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Development, Quality Evaluation and Acceptability of Pumpkin Seed Flour Incorporated in Gravy

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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 and 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 acceptability of Pumpkin Seed Flour Incorporated in Gravy".

Keywords: Pumpkin seed; Optimum alimentary diet; Cholesterol; *Cucurbita pepo*

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. Pumpkins 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 [1]. 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 [2]. 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 [3]. 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 [4]. Stevenson [5] 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 [6]. 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 [7]. Myosin, which is found in pumpkin seeds, is known for its ability to be essential for muscular contractions [8]. Naghii [9] 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 [10], as a nutritious snack, ¼ cup of pumpkin seeds contains less than 200 calories. This amount also provides 15-50% 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". The present study entitled was carried out with the following objectives

1. To determine the proximate composition, functional and physical properties of Pumpkin Seed flour.

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2. Prepare traditional gravies based on pumpkin seed flour.
3. Evaluate the organoleptic attributes of these gravies.

Methodology

This chapter deals with description of research procedure and techniques based on literature reviewed. The present investigation entitled "Proximate Composition and Functional Properties of Pumpkin Seed Flour" was carried out in the Department of Food and Nutrition, College of Home Science, Maharana Pratap University of Agriculture and Technology, Udaipur.

Plan of the study

Preparation of sample, sensory evaluation and proximate analysis of the pumpkin seed flour. The materials used and method adopted in the experiments conducted for attainment of various objectives has been elaborated in this chapter, under the following sections:

The study was undertaken in the following phases:

PHASE-1

Physico-chemical analysis of pumpkin seeds.

Local of the study

The present study was conducted at Department of food and nutrition, college of home science, Maharana Pratap University of Agriculture and technology Udaipur, Rajasthan, India.

Sample collection and flour preparation

The dry pumpkin (*Cucurbita pepo*) seeds were obtained from the local markets of Udaipur and Rajasthan. Powdered seeds were obtained and dried at 37°C in an incubator and preserved in clean sealed polyethylene bags at room temperature.

Physical properties

Pumpkin seed was selected for analysis of physical properties. It was carried out using standard techniques as described below.

Seed size: Length and width of 10 seeds were measured using electronic digital calipers. Color and appearance was visually examined.

No. of seed in 10 g: 10 g of seeds were counted manually and replicate 30 times.

Weight of 100 seeds: 100 seed were counted manually and weighed using weighing balance (make, least count, maximum count) and replicate 30 times.

Seed volume: Volume of seeds were assess through method suggested by Bishnoi and Khetrapal in triplicate. Raw sample (BW) weighing 10 g were transferred to a measuring cylinder, where 10 ml distilled water was added. Seed volume was recorded after subtracting 100 ml from the total volume (ml).

Seed density: It was determined through the method suggested by Bishnoi and Khetrapal in triplicate. Raw sample (BW) weighing 10 g were transferred to a measuring cylinder, where 10 ml distilled water was added. Seed volume was recorded after subtracting 100 ml from the total volume (ml). Density was recorded as g per ml.

Functional properties determination

Water and oil absorption capacity: The functional properties of individual and composite flour such as Water Absorption Index (WAI), Oil Absorption Index (OAI) were determined by standard methods. WAI and OAI were determined according to the methods of Sosulski et al. Flour samples (1 g) were suspended in 10 ml of water (for WAI) or vegetable oil (for OAI) in a centrifugal tube. The slurry was shaken on a platform tube rocker for 1 min at room temperature and centrifuged at 2000 rpm for 10 min. The supernatant was decanted and discarded. The adhering drops of water was removed and reweighed. WAI and OAI were expresses as the weight of sediment/initial weight of flour sample (g/g).

$$\text{WAC and OAC\%} = \frac{\text{Weight of sample after centrifugation (g) - weight of sample before centrifugation}}{\text{Weight of original sample taken (g)}} \times 100$$

Proximate Analysis

Determination of moisture

Moisture content of flour is very important for its shelf life, lower the flour moisture, the better its storage stability. Hruskova and Machova observed that the changes in the moisture contents depends on the short time storage conditions and had a different time course in the individual locations. Standardized Procedure of AOAC [11] was followed to estimate the nutrients composition of foods.

Crude nitrogen

Crude Nitrogen was determined based on the Kjeldhal procedure and crude protein value was obtained by multiplying the nitrogen.

Crude fat

The sample of dried feed stuff is placed in a continuous extractor (Soxhlet) and subjected to an extraction with ether. The ether soluble substances thus removed are collected in a flask dried and weighed. The material extracted include besides the triglycerides material such as phospholipids, sterols, essential oils, pigments, waxes, etc. hence term "crude fat" [12,13]. If the sample contains water-soluble sugars as in molasses, the weighed sample should be washed with water and dried before extraction.

Crude fiber

The dry, fat free material is boiled successively with dilute acid and dilute alkali for a specified time period and filtered. The residue was dried and ignited. The loss in weight on asking gives crude fibre. This consists chiefly of cellulose and lignocelluloses [14,15].

Total ash

Ash comprises the mineral contents of foods and feeding stuff, which can be determined by igniting a known amount of dried material (moisture free fees) in a muffle furnace.

Determination of carbohydrate

The total CHO content in maize flour was calculated by difference method.

Total CHO (%)=100-(Moisture+Crude Protein+Total Ash+Fat+Crude Fibre)

Calculation of energy

Carbohydrate, protein and fat are multiplied with their conversion factors.

PHASE-2

Development of different types of gravies of Pumpkin seed flour.

Standardization of recipes

Planning of recipes: Three recipes were selected i.e., Paneer masala, lauki ka kofta and dum aalu the recipe was standardized.

Procurement of raw materials: Pumpkin seed, paneer, vegetables and all ingredients were made available by the foods lab of department of Foods and Nutrition, College of Home Science, MPUAT, Udaipur.

Preparation of sample: Pumpkin seed were first cleaned and then roasted separately. They were grinded separately and flour was obtained. Mix flour separately in different gravy [16].

Sensory evaluations of developed products: The acceptability of gravies was evaluated by a panel of 20 judges using 9-point Hedonic Scale to test the liking or disliking of products. Semi -trained panel did the evaluation. The panelist asked to record the level of liking or disliking by giving marks for various characteristics of the products. The samples were rated on 9 point Hedonic Scale for quality attributes according to following grade descriptions and scoring [17].

PHASE-3: Statistical Analysis

After collecting data, it is necessary to analyze it with help of statistics to arrive at proper and adequate conclusion. Following statistical measures were used to analyze the data:

Frequency and percentage: Frequency and percentage were used to analyze general background information and knowledge of respondents before and after 5 days of training for each batch.

Mean per cent score: MPS were calculated to assess the knowledge before and after 5 days of training for each batch.

Results and Discussion

The section of study sets forth clearly and precisely the finding and interpretation in the context of major objectives of study, thus providing a bird's eye view of complete study, which makes this section the most significant and crucial part of the research work [18].

Phase 1: Physico-chemical analysis of pumpkin seed flour

Physical properties: Physical characteristics of Pumpkin seed (whole) seed assessed by the parameters like seed length, seed width, numbers of seed in 10 g, weight of 100 seeds, seed volume, seed density. The results obtained are presented in Tables 1 and 2.

Physical examination of pumpkin seed revealed that it is light brown in color. Pumpkin seed is elongated as it is lengthier than width. The seed length was 5.0 mm and width was 1.0 mm (Table 1). No. of seeds in 10 g was 125 and weight of 20 seeds was found 2.60 g.

Functional properties: Result of functional properties analyzed in pumpkin seed was water absorption capacity, oil absorption capacity and least gelatinization concentration (Table 3).

Water Absorption capacity is the ability to retain water against gravity and include bound water, hydrodynamic water, capillary water and physically entrapped water. Water absorption capacity of pumpkin seed was found 189%. Oil absorption capacity of pumpkin seed flour was 168%.

Proximate analysis: The chemical analysis of pumpkin seed flour fractions for proximate composition revealed difference for moisture, fat, ash, protein, fiber and energy. Pumpkin seeds were consumed as roasted. The results of the proximate composition of the samples (roasted pumpkin seeds flour) are shown in Table 1. The moisture content was quite low and was found to be 5.47 and 6.10% for unroasted and roasted pumpkin seeds, respectively which may be advantageous in view of the samples' shelf life. The result showed that roasted pumpkin seeds flour is quite rich in protein (29.65%). Thus, pumpkin seeds could contribute significantly to the recommended human daily protein requirement which was reported to be ranged from 23% to 56%. The pumpkin seeds contained high ash and were found to be 8.78%, respectively. Since the ash content of a sample is a reflection of the minerals it contains therefore, pumpkin seeds are expected to be rich in minerals. Pumpkin seeds contained higher amount of oil [19,20]. Highest amount of crude fat content was exhibited in pumpkin seed flour (40%) Fats are essential in diets as they increase the palatability of foods by absorbing and retaining their flavors and help in the transport of nutritionally essential fat-soluble vitamins. As shown in Table 1, crude fiber content to 3.80%.

PHASE 2: Development of different types of gravies of Pumpkin seed flour

Selection and preparation of products: In the present investigation the gravies namely paneer gravy, lauki kofta gravy, dum allu were selected for incorporating pumpkin seed flour in proportion of 5, 8, 10 and 15%.

Sensory evaluation: Perceivable sensory characteristics have always been recognized to be the deciding factor in the acceptance and enjoyment of referred by masses and have an edge over other equally important and safety aspects. Therefore, all developed products were subjected to sensory evaluation (colour, appearance, flavor, texture, taste and overall acceptability on nine point hedonic rating scales by panel of 20 members [21-24]. Sensory scores as assigned by the panel members for individual sensory attributes and overall acceptability were statistically analyzed and are presented in Table 3 for products paneer masala, lauki ka kofta, dum allu.

In the present study different gravies with replacement of 5, 8, 10 and 15% pumpkin seed flour and scores assigned for sensory attributes by panel members are presented in Table 4. Overall

S. No.	Physical properties	Mean ± SD
1	Seed length (mm)	5.0 ± 1.25
2	Seed width (mm)	1.0 ± 0.05
3	No. of seed in 10 g	125 ± 4.26
4	Weight of 20 seeds (g)	2.60 ± 0.02
5	Seed volume	10.5 ± 0.09
6	Seed density	0.95 ± 0.03

Table 1: Physical properties of pumpkin seed whole.

S. No.	Functional Properties	Mean ± SD
1	Water absorption capacity (%)	189.00 ± 0.00
2	Oil absorption capacity (%)	168.7 ± 1.35
3	Least gelatinization concentration (%)	20 ± 0.02

Table 2: Functional properties of pumpkin seed flour.

Nutrition g/100 g	Pumpkin seed flour
	Mean ± SD
Moisture	5.47
Fat	40
Ash	8.78
Protein	29.65
Fibre	3.80

Table 3: Proximate composition of pumpkin seed flour.

Different gravies with pumpkin seed flour		Sensory attributes					
		Color	Appear	Texture	Aroma	Taste	Overall
		Mean ± SD					
Paneer masala	Control	9.25 ± 0.34	9.45 ± 0.89	9.78 ± 0.78	9.67 ± 0.15	9.56 ± 0.82	9.54 ± 0.20
	5%	9.12 ± 0.90	8.09 ± 0.54	8.78 ± 0.67	9.25 ± 0.76	9.28 ± 0.72	8.90 ± 0.49
	8%	8.68 ± 0.73	8.56 ± 1.04	8.28 ± 1.06	8.34 ± 0.80	8.45 ± 1.09	8.48 ± 0.77
	10	8.27 ± 0.78	7.74 ± 0.86	8.47 ± 0.78	8.50 ± 0.57	8.30 ± 0.70	8.33 ± 0.68
	15	7.45 ± 0.15	7.07 ± 0.22	7.35 ± 0.15	7.27 ± 0.19	7.32 ± 0.35	7.26 ± 0.13
Lauki ka kofta	Control	9.05 ± 0.30	9.55 ± 0.90	9.80 ± 0.70	9.70 ± 0.15	9.60 ± 0.82	9.35 ± 0.25
	5%	8.68 ± 0.73	8.56 ± 1.04	8.28 ± 1.06	8.34 ± 0.80	8.45 ± 1.09	8.88 ± 0.77
	8%	8.27 ± 0.78	7.74 ± 0.86	8.47 ± 0.78	8.50 ± 0.57	8.30 ± 0.70	8.33 ± 0.68
	10	8.08 ± 0.56	8.09 ± 0.45	8.78 ± 0.99	7.00 ± 0.08	8.56 ± 0.07	8.08 ± 0.68
	15	7.99 ± 0.87	7.66 ± 0.43	7.82 ± 0.21	7.23 ± 0.54	7.43 ± 0.67	7.78 ± 0.56
Dum aalu	Control	9.05 ± 0.30	9.55 ± 0.90	9.80 ± 0.70	9.70 ± 0.15	9.60 ± 0.82	9.05 ± 0.25
	5%	8.27 ± 0.78	7.74 ± 0.86	8.47 ± 0.78	8.50 ± 0.57	8.30 ± 0.70	8.03 ± 0.68
	8%	8.07 ± .56	7.77 ± 0.54	7.00 ± 0.87	8.99 ± 1.23	8.00 ± 0.98	7.96 ± 0.71
	10	7.65 ± 0.15	7.09 ± 0.22	7.35 ± 0.95	7.27 ± 0.29	7.32 ± 0.97	7.26 ± 0.83
	15	6.05 ± 0.12	6.00 ± 0.67	7.89 ± 0.98	6.00 ± 0.54	7.00 ± 0.65	6.76 ± 1.02

Table 4: Sensory evaluation of different gravy with pumpkin seed (N=20).

acceptability of 5, 8 and 10% of pumpkin seed flour incorporated gravies was highest among the other gravies. Significant difference between variations (5, 8 and 10, 15) for all sensory attributes was observed in the gravies [24-28].

Conclusion and Future Perspective

This work has provided baseline information on the proximate composition of pumpkin seeds. Pumpkin has high nutritive value and thus can be used in treatment of pregnant women and children affected by infestation of tape worms. It is also used in promoting prostate health. So adequate and frequent consumption of pumpkin recipes can be used to increase a better nutrition and health besides serving as delicious food, but also possesses therapeutic values. There are several cultivars of pumpkins, but so far only *Cucurbita pepo, Cucurbita maxima* and *Cucurbita moschata* have been studied. Nutritional assessment of other seed varieties and breeding of the high-yield varieties can open up new food formulation opportunities. With sufficient investigative focus, it may emerge as a substitute to sunflower seed or a complement to flaxseed. Pumpkin seed oil could be an alternative to the expensive olive oil. The optimal use of this nutrition-dense seeds must be given due attention, for it could address the food security issue to a significant degree.

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