

## **THE DEVELOPMENT OF PUMPKIN SEEDS FLOUR AS SUPPLEMENTED PRODUCTS**

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### **ABSTRACT**

*Pumpkin seeds are nutritionally dense by-product of pumpkin but commonly discarded as waste. The purpose of the study was to formulate pumpkin seeds as valuable product with good nutritionally supplement. Pumpkin seeds were processed into raw flour. Four products namely Cake, Cookies, Muffin and Bingka were prepared and standardized. For each product, one control and three experimental samples using raw pumpkin seed flour were prepared. The control and test samples were analyzed for their sensory attributes. Most accepted test samples were analyzed for nutritional composition along with control sample. All the products supplemented with 30% pumpkin seed were most acceptable except cake which was highly accepted at 20% level of supplementation. The moisture, protein, fat, fiber, ash, iron, zinc content of raw pumpkin seed flour was 6.98 and 2.80%, 22.05 and 23.45%, 30.80 and 31.90%, 7.68 and 7.56%, 8.92 and 8.04%, 8.16 and 7.08mg/100gm, 6.60 and 6.35mg/100gm respectively. Total carotenoid content, antioxidant activity, peroxide value of pumpkin seed flour was found as 0.75 and 0.42mg/100gm, 68.80 and 61.30%, 4.60 and 6.20meq/kg. The protein, fat, fiber, ash and energy content of all the supplemented products were significantly higher as compared to the control samples.*

**Keywords:** *Pumpkin seeds, supplemented products, sensory evaluation, nutritional composition.*

### **1. Introduction**

The enrichment of food products is a consequential idea to treat explicit nutritional insufficiencies. Food enrichment also elevates healthiness in humanity and averts chronic diseases. The identification and evolution of fortifying agents that would guarantee good product quality and maximize the bioavailability of essential nutrients create technical and scientific challenges for the nutritionists (Revathy and Sabitha 2013). Significant consideration has been given to enrich wheat flour products with high protein oilseed flour and for this, baked products are considered best due to worldwide consumption.

Pumpkin belongs to the family Cucurbitaceous. It is a plant that has been traditionally used as a medicine in developing countries and obtained revival of use in the United States and Europe (Caili et al 2006). Edible parts of the plant include the flowers, fruit, leaves, root and seeds. Pumpkin is cultivated throughout the world and traditionally used as medicine in China, Yugoslavia, Argentina, India, Mexico, Brazil and America. Pumpkin has gained extensive attention in current times due to the good nutritional composition and health shielding values of its seeds. Pumpkin seeds, also known as pepitas which are small, flat, green, edible seeds. These seeds are the most important part of pumpkin but are mostly discarded as waste. But now days,

pumpkin seeds are subjected to industrial processing and have been commonly commercialized as a salty snack.

Pumpkin seeds are also a good source of fibre. They contain 31.48 % crude fibre (Nyam et al 2013). Fibre present in pumpkin seeds can prevent constipation, diabetes, prolong intestinal transit time, lower cholesterol level and provide satiety. Pumpkin seed flour is a valuable by-product obtained after the extraction of oil from pumpkin seeds which is rich in fibre and helpful in maintaining intestinal functions and provides satiety that is beneficial for obese people to control the body weight. Furthermore, these studies had formulated and standardize pumpkin seed flour in raw form, developed and organoleptic ally evaluate pumpkin seed flour supplemented products and conducted experiment by using instrument to test shelf-life, physicochemical properties to innovate product from pumpkin seed.

## **2. Literature Review**

Pumpkin and their seeds are native to America and various species are found across the North, South and Central America. Pumpkin seeds - a renowned food among many inhabitant American tribes, who consume these seeds for their nutritional and medicinal properties. From America, the pumpkin seeds got popularized and spread to the rest of the globe through trade and exploration over many centuries. India and other parts of Asia also included these seeds into a place of importance instead of discarding them. Today, China ranks first in production of pumpkin and pumpkin seeds in the whole world. India, Russia, the Ukraine, Mexico, and the U.S. are also major producers of pumpkin and pumpkin seeds.

Pumpkin seeds were considered as most nutritious – excellent source of vitamin A, all the minerals, protein and fair sources of thiamine and niacin. Pumpkin seeds were found to contain several major groups of active constituents: essential fatty acids, amino acids, minerals, phytostereols (e.g.  $\beta$ -sitosterol) and vitamins- pyridoxine, vitamin K, pantothenic acid,  $\gamma$ -tocopherol, thiamine, niacin, folate, choline. Elinge et al (2012) analysed the pumpkin seeds for their nutritional and ant nutritional composition and the results obtained were: moisture content 5.00%, ash 5.50%, crude lipid 38.00%, crude fibre 1.00%, crude protein 27.48%, carbohydrate 28.03%, energy 564Kcal/100g. Mineral analysis showed that the iron and zinc content were 3.75mg and 14.14 mg per 100gm. Milovanovic et al (2014) found the chemical composition of pumpkin seeds as moisture 5.26%, ash 3.26%, protein 24.46%, fat 38.53% and crude fibre 14.77% and she evaluated the nutritional quality of the wheat bread prepared with supplementation of pumpkin seed, buckwheat and quinoa. The principle of the research was to mix pumpkin seed, buckwheat and quinoa at the level of 40% with wheat flour and to study the effect of this blend on nutritional composition and sensory parameters of the bread.

### **2.1 In vitro protein digestibility**

The good quality of protein depends on the amino acid profile and the in vitro protein digestibility (Hahn et al 1984). El-Adawy and Taha (2001) reported that pumpkin seeds kernels had 90% in

vitro protein digestibility which was higher than the water melon seeds kernel flour i.e. 87.9%. Atuonwu and Akobundo (2010) stated that the in vitro protein digestibility of defatted pumpkin seed flour was 77.91%. They also found the essential amino acid index (EAAI) and protein efficiency ratio (PER) as 57.31% and 1.80. Hamed et al (2008) examined the effect of roasting on protein digestibility of pumpkin seed flour. Results showed that the in vitro protein digestibility of unroasted and roasted seed flour was 59.39 and 92.76%. Roasting significantly increased the protein digestibility may be due to the reduction of anti-nutritional factors. Fagemi et al (2005) showed that the in vitro protein digestibility of raw dried, boiled, fermented, germinated and roasted fluted pumpkin seeds was 78.3, 86.5, 85.9, 72.0 and 78.1 %.

## **2.2 Effect of Processing on Pumpkin Seeds**

Many heat treatments were used in pumpkin seed preparations before they were consumed. Pumpkin seeds were employed for human feeding after previous salting and roasting (Cirrilli 1971). Giami et al (2001) reported that there were no significant differences on crude protein, ash and fat content of raw and heat processed (roasted and boiled) sample of breadnut seed. Fagbemi et al (2005) stated that roasting significantly increased the water absorption capacity, fat absorption capacity and least gelation concentration of the defatted pumpkin seed flour by 17.26, 21.3 and 6% while heat processing reduced foaming capacity and emulsification capacity. Modawi (2006) investigated the effect of roasting process on defatted pumpkin seed flour in terms of nutritional, anti-nutritional and functional properties. It was observed that roasting process reduced the protein content and increase the fibre and carbohydrate content. Roasting had no significant effect on moisture, ash and fat content.

## **2.3 Antioxidant activity**

Nyam et al (2013) found that DPPH radical scavenging activity of pumpkin seeds was 36.97%. He also prepared bread supplemented with 5 % pumpkin seeds. Results showed a 37.99% increase in DPPH radical scavenging activity in pumpkin seed bread as compared to control bread. Bialek et al (2016) analysed the quality of pumpkin seed flour and found that the antioxidant capacity measured by DPPH reduction of pumpkin seed flour was 64%. Xanthopoulou et al (2009) determined the antioxidant and lipoxygenase inhibitory activities of pumpkin seed methanol extracts using free radical DPPH (2,2-diphenyl-1-picrylhydrazyl) scavenging and soyabean lipoxygenase inhibition. Results expressed as EC<sub>50</sub> values for scavenging activity on DPPH assay was 5.57 mg/ml. In addition, the methanol extract inhibited 50% of lipoxygenase activity at concentrations ranging from 0.3 mg/ml to 1.02 mg/ml. Ardabili et al (2010) reported that the addition of pumpkin seed oil in the canola oil enhanced the frying stability of canola oil. Phenolic composition of pumpkin seed oil had good anti-oxidative effect which significantly affects the canola oil stability.

### **3. Pumpkin Seeds and Health**

*Bone protection:* Pumpkin seeds are good source of minerals i.e. magnesium and phosphorous which optimize the bone health and avert osteoporosis. Ryder et al (2005) assessed the relationship between magnesium intake and bone mineral density, a major factor in the development of osteoporosis, in over 2000 elderly men and women aged 70-79 yrs. After taking into account confounding factors of age, calcium intake, osteoporosis status, Body Mass Index, and physical activity, they concluded that higher intakes of magnesium were correlated with greater bone mineral density, particularly for Caucasian (white people of Europe) individuals. They believed that magnesium promotes alkaline environment inside the bones, which had shown to be conducive to boost the bone mineral density.

*Cancer management:* Consumption of pumpkin seeds has revealed extensive benefits in benign prostate hyperplasia i.e. enlargement of prostate gland in men. GossellWilliams et al (2006) studied the efficacy of pumpkin seed oil on rats with testosterone-induced prostate hyperplasia. During the course of hyperplasia induction, pumpkin seed oil and corn oil (vehicle) were orally administered for 20 days. On 21st day, rats were killed and their prostate was weighed. The induced increase in prostate size was repressed in rats fed with pumpkin seed oil i.e. 2mg/100g. The protective effect of pumpkin seed oil was considerable at the higher dose. The results showed that utilization pumpkin seed oil can be helpful for managing benign prostatic hyperplasia. Zaineddin et al (2012) given a food-frequency questionnaire to a vulnerable group of women. It was found that the eating of sunflower and pumpkin seeds was associated with extensively reduced postmenopausal breast cancer threat.

### **4. Research Methodology**

The present study was carried out on development and nutritional evaluation of pumpkin supplemented products. The material and methods selected for the study have been discussed under the following headings.

1. Procurement of pumpkin seeds and preparation of flour .
2. Development and standardization of pumpkin seed flour based products .
3. Organoleptic evaluation of developed products .

The developed products were evaluated by my classmates. They were served each preparation with one control and six experimental samples. Control sample was prepared from ingredients used in the usual recipes and test samples were prepared by using pumpkin seed flour at different levels for different recipes. The samples were coded to avoid any biased judgement. Each product was tested and means scores were calculated. They were asked to score the samples for appearance, colour, texture, flavour, taste and overall acceptability using a score card of 9-point Hedonic Rating Scale.

## **5. Results and Discussion**

Four samples of the cake were prepared using refined wheat flour for control and for test samples, refined wheat flour was supplemented with raw pumpkin seed flour at different levels (10%, 20% and 30%). The highest scores for all sensory parameters was obtained by T2 treatment (20%) and was found to be higher than control with overall acceptability 7.66 and 7.58 respectively. The other two treatments i.e. T1 (10%) and T3 (30%) had a lower overall acceptability score i.e. 7.40 and 7.46 respectively as compared to control (refined wheat flour) with 7.58 overall acceptability score. The overall acceptability score of T2 treatment was higher than that of control and other two treatments. Thus indicating that the cake supplemented with raw pumpkin seed flour at 20% level was better accepted than the cake prepared with refined wheat flour.

## **6. Conclusion**

Incorporation of pumpkin seed flour in various recipes at a level up to 30% is highly acceptable and is recommended to improve the nutritional value of diets in terms of protein, fat, fiber, energy, iron and zinc. Value added products using pumpkin seed flour can be supplemented to the children to eradicate malnutrition. These products may also be a part of supplementary feeding programmers. Further research is required to study the complete potential of pumpkin seed flour.

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