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## **DEVELOPMENT, QUALITY EVALUATION AND POPULARIZATION OF PUMPKIN SEED FLOUR INCORPORATED BAKERY PRODUCTS**

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### **ABSTRACT**

The society is now heading to find an optimum alimentary diet that tries to promote the consumption of the foods that have a favorable effect on the health. This is the context where appeared the concept of “Functional foods”. Pumpkin seeds (*Cucurbita Pepo*) have received considerable attention in recent years due to its health protective and nutritional benefits. They are a beautiful food – earthy in flavor, sweet nuts used in variety of dishes like snacks (baking), soups, and salads. They are a good source of calories, proteins, carotenoids, minerals, fiber and phytosterols which contribute in regulating cholesterol. They also have omega 3 & omega 6 fatty acids needed for hormone balance, brain function and skin health. Tryptophan present in these seeds aids in milk production in lactating mothers and used to reduce postpartum swelling of the hands and feet. Hence Pumpkin seeds serve as a good nutritious snack and helps in promoting good health. Hence, the present study entitled “Development, Quality Evaluation and Popularization of Pumpkin Seed Flour Incorporated Bakery Products” was framed to formulate and standardize the pumpkin seed flour incorporated bakery products and to create awareness and popularize through nutrition education.

**Key words:** Pumpkin seeds, Nutrient rich, Pumpkin seed flour incorporated bakery products, Fortification.

### **INTRODUCTION**

Pumpkin seeds, also known as pepitas, are small, flat, green, edible seeds. Most pumpkin seeds are covered by a white husk, although some pumpkin varieties produce seeds without them. Pumpkin seeds are a popular snack that can be found hulled or semi – hulled at most grocery stores. Pumpkin’s most valuable elements are included in its part which is most commonly disregarded as waste, namely pumpkin seeds. Pumpkin seeds are rich in medicinal and nutritive components, due to which reason they are applied in therapeutic purposes across the globe. Food is one of our most basic needs, which provides us energy for everything we do and also for all involuntary functions of our internal organs. All the vast variety of food we eat comes either from plants or animals. Plants provide oil seeds, grains, fruits and vegetables (Srinivasan *et al.*, 2004). Like pulses, oil seeds and nuts are rich in protein particularly the amino acid, arginine. In addition they contain a high level of fat. Hence they are not only a good source of protein but are concentrated source of energy. Nuts are low in saturated fatty acids and high in monounsaturated and polyunsaturated fatty acids (Srilakshmi, 2008). Pumpkin (*Cucurbita pepo*) has received considerable attention in recent years because of the nutritional and health protective values of the seeds. The seed

is an excellent source of protein and also has pharmacological activities such as anti-diabetic, antifungal, antibacterial, anti-inflammation activities and antioxidant effects (Nkosi *et al.*, 2006). Besides, the pumpkin is economical and a nutrient dense source, the pumpkin seed flour fortified complementary food mix is economical, with highly acceptable sensory qualities and a rich nutritive value (Dhiman, 2009). Stevenson (2007) quoted that, pumpkin seeds offer a nutritious, sweet, somewhat soft and chewy snack or food additive. Some pumpkin seeds have hulls, while others do not. Like most gourds, they contain the best flavor when in season during the fall months. These flat, greenish seeds can be found at grocery stores; they come packaged or loose in bins. When purchasing seeds, check for moisture or insect evidence. Smell them if possible to check for freshness. They should not smell musty. Stored in air tight containers, they will keep for several months. Fortification involves the addition of nutrients to foods irrespective of whether or not the nutrients were originally present in food. It is a means of improving the nutritional status of a population. Fortified foods make an important contribution to diets. Adding nutrients to foods is not a new idea but the types of foods selected and the amounts of nutrients added will depend on the particular nutritional

needs of the individual (Wilde, 2002). Food fortification will continue to be an important tool, not only to treat or prevent specific nutritional deficiencies, but also to promote a general state of well being in different populations, and possibly to prevent certain chronic diseases. The identification and development of fortifying agents that will guarantee product quality and high bioavailability are technological and scientific challenges (Karmes *et al.*, 2006). Myosin, which is found in pumpkin seeds, is known for its ability to be essential for muscular contractions (Kreft, 2007).

Naghii (2007) stated that, Fortified foods contribute to maintaining optimal nutritional status and minimizing the likelihood of iron insufficiencies and use of fortified ready-to-eat cereals is a common strategy. The results showed that adding another food source of iron such as pumpkin seed kernels improves the iron status. Additional and longer studies using these two food products are recommended to further target population, and mainly in young children, adolescents, women of reproductive ages and pregnant women. According to Eller (2007), as a nutritious snack, ¼ cup of pumpkin seeds contain under 200 calories. This amount also provides 15 to 50 percent of several important nutrients including protein, zinc, iron, magnesium and manganese. The seeds also contain beneficial fatty acids and amino acids.

Pumpkin seeds have one of the highest levels of Antioxidants of any nut, seed or food. They are also loaded with tons of vitamins and minerals that the body needs, ‘A handful a day to keep the doctor away’ (Leung, 1996). The present study entitled “Development, Quality evaluation and Popularization of pumpkin seed flour incorporated bakery products” was carried out with the following objectives.

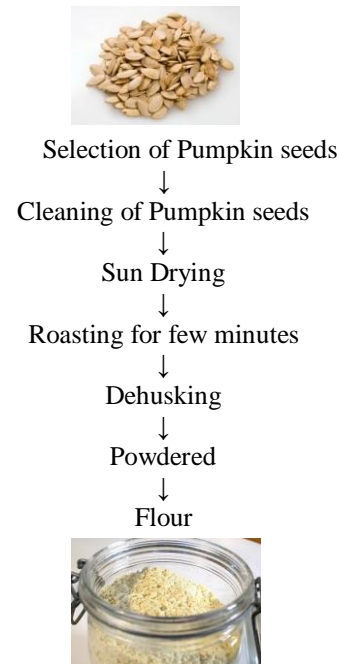
- To Formulate and standardize the standard and pumpkin seed flour incorporated bakery products.
- To assess the organoleptic evaluation of standard and pumpkin seed flour incorporated bakery products.
- To estimate the nutrient and microbial analysis of the processed pumpkin seed flour.
- To calculate the cost of the pumpkin seed flour incorporated bakery products.
- To create awareness and popularize the pumpkin seed flour incorporated bakery products through nutrition education.

## METHODOLOGY

### SELECTION OF PUMPKIN SEEDS

A pumpkin seed (*Cucurbita Pepo*) which comes from the cucurbita family was selected for the preparation of bakery products. Pumpkins were procured from the local market and the seeds were removed and subjected to cleaning and then dried in the sun till the moisture is completely removed. Drying was carried out in a hygienic environment and the seeds were free from insect, microbial

spoilage and off odour. The preparation of Pumpkin seed flour is given in Figure 1.



**Figure 1- Preparation of Pumpkin seed flour**

### FORMULATION OF PUMPKIN SEED FLOUR IN BAKERY PRODUCTS

Food processing is the set of methods and techniques used to transform raw ingredients into food for consumption by humans or animals (Levenstein, 2003). The bakery products like namely Bread, Bun (Plain, coconut), Biscuits (Sweet, Salt and coconut) and Cake (Plain, Plum) were formulated using Pumpkin seed flour. In all the eight baked products the major cereal namely Maida flour was incorporated by pumpkin seed flour in different proportions. The different proportions for the bakery products were prepared by blending 90 parts, 80 parts, 70 parts of the Maida flour with pumpkin seed flour. The key to proper baking really comes down to the proper ratio between the oven temperature and the baking temperature which can be determined by the size or weight of the dish (Skabar, 2005). The Formulation of Bakery products is given in Table 1.

**Table – 1- Formulated proportion of bakery products**

Standard ingredient Maida flour (g)	Incorporated ingredient Pumpkin seed flour (g)
90	10
80	20
70	30

### **ORGANOLEPTIC EVALUATION OF THE PUMPKIN SEED FLOUR INCORPORATED BAKERY PRODUCTS**

The Institute of Food Technologies (IFT) defines sensory evaluation as “The scientific discipline used to evoke measure, analyze and interpret human reactions to those characteristics of foods and beverages as they are perceived by the senses of sight, smell, taste, touch and hearing (Murano, 2003). The term ‘flavors’ includes taste, smell and feeling on the tongue. The sense of taste is limited to three characteristics namely sweet, salty and bitter (Swaminathan, 2004). Organoleptic evaluation is done to estimate the acceptability of the prepared pumpkin seed flour incorporated bakery products. The Numerical score card rating was used to sense the parameters like Appearance, Colour, Flavor, Texture and Taste of the Pumpkin seed flour incorporated bakery products. Semitrained (taste) panel members were selected for the evaluation and the panelists were asked to assess the degree of liking for each sample and the scores obtained were tabulated. Taste may be defined as the sensation derived from food as interpreted through the tongue to brain sensory system. The four primary taste sensations are sweet, salty, sour, bitter and fifth sensation is Unami (delicious) all triggers the brain’s response (Murano, 2003).

### **NUTRIENT ANALYSIS OF THE PROCESSED PUMPKIN SEED FLOUR**

The nutrient content of the diet needs to be screened in order to improve the availability (Raghramulu, 2002). The Pumpkin seed flour was used for analysis of Energy, Carbohydrate, Protein, Fat, Fiber, Ash, Moisture, Vitamin A, Vitamin K, Iron, Phosphorous and Folate.

### **STORAGE STABILITY OF THE PROCESSED PUMPKIN SEED FLOUR**

Product durability is assessed with the help of storage stability tests. The aim of these tests is to investigate the character of the product, its properties and the quantitative composition of its contents under storage conditions. This type of investigation can also be extended to cover the container. (Jay, 2005). The prepared pumpkin seed flour was stored in two different packaging materials (Plastic container and Polyethylene Bag) and both are stored at room temperature and also in refrigerated condition for a period of 45 days and the microbial contamination were tested during the initial, 15<sup>th</sup>, 30<sup>th</sup> and 45<sup>th</sup> day of storage. Packaging plays a visible and catalytic role in a modern economy, with the widespread and adoption of branding and development of products according to consumer preferences. It enables to preserve the quality and increase the shelf life of innumerable products ranging from milk and biscuits; to drugs and medicines, processed and semi product foods (Joshi, 2010). The Streak Plate Method was used to find out

the microorganism present in the prepared pumpkin seed flour.

### **IMPARTING NUTRITION EDUCATION AND POPULARIZATION OF THE PUMPKIN SEED AND PUMPKIN SEED FLOUR INCORPORATED BAKERY PRODUCTS**

Undernutrition, vitamin and mineral deficiencies, obesity and diet-related chronic diseases exist side by side in many countries. Whether food supplies are scarce or abundant, it is essential that people know how best to make use of their resources to ensure nutritional wellbeing. To be adequately nourished, individuals need to have access to sufficient and good quality food and they need an understanding of what constitutes a good diet for health, as well as the skills and motivation to make good food choices (WWW.FAO.ORG). The popularization of the formulated pumpkin seed flour incorporated bakery products was done by imparting nutrition education to the selected 25 homemakers through lecture, demonstration method and computer aided programme. After imparting nutrition education, evaluation was carried. For evaluating the level of nutritional knowledge, one score was awarded for right answer and zero for wrong answer for each question and the results were consolidated. Nutrition Education is any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food- and nutrition-related behaviors conducive to health and well-being (Bartlett, 2007). A questionnaire is a list of the questions sent to a number of persons to answer. It secures the standardized results that can be tabulated and also treated statistically (Bogardus, 2003).

### **POPULARIZATION OF THE PUMPKIN SEED FLOUR INCORPORATED BAKERY PRODUCTS AMONG HOMEMAKERS**

Bakery products in India are in common use. Items like breads, biscuits, buns, doughnuts, cookies etc are very much popular among people and use them in their daily life, because they are cheaper and largely accepted. Attempts at popularizing bakery products among all has been successful because these products are considered easy, convenient and rather inexpensive means of taking food in hygienically prepared ready-to-eat form (www.niir.org). This study attempted to test knowledge of homemaker’s attitude towards Pumpkin seeds and to see whether there is any potential this might have for changing their behavior to use this seeds in cooking. Therefore homemaker’s attitude on health out of waste, perception towards Pumpkin seeds and its products, willingness to use the seeds and intention to use this in cooking was the main agenda in popularizing the Pumpkin seed incorporated baked recipes. Bakery is a more traditional industry. Less money is spent on marketing, especially communicating the benefits of new products. If

more money was spent, the bakery industry could leverage increased sales (Patrick, 2006). Yadav (2002) stated that the cost is mainly calculated on the basis of price of goods used up for preparation, cooking, packaging and also transportation. The effort of every establishment is to maximize its profit and to do that cost should have to be minimized. Cost is one of the important features in order to make a product acceptable. The rural poor are living below poverty line and cost is an important feature. The formulated recipes should be in such a way that it is reachable to the consumer.

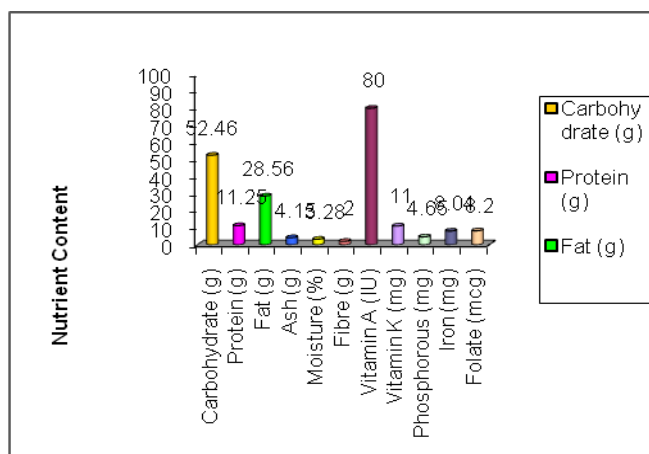
### STATISTICAL ANALYSIS

The overall acceptability scores obtained through sensory evaluation was analyzed statistically using the mean and standard deviation (Gupta, 2003). The results obtained were consolidated, tabulated, statistically analyzed using 't' test and results were discussed and concluded.

### RESULTS AND DISCUSSION

#### THE SALIENT FINDINGS OF THE STUDY ARE AS FOLLOWS

The nutrients present in the pumpkin seed flour were 52.46g of carbohydrate, 11.25g of protein, 28.56g of fat, 5.49g of monounsaturated fatty acid, 7.01g of poly unsaturated fatty acid, 8.04mg of iron, 4.65mg of phosphorous, 2g of fiber, 80 IU of vitamin A, 11mg of vitamin K and 8.20 mcg of folate. It was revealed that pumpkin seed flour is rich in protein, iron, vitamin A, vitamin K and folate. The nutrient content of processed pumpkin seed flour is given in Figure 2.

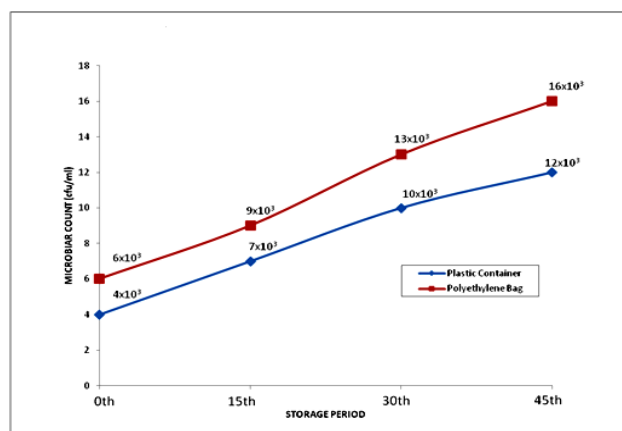


**Figure 2 - Nutrient content of the pumpkin seed flour**

The sensory characteristics of Pumpkin seed flour incorporated bakery products studied by organoleptic evaluation revealed that all the products namely, Bread, Bun (Plain, coconut), Biscuits (Sweet, Salt and coconut) and Cake (Plain, Plum) were highly acceptable and none of the

products were rated poor by the panel members. Further statistical analysis of 't' test revealed that there was no significant difference found between the standard and the pumpkin seed flour incorporated bakery products. The panel members commented that the pumpkin seed flour can be used as a major ingredient in value added food products.

The count of pumpkin seed flour stored in plastic container at room temperature on initial day was  $4 \times 10^3$ , 15<sup>th</sup> day was  $7 \times 10^3$ , 30<sup>th</sup> day was  $10 \times 10^3$  and  $12 \times 10^3$  on 45<sup>th</sup> day of storage. The microbial count of processed pumpkin seed flour stored at room temperature is given in Figure 3.



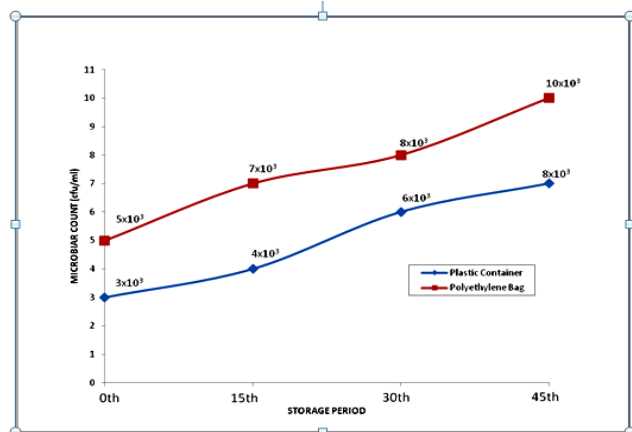
**Figure 3 - Microbial count of processed pumpkin seed flour at room temperature**

Pumpkin seed flour stored in polyethylene bag showed gradual increase of bacterial counts when compared to pumpkin seed flour stored in plastic container at room temperature. The count was  $6 \times 10^3$  on initial day which has increased to  $9 \times 10^3$  on the 15<sup>th</sup> day,  $13 \times 10^3$  on 30<sup>th</sup> day and finally increased further to  $16 \times 10^3$  on 45<sup>th</sup> day of storage.

The bacterial count of the Pumpkin seed flour stored in plastic container at refrigerated temperature on the initial day was  $3 \times 10^3$  and increased to  $4 \times 10^3$  on the 15<sup>th</sup> day. And on the 30<sup>th</sup> day of storage the count was further increased to  $6 \times 10^3$  and finally  $7 \times 10^3$  on 45<sup>th</sup> day of storage period.

Pumpkin seed flour stored in polyethylene bag, at refrigerated temperature showed higher counts when compared to the pumpkin seed flour stored in plastic container. The count was  $5 \times 10^3$  on initial day which has increased to  $7 \times 10^3$  on the 15<sup>th</sup> day,  $8 \times 10^3$  on 30<sup>th</sup> day and finally increased further to  $10 \times 10^3$  on 45<sup>th</sup> day of storage. It is revealed that microbial count of processed pumpkin seed flour increased when it is stored in Polyethylene bag when compared to the pumpkin seed flour stored in Plastic containers. Hence, it is understood that the growth of bacteria is less when the food product is tightly closed in an airtight container. Microbial analysis revealed the presence of Streptococci species in the processed pumpkin seed flour. However the count of bacteria was within the standard limits and no fungus was observed. The microbial count of

processed pumpkin seed flour stored at refrigerated temperature is given in Figure 4.



**Figure 4 - Microbial count of processed pumpkin seed flour at refrigerated temperature**

The cost of formulated pumpkin seed flour incorporated bakery products varied according to the ingredients added in each product. The cost of pumpkin seed flour incorporated bread varied from Rs. 4.75 to Rs. 6.25. The cost of pumpkin seed flour incorporated plain bun varied from Rs. 1.75 to Rs. 2.20 and coconut bun from Rs. 5.30 to Rs. 5.90. The cost of pumpkin seed flour incorporated sweet and salt biscuits varied from Rs. 2.20 to Rs. 3, coconut biscuits from Rs. 3.25 to 4. The cost of plain cake ranged from Rs. 4.50 to Rs. 5 and plum cake from Rs. 5.50 to Rs. 6.50. As the percentage of pumpkin seed flour increases, the cost of the product is also increased, this might also increase the nutritive value of the products.

The cost of all the pumpkin seed flour incorporated bakery products was calculated depending on the ingredients added in each product. When compared to the standard, pumpkin seed flour incorporated bakery products showed gradual increase in cost which may be due to its high nutritive value and final taste of the product. The another factor for the difference of cost between standard and pumpkin seed flour incorporated recipes was, the shelf life of the pumpkin seed flour incorporated bakery products was found to be the same.

The results of the nutrition education revealed that, before imparting nutrition education, majority (49%) of the respondents had obtained the scores pertaining to nutrition knowledge between 11- 20 followed by 0-10 (32%) and 21-30 (24%). None of the respondents are able to get the levels of 25 and above.

After imparting nutrition education, majority (72%) of the respondents had obtained the scores pertaining to nutrition knowledge between 11- 20. And 28 percent of the respondents were able to get the scores up to 21-30. Comparison of pre-test and post-test scores is given in Table 2.

**Table – 2 - Comparison of nutrition knowledge scores of the homemakers before and after imparting nutrition education N = 25**

Scores	Pre Test (T <sub>1</sub> ) before imparting nutrition education		Post Test (T <sub>2</sub> ) after imparting nutrition education	
	No	%	No	%
<b>0-10</b>	8	32	0	0
<b>11-20</b>	11	49	18	72
<b>21-30</b>	6	24	7	28

Before popularization, only 12% of the housewives were aware about pumpkin seed usage in their recipes. And 24% of homemakers used pumpkin seeds moderately in their cooking. Majority (64%) of the homemakers were unaware about its importance in their cooking.

It is evident that after popularization, majority (72%) of the homemakers used pumpkin seeds in their cooking after the popularization of pumpkin seed flour incorporated bakery products followed by 16% of homemakers who used moderately. And only 12% of the homemakers used minimum pumpkin seeds in their cooking. Comparison of utilization of pumpkin seed and flour before and after popularization among homemakers is shown in Table 3.

**Table – 3 - Comparison of utilization of pumpkin seed and flour before and after popularization among homemakers in cooking**

Usage	Before Popularization		After Popularization	
	No	%	No	%
Maximum	3	12	18	72
Moderate	6	24	4	16
Minimum	16	64	3	12

From the results, it can be inferred that nutrition education through the Lecture method, Demonstration method and Computer aided programme through power point presentation had a positive impact on the nutritional knowledge of selected homemakers. It is revealed that after imparting nutrition education and popularizing the pumpkin seed flour incorporated bakery products among homemakers, the utilization of pumpkin seeds and its flour in cooking has been increased rapidly.

## CONCLUSION

It may be concluded from the above findings that, incorporation of pumpkin seed flour in bakery products increased its nutritive value. The standard and pumpkin seed flour incorporated bakery products was found to be highly acceptable through organoleptic evaluation. It also adds a different variety in bakery products which can be used as a snack item for all age groups. Nutrition education and

popularization of pumpkin seeds and pumpkin seed flour incorporated bakery products to homemakers showed significant change in their usage of pumpkin seeds in cooking. The cost of the pumpkin seed flour incorporated bakery products was increased with the level of incorporation of pumpkin seed 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. This may have an impact on alleviation of poverty and malnutrition, life style disorders and other diseases. Nutritionists have to play a major role in this regard for the all-round development of the community and thereby the Nation.

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