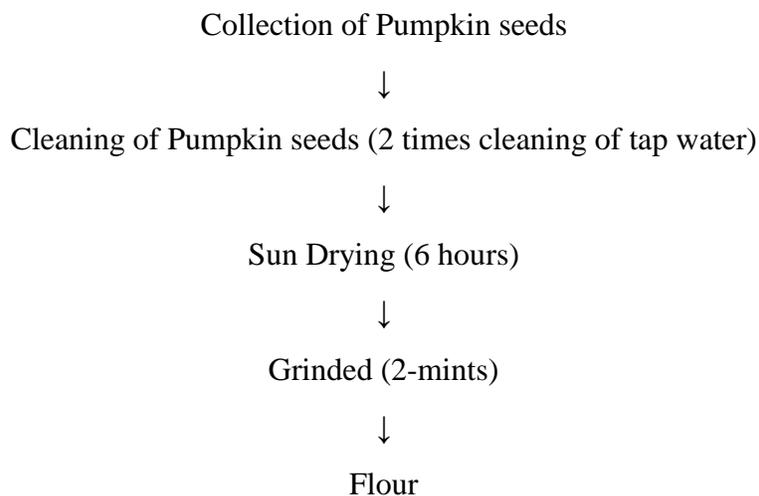
1. To formulate and standardize the pumpkinseed flour incorporated cookies.
2. To assess the sensory evaluation of the pumpkinseed flour incorporated cookies.
3. To study the nutrient composition, antioxidant and phytochemical properties of pumpkin seed flour incorporated cookies.

II. MATERIALS AND METHODS

Procurement of Pumpkin Seeds and Preparation of Flour

The study was conducted in the department of Nutrition and Dietetics at Periyar University, Salem, Tamil Nadu. The Raw Materials were procured from the local market namely Pumpkin seed, wheat flour, powdered sugar, butter, milk, baking powder in the Salem super market, Tamilnadu.

Preparation of Flour



Development and Standardization of PumpkinSeed Flour Incorporated Cookies

Table 1. Ingredients and method used to prepare cookies

Products	Ingredients used as Standard	Developed Food products	Method
Cookies	Refined wheat flour(100) Powdered sugar(50) Butter(60) Milk(13ml) Baking powder(1/4tsp)	Refined wheat flour(70) Pumpkin seed flour (Raw)(30) Powdered sugar(50) Butter(60) Milk(13ml) Baking powder(1/4tsp)	<ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> Fat was rubbed on a clean surface till it becomes light. <input type="checkbox"/> <input type="checkbox"/> Sugar was added to fat and rubbed again. <input type="checkbox"/> <input type="checkbox"/> Flours were sifted and baking powder was added gradually. <input type="checkbox"/> <input type="checkbox"/> Smooth dough was made by using milk. <input type="checkbox"/> <input type="checkbox"/> Dough was rolled to ¼ inch thickness. <input type="checkbox"/> <input type="checkbox"/> Round shapes were cut and baked at 150° C for 20 minutes.

Physical characteristics of Pumpkin seed flour incorporated cookies

The height, weight and bulk density of the cookies were determined using measuring scale and weighing balance respectively (priya 2006)¹⁰.

Size of the seeds: To determine the average size of the seeds, 100 seeds were randomly picked and their three linear dimensions namely, length (L), width (W) and thickness (T) were measured using a Verner reading to 0.01 mm Vilche et al¹¹.

Seed shape: The shape was determined in terms of its sphericity. The sphericity (SI) as given by Mohenin¹² is $SI = \frac{LWT \times 100}{L}$.

Thousand seed weight: Thousand Seed Weight (TSW) was measured by counting 100 seeds and weighing them in an electronic balance to an accuracy of 0.001 g and then multiplied by 10 to give mass of 1000 seeds.

Chemical analysis

After the development of cookies, the organoleptic evaluation of cookies were assessed. The highest acceptable levels along with its corresponding control were weighed, homogenized and oven dried at 60° C. Estimation of proximate composition *i.e.* moisture, protein, fat, fibre, ash, fiber, carbohydrate, energy and estimation of minerals *i.e.* sodium, potassium, calcium, magnesium, iron was done by using AOAC (2000) standardized methods(13). Antioxidant activity was done by using DPPH method given by Liang (2008)(14).

Sensory evaluation of the pumpkinseed flour incorporated cookies

Sensory evaluation of the cookies was conducted to assess the acceptability of cookies by a panel of 20 subject experts. The attributes of the study were, color and appearance, taste texture flavor and overall acceptability(15).

Nutrient composition, antioxidant and phytochemical properties of pumpkin seed flour incorporated cookies

The nutrient composition, antioxidant and phytochemical properties of pumpkin seed flour incorporated cookies were analyzed by the standard procedure.

Cost Calculation

The cost involved in the processing of the value added products cookies are calculated taking into account the fixed and variable cost during the course of processing.

Statistical analysis

The data was analyzed with the help of various statistical tools such as mean and standard error. To test the significant difference between the control and experimental samples, Analysis of variance (ANOVA) was applied using SPSS 16 software.

III. RESULTS AND DISCUSSION

Morphological characteristics of the Pumpkin seeds

The height, weight and bulk density of the product were determined using measuring scale and weighing balance respectively (priya 2006)¹⁰

Table-1

Morphological characteristics of the pumpkin seeds

Parameters	Whole seed (MEAN ± SD)
Length(mm)	0.61±0.01
Width(mm)	0.32± 0.04
Thickness(mm)	0.08± 0.01
Spearicity(mm)	2.84±0.01
Thousand Seed weight	299±0.40

The above table seed length, thickness thousand grains 0.61±0.01,

revealed that width, sphericity and mass were 0.32± 0.04,

0.08±0.01, 2.84±0.01 mm /seed and 299±0.408g respectively in whole pumpkin seeds.

Nutrients content of the pumpkinseed flour

Table 2

Proximate composition of pumpkinseed powder

Nutrients	Results (MEAN±SD)
Moisture (%)	1.9±0.30
Total ash (%)	4.9±0.59
Crude protein (%)	29.54±1.00
Crude fat (%)	3.9±0.02
Carbohydrate (%)	49.85±0.25
Energy(kcal)	629.65±0.10
Nitrogen free extract (%)	9.91±0.03

The result showed that the raw pumpkin seed powder contains 1.9% moisture, 4.9% of total ash, 0.04% acid in soluble ash, 29.54% of curd protein, 3.9% of curd fiber, 49.85% curd fat, 15.71% of carbohydrate, 629.65% of energy, 9.91% of nitrogen free extract.

Table-3
Mineral composition of pumpkinseed powder

Minerals	Amount (MEAN±SD)
Calcium (%)	0.139±0.01
Magnesium (%)	1.35±0.10
Phosphorus (%)	1.35±.10
Iron (%)	354.8±2
Zinc (%)	109±1.00
Manganese (%)	212±0.10
Copper (%)	30±3.00

The result of pumpkin seed 0.139% of

showed that contains calcium,

1.35% of magnesium, 1.35% of phosphorus, 354.8% of iron, 109% of zinc, 212% of manganese and 30% of copper.

Physical characteristics of developed cookies

The initial value of the pumpkin seed flour incorporated cookies height was 1.10cm, the final value of pumpkin seed flour incorporated cookies was 1.22cm, the initial weight of pumpkin seed flour cookies 15.49g, the final weight of the cookies was 16.18g, the initial ratio of pumpkin seed flour cookies bulk density was 0.57g, the final ratio of pumpkin seed flour bulk density was 0.58g.

The above table concludes that there is a difference between the initial value and final value, final value is high than the initial value.

Sensory evaluation of the pumpkinseed flour incorporated cookies

Bakery product cookies of pumpkinseed flour were liked very much by the judges. Cookies with pumpkinseed flour were found to be highly acceptable at 30% level. Overall acceptability mean scores for acceptable cookies were 8.2. Non-significant differences were found in all the attributes. Organoleptic score of cookies is presented in **Table**.

Table-4
Sensory evaluation of pumpkinseed flour incorporated cookies

S.NO	CRITERIA	MEAN ± S.D	t VALUE	p VALUE
1	Colour	8.1 ± 0.55	0.84	0.40
2	Texture	8.05 ± 0.60	0.92	0.35
3	Flavor	8.1 ± 0.85	1.35	0.17
4	Mouth feel	8.1 ± 0.64	0.98	0.32
5	Taste	8.15 ± 0.58	0.89	0.37
6	Overall acceptability	8.2 ± 0.61	0.94	0.34

The above table depicts the sensory criteria of cookies 30g variation-3 has the Mean and SD value was obtained to the Colour-8.1 ± 0.55, Texture-8.05 ± 0.60, Flavor-8.1 ± 0.85, Mouth feel-8.1 ± 0.64, Taste-8.15 ± 0.58, Overall acceptability-8.2 ± 0.61.

Based on the sensory evaluation (Variation-3) was highly accepted by the select panel members.

Nutrient content of the pumpkinseed flour incorporated cookies

The nutrition composition is analyzed to the developed to check the amount of nutrition present in the cookies.

Table-5
Nutrient content of the pumpkin seed flour incorporated cookies

S.NO	Parameters	V-1 10%	V-II 20%	V-III 30%
1	Moisture(g)	2.52	2.61	5.41
2	Total Ash(g)	0.35	0.71	1.61
3	Crude Protein(g)	8.89	13.19	10.30
4	Crude Fat(g)	13.98	15.09	25.76
5	Crude Fiber(g)	0.15	0.92	2.45
6	Carbohydrate(g)	74.11	67.48	54.47
7	Energy(Kcal)	457.82	462.72	490.92
8	Sodium(mg)	155.12	157.02	159.14
9	Potassium(mg)	305.05	310.61	318.28

10	Calcium(mg)	206.15	211.32	214.79
11	Magnesium(mg)	42.16	45.04	46.86
12	Iron(mg)	2.36	2.18	3.42
13	Dietary Fiber (%)	4.02	5.66	6.64

Variation-1 10% of pumpkin seed flour incorporated cookies contain 0.52g of moisture, 0.35g of total ash, 8.89g of crude protein, 13.98g of crude fat, 0.15g of crude fiber, 74.11g of carbohydrate, 457.72kcal of energy, 157.02mg of sodium, 310.61mg of potassium, 211.32mg of calcium, 42.16mg of magnesium, 2.36mg of iron and 4.02% of dietary fiber is present in pumpkin seed flour cookies.

Variation-2 20% of pumpkin seed flour cookies contain 2.61g of moisture, 0.71g of total ash, 13.19g of crude protein, 15.09g of crude fat, 0.92g of crude fiber, 67.48g of carbohydrate, 462.72kcal of energy, 157.02mg of sodium, 310.61mg of potassium, 211.32mg of calcium, 45.04mg of magnesium, 2.18mg of iron and 5.66% of dietary fiber is present in pumpkin seed flour cookies.

Variation-3 30% of pumpkin seed flour cookies contain 5.41g of moisture, 1.61g of total ash, 10.30g of crude protein, 25.76g of crude fat, 2.45g of crude fiber, 54.47g of carbohydrate, 490.92kcal of energy, 159.14mg of sodium, 318.28mg of potassium, 214.79mg of calcium, 46.86mg of magnesium, 3.42mg of iron and 6.64% of dietary fiber is present in pumpkin seed flour cookies.

Figure-1
Nutrient Content of the Pumpkinseed flour incorporated Cookies

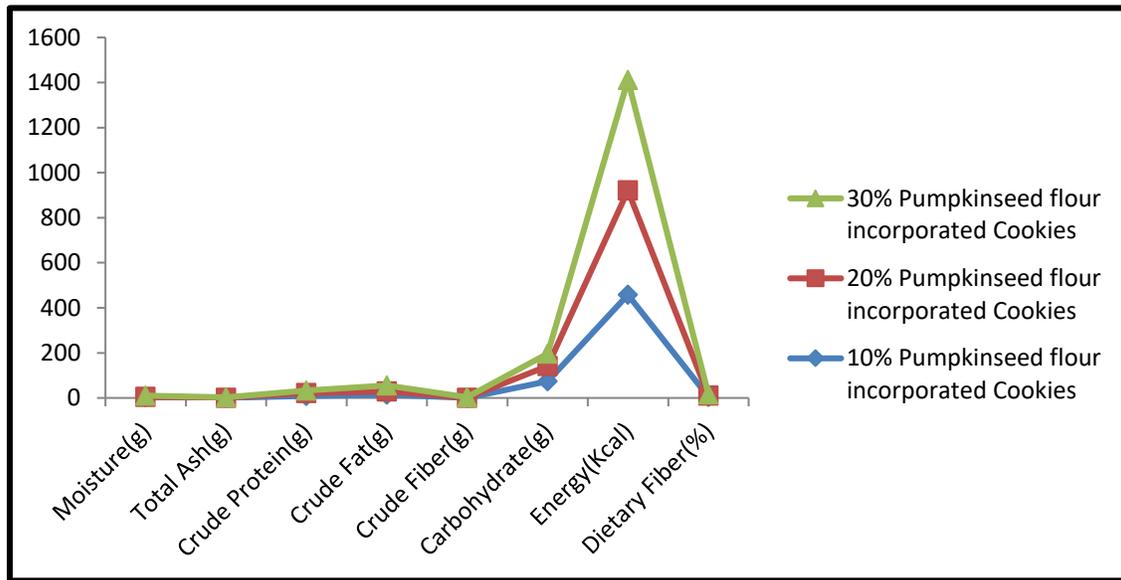
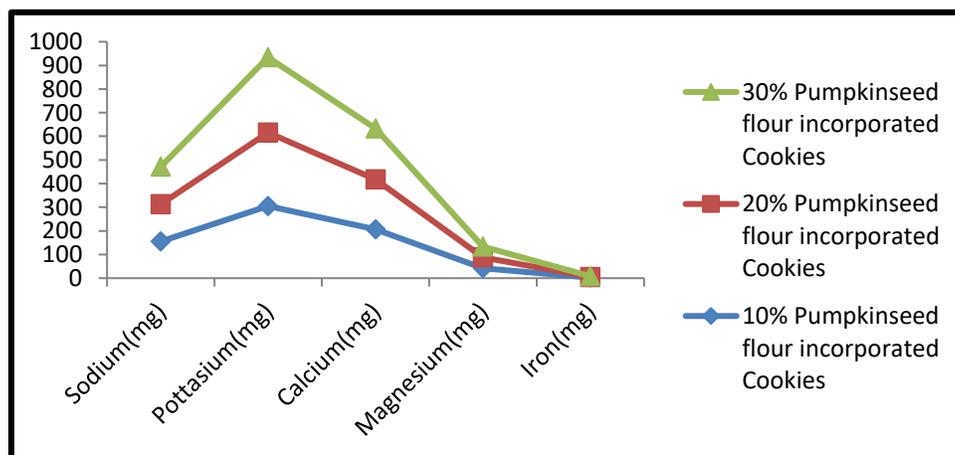


Figure -2
Mineral Contents of the Pumpkinseed flour incorporated Cookies



Antioxidant and phytochemicals properties of the pumpkinseed flour incorporated cookies

Table-6

Quantitative analysis of phytochemicals in pumpkinseed flour incorporated cookies

s.no	Test parameters	Variation-3
1	DPPH Scavenging Activity (%)	44.6
2	Gallic Acid(μg)	220
3	Catechin(μg)	ND
4	Procyanidine(μg)	ND
5	Tannins(μg)	66
6	Phenols(μg)	256
7	Sterols(μg)	26
8	Epicatechin(μg)	ND
9	Proanthocyanidin(μg)	ND

ND- Not Detected

The result revealed that 44.6% of DPPH Scavenging Activity, 220 μg of gallic acid, Not detected in catechin, Not detected in Procyanidine, 66 μg of tannins, 256 μg of phenols, 26 μg of sterols, Not detected in Epicatechin and Not detected in Proanthocyanidin is present in this variation-3 cookies.

Statistical analysis of cookies in different variations

Statistical analysis of pumpkinseed flour incorporated cookies in different variations

The ANOVA was done to kind significance difference in three variation of cookies the ANOVA value are given.

Table 7

Statistical analysis of pumpkinseed flour incorporated cookies in different variations

VARIATIONS	MEAN	S.D	SUM OF SQUARE	MEAN OF SQUARES	f VALUE	p VALUE
Variation 1	6.9000	.71818	20.233 Between groups	10.117 Between groups	22.222	0.485
Variation 2	7.0500	.68633				
Variation 3	8.2000	.61559	25.950 Within groups	0.455 Within Groups		

The above table indicated that it can be concluded that the mean of variation are significantly different from group. Also the p value is 0.485 which is greater than 0.05 thus it can be said that there was no significant different in sensory characteristics of three variation in cookies.

Cost Calculation

The cost analysis is calculated to the value added products because to see the price amount of the products and also whether it is cheap or costly and if the product is cheap, it can be reached among the all the people and also it purchased by all the group of people.

The cost calculation of pumpkin seed flour 30g incorporated cookies indicated 55 rupees for hundred grams 20 pieces.

IV. CONCLUSION

This study of pumpkinseed flour incorporated cookies increased its nutritive value. The pumpkinseed flour incorporated cookies(variation-3) was found to behighly acceptable through organoleptic evaluation. It also adds a variety in bakery products which can be used as a snack

item for all age groups. Pumpkinseed can be suitable for supplementation to the school children. Imparting education to women in villages regarding importance of pumpkinseeds which are commonly discarded as waste and encourage them to use these seeds in various recipes. The cost of the pumpkinseed flour incorporated cookies was increased with the level of incorporation of pumpkinseed flour. Thus, Nutrition Research on low cost foods, unfamiliar, nutrient rich foods and their health benefits to human population is the need of the hour.

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