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Preparation And Nutritional Properties Of Cookies From The Partial Replacement Of Wheat Flour Using Pumpkin Seeds Powder

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ABSTRACT

This study was carried out to evaluate the pumpkin seeds powder as function properties, phytochemicals, and vitamins to prepare cookies using partial replacement of 72%wheat flour extraction. Chemical composition, minerals content, and dietary fibers were determined in raw materials and its blends. Whereas, sensory evaluation, physical properties, color, and texture profile analysis were determined in cookies.The results showed that the functional and emulsification properties were of great quality in a pumpkin seed powder. Moreover, the pumpkin seeds had great total phenolic content, total flavonoids compounds, antioxidant activity, and vitamins. The results observed that the blend at 15% fortified pumpkin seeds powder wasthe highest in protein, fat, ash, and crude fiber; this may be due to greater the chemical composition of pumpkin seeds than the wheat flour 72% extraction. Also, when the pumpkin seeds powder increased, the fiber fractions increased in the different blends which caused pumpkin seeds and rinds to contain high amounts of fiber. Moreover, the minerals contained in the different blends were increased gradually when the pumpkin seeds powder was increased in blends as the pumpkin contained the greatest minerals content. The addition of pumpkin seeds powder to wheat flour up to 15% improved the sensory evaluation, color, and texture profile analysis.From the results, it could be indicated that the pumpkin seeds powder is a good source of chemical, phytochemicals, and vitamins which improves the cookies when preparing with up to 15% pumpkin seeds. Therefore, it could be recommended that when pumpkin seeds are added up to 15%,good quality and nutrition value are obtained for cookies.

Keywords: *Partial replacement, cookies, total phenolic, antioxidant activity, pumpkin seeds*

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1. INTRODUCTION

The pumpkin seeds (*Cucurbita sp.*) from the Cucurbitaceae family are usually considered as industrial waste products and thrown out. In some are as, seeds are utilized as uncooked, cooked, or roasted, although simply for the domestic purpose. As they are rich in protein, fibers, minerals like iron, zinc, calcium, magnesium, manganese, copper and sodium, PUFA (polyunsaturated fatty acids), phytosterol, and vitamins, they might be considered important for the food industries. As the seeds are considered a byproduct of the pumpkin fruit, they are cheaper and their utilization in different food products may lead to enhancement in their nutritional value at a lower cost **(Syed *et al.,* 2019).**

Pumpkin seed (*Cucurbitapepo*) has the nutritional and health-protective values and high amount of protein also it has pharmacological activities like antidiabetic, antifungal, antibacterial, anti-inflammation activities and antioxidant effects (**Nkosi and Opaku, 2006)** The pumpkin seed flour is a food mix that is economical, with great acceptable characteristics and high nutritive value. Pumpkin seeds present a snack that is nutritious, sweet, and somewhat soft (**Stevenson, 2007; Dhiman, 2009).**

Pumpkin (*Cucurbita maxima*) flesh and seeds are rich in vitamins, proteins, minerals, and antioxidants (β- carotene and tocopherols) **(Kim *et al.,* 2012).** In addition to nutrient composition, it is composed of various biologically active components such as polysaccharides, protein, peptide, sterols, and para-aminobenzoic acids **(Adams *et al.*, 2011).**The pumpkin seeds are utilized for the cure of different diseases separately or combine with medicines. The pumpkin is one of the famous edible plants that is utilized as acure for many disorders due to the occurrence of many edible components and phytochemicals **(Yadav *et al.,* 2010)**.

Cookies are used as a snack food in developing countries as they haveprotein and calories. Morefore, cookies are consumed on a great scale between women and children (**Chinma and Gernah 2007**). Cookies as bakery products and theyhave become fast food for every age-group due to being easy to carry about, tasty to eat, cholesterol-free, containing digestive and dietary principles of vital importance and cheap (**Peter Ikechukwu*et al.,* 2017).**

The current study is designed to develop widely consumed food product i.e. cookies with the incorporation of pumpkin seeds for nutritional enhancement and to evaluate the chemical composition, vitamins, phytochemical and sensory parameters of supplemented cookies.

2. MATERIALS AND METHODS

Materials

Wheat flour (72% extract) and fresh pumpkin (*Cucrbitamoschata*) were obtained from the local market in Saudi Arabia.The other stating materials used in the preparation of cookies i.e., sugar, butter, fresh milk, sodiumbicarbonate, and baker's yeast were purchased from a local market.

Methods:

Preparation of pumpkin seed kernel powder:

Ripe fresh pumpkin was cut into halves and seeds were extracted from the fluffy portion (fibrous strains). The seeds were cleaned and sanitized using 200 ppm chlorine solution and left to dry at ambient room temperature (30 ±2 °C) for five hours to remove any residual moisture from the washing process. This step was carried out to prevent sprouting of the seeds in refrigerated storage due to the presence of excess moisture. Seeds were then placed into plastic bags and stored in a refrigerator at 4 °C according to **Sacilik. (2007).**

Determination of functional and emulsification properties of pumpkin seed powder

Water absorption capacity (WAC), fat absorption capacity (FAC), and bulk density of pumpkin seed powder were estimated by the methods described by**Chantaro*et al.* (2008),Vazquez-Ovando*et al.* (2009) and Wang and Kinsella (1976).**Emulsification capacity (EC) of the sample was determined by the method described by **Beuchat *et al*. (1975)** and also emulsifying activity and emulsion stability were described by **Vazquez-Ovando*et al.* (2009).**

Phytochemicals, antioxidant activity, and vitaminsof pumpkin seed powder

The total phenol content of the extracts was determined using Folin–Ciocalteau reagent according to **Xu and Chang (2007)**. The total phenolic content was calculated using milligrams gallic acid equivalents per gram dry weight (GAE mg/100g of dry weight).

The total flavonoid content was determined by the method of **Eghdami and Sadeghi (2010).** The flavonoid content was expressed in milligrams of quercetin equivalent per gram dry weight (mg QE/100g of dry weight)**.**

Antioxidant activity was measured based on the modified method of **Liu *et al.* (2008)**. The antioxidant activity of the sample was determined based on the equations: % DPPH Scavenging = $[(AControl–ASample)\ Control] \times 100\%$;Where a control is the absorbance of DPPH solution without addition of sample and A sample is the absorbance of DPPH solution by addition of sample.

Antioxidant activity was also determined by the β-carotene method using a spectrophotometer at 470 nm by following the method of **Mueller and Boehm (2011).**

The total amount of carotenoids in pumpkin seeds powder was determined using a spectrophotometer at 450 nm. Total carotenoids were calculated and expressed in mg/100/g of the sample according to the method described by **Dere*et al.* (1998).**

Vitamins B1 (Thiamin), B2 (riboflavin) and *L*-ascorbic acid (vitamin C) of pumpkin seed powder was determined according to the method described in the **AOAC (2012)** using High-Performance Liquid Chromatography (HPLC) Beckman model equipped by double piston pump 126 with Fluorescence detector LC 240 (Perkin Elmer). Whereas, Vitamin E (α-tocopherol) and Vitamin A (Retinol)were measured by using high-pressure liquid chromatography (HPLC) methoddescribedby**Leth and Sondergaro (1983)** and **Leth and Jacobsen (1993).**

Preparation of different blends and baking cookies:

Cookies were prepared according to the method of **Kohajdová *et al.* (2014).** The formula of cookies were as follows: 150 g fine wheat flour 72% extraction, 42.4 g sugar, 39.75 g shortening, 1.33g sodium chloride, 1.65 g sodium bicarbonate, and 18 mL water. Fine wheat flour was replaced with preparations of pumpkin seed powder to a level of 5, 10, and 15% in the cookie recipe. The ingredients were mixed into the consistent dough. Baking was carried out at 180°C in an electrical oven for 8 min. After baking, the cookies were cooled at ambient temperature, and packed in polypropylene bags until further analysis.

Chemical constituents of raw materials and its blends:

Protein, total fat, ash, and crude fiber were determined in raw materials (wheat flour 72% extraction and pumpkin seeds powder) and their blends according to the method outlined in **AOAC (2012).**Moreover, total dietary fiber was determined of the raw materials and their blends according to the methods described by **Prosky *et al.* (1988).** Also, soluble and insoluble dietary fibers were determined in the raw materials and their blends according to **Lee and Prosky (1995).**

Minerals content including cupper (Cu), potassium (K), calcium (Ca), magnesium (Mg), iron (Fe), zinc (Zn), sodium (Na) and manganese (Mn) were determined in the diluted solution of ash raw materials and their blends using the atomic absorption spectrophotometer (3300 Perkin-Elme) as described in by **AOAC (2012)** method.

Sensory evaluation of cookies product

Nine points hedonic scale method given by **Popov-Rajlič*et al.* (2013)** was followed for conducting the sensory evaluation of cookies prepared with 5, 10, and 15% pumpkin seeds. It was performed using judges of faculty members from the Food Science and Nutrition Department, College Science, Taif University, Saudi Arabia. They were selected with care to evaluate the products for various sensory parameters such as color, texture, flavor, taste, and overall acceptability. Efforts were made to keep the same panel for sensory evaluation throughout the entire period of study. Plain water was given to the judges to rinse their mouths in between the evaluation of samples.

Physical properties of cookies

The physical properties, which were measured as averages of five replicates for each sample, were weight, diameter, and height (thickness) according to **Zoulias*et al.* (2002).** The spread ratio was expressed as diameter/height**.**

Color measurement of cookies product

Pumpkin seeds powder and different blends of cookie product color were measured using The Minolta Spectrophotometer CM-3500d (Osaka, Japan). The color attributes Hunter L^*, a^*, and *b**. *L** defines lightness, *a** denotes the red/green value and *b** the yellow/blue value according to **See *et al.* (2007)**.

Textural properties of cookies

Textural properties of cookies were measured using texture profile analysis (TPA) on a texture analyzer TA.XT plus (Stable Micro Systems Ltd., UK). The crumb parameters (hardness, stickiness, elasticity, cohesiveness, and chewiness) were calculated from the TPA graphic according to **Bourne (2003).**

Statistical analysis

The data were subjected to multivariate statistical analysis, by mean comparisons, using the statistical software SAS 9.2 **(SAS Institute, 2011).**

3. RESULTS AND DISCUSSION

Functional and emulsification properties of pumpkin seed powder

For food processing, storage, and food preparation, functional characteristics of foods are significant characteristics to establish the implementations and uses of food material since they concern the general quality of foods. The important functional properties so as to be generally checked to involve water and oil absorption capacity and bulk density (**Guérin-Deremaux*et al.,* 2011).**

Functional properties as water absorption capacity (WAC), fat (oil) absorption capacity (FAC), and bulk density were found 175.5ml/100g, 185.3 ml/100g, and 3.04 g/ml, in pumpkin seeds powder (Table 1). These results confirmed that the WAC usually connected with the amylose filtration, solubility, and absence structure of starch, so increasing WAC leads to increasing those **(Chandra *et al.,* 2015)**. This also causes them to become weaker in the power of dough and reductions in its stability and extensibility. On the other hand, pumpkin seeds powder composites can be used in making cookies.

The oil absorption capacity interrelated to the ability of proteins to attach fat is an important property in food formulations since fats are active as flavor retainers and improve the mouthfeel of foods. The mechanism of fat absorption is attributed mainly to the physical entrapment of oil and the binding of fat to a polar chain of the protein. Non-polar amino acid side chains can form hydrophobic interaction with hydrocarbon chains of lipids (**Adeleke and Odedeji, 2010).**

Scientifically and economically, bulk density is an important factor, second only to moisture. The bulk density also content mostly influenced by the particle size and density of the flour **(Onabanjo and Dickson, 2014).** Therefore, when the particle size was increased, bulk density was decreased. Consequently, enhancement in bulk density is really necessary as it takes advantage package processing, then a higher the amount perhaps packed within a constant volume **(Eleazu and Ironua, 2013).**

The emulsification properties were great in pumpkin seed powder and the results are reported in the same table. From these results, it could be noticed that this influence may be a consequence of the high solubility of protein from the *Cucurbitapepo* seed flour which shows more binding groups to water and oil interface most important to making greater emulsion capacity and stability. Whereas, mostly insoluble proteins are not good emulsifiers and can generate coalescence(**Moure *et al.,* 2006).**

Table 1: Functional and emulsification properties of pumpkin seed powder

Function properties	pumpkin seed powder	Emulsification properties	pumpkin seed powder
WAC ml/100g	175.5±7.25	E.C. mg oil/g	82.9±2.76
FAC ml/100g	185.3±5.38	E. A. %	75.3±4.13
Bulk density g/ml	3.04±0.94	E.S %	65.6±1.57

Values are mean and SD (n = 3)

Phytochemicals and vitamins of pumpkin seed powder

Phytochemical and vitamin contents were determined in pumpkin seeds powder and the results are recorded in Table (2). The results observed that the amounts of phytochemicals as the phenolic and flavonoids compounds were 25.62mg GAE/100 g and 8.25 mg QE /100g, respectively. The phenolic contents were vanillin, tyrosol, luteolin, sinapic acid, and vanillic acid. The max antioxidant capacity calculated with the aid of the reduction of the DPPH radical was 62% (**Andjelkovic*et al.* (2010).**Moreover, antioxidant activity as DPPH radical scavenging activity and β-carotene were found 51.76 and 72.35 %, respectively. These results are in agreement with **Nkosi *et al.* (2006)** who studied the antioxidative role of isolated protein of pumpkin seed on rats kept on a low-protein weight-reduction feed plan for five days. The protein isolated from pumpkin seeds showed about 80% radical scavenging activity;chelating activity was round about 64% on Fe^{+2} ions and xanthine oxidase inhibition was approximately 10%.

Vitamin content as Vitamins B1 (Thiamin), B2 (riboflavin), *L*-Ascorbic acid vitamin C, Vitamin E (α-tocopherol), Vitamin A (Retinol) and total carotenoids were found 0.33, 0.15, 7.23, 40.21, 21.14 and 17.35 mg/100g in pumpkin seeds powder and the results are shown in the same table. These results are confirmed by **Kim *et al.* (2012)**who found that the *Cucurbitamoschata*and *Cucurbitapepo*seeds had notably much more c-tocopherol than *Cucurbita maxima*, whose seeds had more b-carotene. Seeds of *Cucurbitapepo* had notably more b-sitosterol than the pumpkin types. Among 11 varieties of seeds and nuts profile for dietary abundance, pumpkin seeds were scored the highest for iron content (95.85 ± 33.01ppm).

Pumpkin contains a high content of nutritional value like β-carotene, pectin, some vitamin, material content. In addition, pumpkin could be a source of carotenoids and vitamin C (**Caili*et al.,* 2006)** which have important functions in nourishment as pro-vitamin A as a natural antioxidant. However, α, ß-carotenes, flavonoids as lutein and anthocyanin pigments like cryptoxanthin and zeaxanthin, are antioxidant compounds in pumpkin. Moreover, vitamin-A is known as a strong natural antioxidant and it is necessary to preserve the integrity of skin and mucosa and also as an essential vitamin for good eyesight. Thus **Heinonen and Albanes(1994)** suggested that the increasing vitamin-A in the human body can be kept safe from harm versus lung and oral cavity cancers.

Table 2: Total phenolic, DPPH, and vitamins (mg/100g)of pumpkin seed powder.

Phytochemical analysis	pumpkin seed powder	Vitamins content	pumpkin seed powder
Total phenol compound (mg GAE/100 g)	25.62± 1.86	Thiamin (Vit. B1) (mg/100g)	0.33±0.01
Total Flavonoids (mg QE /100g)	8.25± 0.93	Riboflavin (Vit. B2) (mg/100g)	0.15±0.00
DPPH radical scavenging activity (%)	51.76± 3.17	*L*-Ascorbic acid (C) (mg/100g)	7.26±0.24
β-carotene %	72.35± 24.43	α-Tochoferol (Vit. E)	40.21±0.26
Total carotenoids (mg/100g)	17.35± 1.12	Retinol (Vit. A) (mg/100g)	21.14±1.18

Values are mean and SD (n = 3)

Chemical compositions of pumpkin seeds powder and its blends

Chemical composition of wheat flour 72% extraction, pumpkin seeds powder, and its blends at 5, 10, and 15% levels of pumpkin seeds were determined and the results illustrated in Table (3).From the results, it could be noticed that the blend at 15% fortified pumpkin seeds powder had the highest protein, fat, ash, and crude fiber (13.75, 7.13, 1.62, and 1.95%, respectively). The highest results may be due to the greater chemical composition of pumpkin seeds (19.94, 26.38, 6.54, and 8.37%, respectively) than the wheat flour 72% extraction (12.12, 3,03, 0.55 and 0.90%, respectively).These results are assured by**Kanwal *et al.* (2015)** who evaluated the moisture, protein, fat, ash, the fiber of control biscuits and biscuits supplemented with 20 % pumpkin seed flour, as 4.76, 9.20, 20.39, 1.68, 3.40 and 1.55, 12.30, 28.29, 4.13 and 1.60 %. **Seth and Kochhar (2016)** found that the nutritional value of control and experimental cookies supplemented with 10 % level of partially defatted peanut flour per 100 g as moisture 13.09 and 12.47 %, protein 4.71 and 6.21 %, fat 28.86 and 28.51 %, fiber 0.12 and 0.60 %t, ash 1.34 and 1.48 % and carbohydrates 66.25 and 62.87 %. **Pratyush *et al.* (2015)** found that the nutritional value of control cookies to be 1.52% ash, 2.44 % moisture, 8.10 % crude protein, 22.75 % crude fat, 0.86 % fiber and cookies supplemented at 50 % level of pumpkin seed powder had 1.85 % ash, 3.49 % moisture, 9.45 % crude protein, crude fat 23.10 %, and 23.32 % crude fiber.

The same table showed that the results from fiber fraction as total, insoluble, and soluble dietary fiber were the highest in pumpkin seeds powder (24.15, 16.37 and 7.78%) and the lowest in wheat flour 72% extraction (3.09, 2.02 and1.07%, respectively). When the pumpkin seeds powder increased, the fiber fractions increased in the different blends. Pumpkin seeds contained the highest quantities of fiber (24.20 % crude fiber)**(Nyam*et al.,* 2009).**

Dietary fiber had many characteristics like water-holding, oil holding, emulsifying, and gel formation; also it could be utilized in nutritional products **(Elluech*et al.,* 2011).**The amalgamation of dietary fiber with the nutritional products to assistances modifies for textural characteristics of the food, in addition, stabilize high-fat content food and emulsion **(Abdul-Hamid and Luan, 2000).**Total dietary fiber and its fractions are a significant component in the daily food whereas, the intake of total dietary fiber and its fractions provide health beneficial effects **(Slavin, 2005).**

Table 3: Chemical composition of pumpkin seeds powder and its blends on a dry weight basis

Chemical analysis	Wheat flour 72% extraction	Pumpkin seeds Powder	Blends cookies made from pumpkin seeds		
			5 %	10 %	15 %
Protein	12.12 ±1.25	19.94 ±1.64	12.62 ±0.94	13.12 ±1.61	13.75 ±1.52
Lipid	3.03 ±0.21	26.38 ±2.15	4.35 ±0.24	7.13 ±0.82	7.13 ±0.92
Ash	0.55 ±0.01	6.54 ±0.41	0.92 ±0.35	1.27 ±0.04	1.62 ±0.04
Crude fibers	0.90 ±0.01	8.37 ±0.73	1.25 ±0.43	1.60 ±0.07	1.95 ±0.07
Total carbohydrates	83.40 ±7.39	38.77 ±2.86	80.86 ±5.26	78.23 ±4.29	75.55 ±7.68
Total dietary fiber	3.09 ±0.04	24.15 ±1.71	4.14 ±0.51	5.19 ±0.27	6.24 ±0.51
Insoluble dietary fiber	2.02 ±0.07	16.37 ±1.58	2.84 ±0.12	3.66 ±0.02	4.48 ±0.38
Soluble dietary fiber	1.07 ±0.01	7.78 ±0.82	1.30 ±0.04	1.53 ±0.06	1.76 ±0.08

Values are mean and SD (n = 3)

Minerals content of pumpkin seeds powder and its blends

The results in Table showed that the highest amounts of Mg, Na, Zn, Mn, Fe, Ca, K and Cu are present in the pumpkin seeds (540.35, 15.18, 6.95, 1.45, 7.56, 36.79, 412.17 and 1.24 mg/100g, respectively) and the lowest amounts were found in wheat flour (102.25, 4.84, 3.83, 0.70, 1.82, 15.74, 146.07 and 0.27 mg/100g, respectively). Moreover, the minerals contained in the different blends were increased gradually when the pumpkin seeds powder increased in blends as the pumpkin had great mineral contents.

Food and vegetables have beneficial minerals for humans, in addition, they may be presented as salt in food combined with an organic compound, such as iron in hemoglobin.Teeth and bone require the minerals. The little amounts of minerals are ingredients of different regulatory compounds like vitamins, enzymes, and hormones; for example, they need calcium for their activity. The enzymes are activated by iron and the minerals are present in the intra- and extracellular fluid. Besides, they regulate the transmission of impulses and the contraction of muscles. Therefore, the reduction of minerals creates more diseases in human beings**(Habib *et al.,* 2015).**

Table 4: Minerals content of pumpkin seeds powder and its blends on a dry weight basis (mg/100g).

Minerals content	Wheat flour 72% extraction	Pumpkin seeds Powder	Blends cookies made from pumpkin seeds		
			5 %	10 %	15 %
Magnesium	102.25 ±10.27	540.35 ±30.58	124.15 ±11.25	146.05 ±12.38	167.95 ±15.27
Sodium	4.84 ±1.25	15.18 ±1.27	5.35 ±0.43	5.86 ±0.61	6.37 ±0.43
Zinc	3.83 ±0.31	6.95 ±0.43	3.99 ±0.15	4.15 ±0.39	4.31 ±0.27
Manganese	0.70 ±0.51	1.45 ±0.24	0.76 ±0.04	0.82 ±0.01	0.88 ±0.01

Iron	1.82 ±0.15	7.56 ±0.65	2.11 ±0.14	2.40 ±0.16	2.69 ±0.17
Calcium	15.74 ±2.46	36.79 ±3.81	13.79 ±1.38	17.84 ±13.17	18.89 ±17.64
Potassium	146.07 ±11.28	412.17 ±37.39	159.37 ±15.28	172.6 ±716.39	185.97 ±18.16
Cupper	0.27 ±0.001	1.24 ±0.07	0.33 ±0.00	0.39 ±0.00	0.45 ±0.00

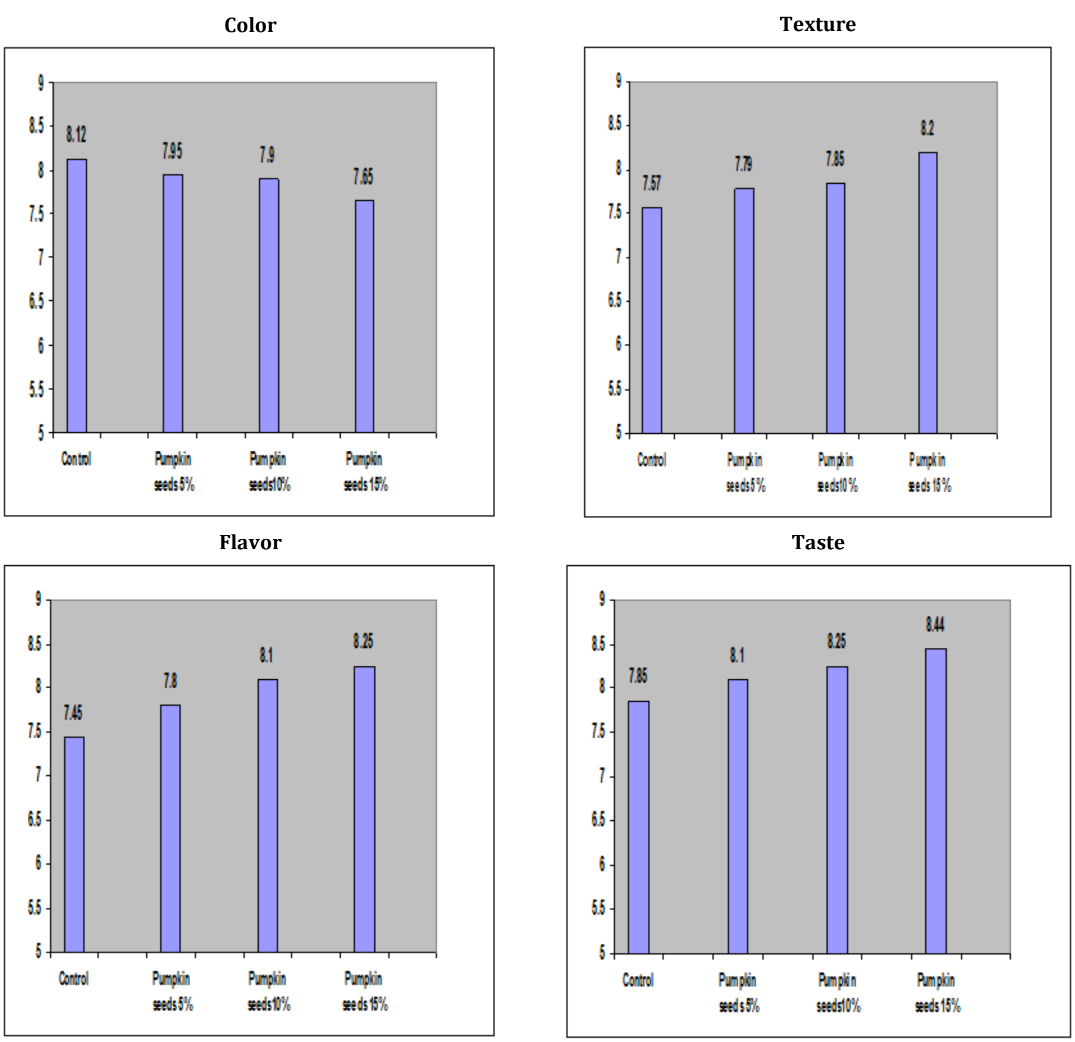
Values are mean and SD (n = 3)

Sensory evaluation of cookies supplemented with pumpkin seeds powder

Sensory characteristics of cookies at various levels pumpkin seeds are reported in Figure (1) and photo (1). The results from the texture observed that there is a considerable variation between different cookies products. Control cookies had got 7.57score and the different cookies hadimprovedtexture when the pumpkin seeds were increasedat 5, 10, and 15% replacement levels (7.79, 7.85, and 8.20, respectively).The improvement in texture when increasing pumpkin seeds in cookies may be caused as a pumpkin seeds had a high protein content. **Atuonwu and Akobundu (2010)** also observed improvement in the texture of cookies supplemented with pumpkin seeds.

The color score was ranged between 8.12 in control cookies to 7.65 in cookies containing 15% pumpkin seeds. The change in color was due to high protein content in the pumpkin seeds which is desirable. Also, the gradual lowering in the color score of cookies treatment may be attributed to sugar caramelization and the Maillard reactions between sugars and amino acids and the same results are confirmed by **Siddiqui*et al.* (2003)**who indicated an improvement in the color score with greater supplementation level. Cookies were considerably various in flavors;the highest score was found in 15% pumpkin seeds and the lowest was in control cookies. This increase in the flavor was also confirmed by **Atuonwu and Akobundu (2010)**who noted an improvement in flavor score with an increase in the level of pumpkin seeds. Moreover, the highest score was found in the taste of the products containing 15% pumpkin seed. This increase in pumpkin seeds is necessary for the development of taste characteristics in cookies **(Siegmund and Murkovic, 2004)**.

Kanwal*et al.* (2015) illustrated that pumpkin seed flour is incorporated successfully to partial replacement with wheat flour to produce cookies with the nutrition value and wholesome cookies without disturbing their overall acceptability.



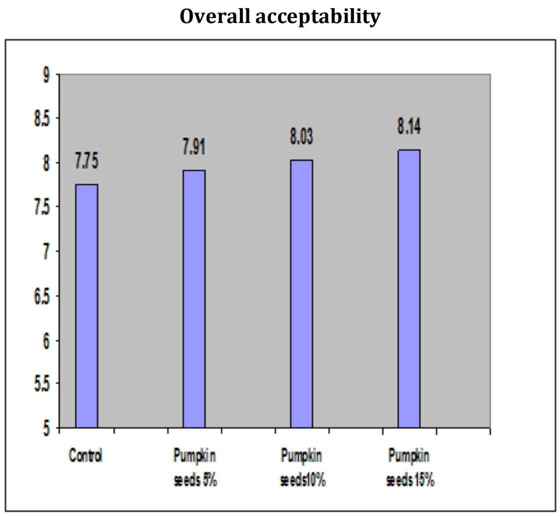


Figure 1: Sensory evaluation of cookies supplemented with pumpkin seeds powder

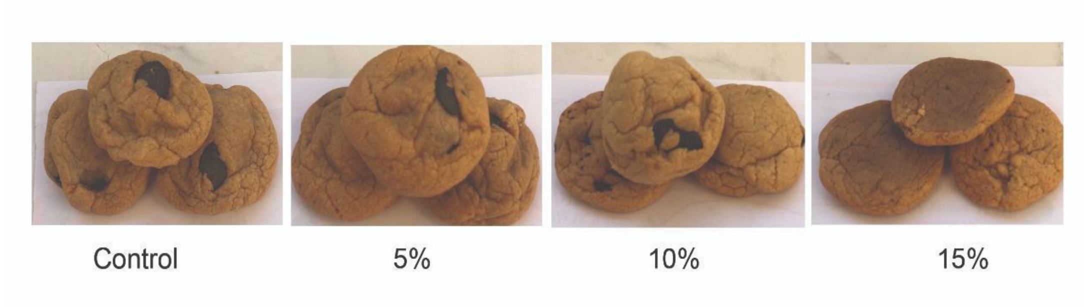


Photo 1: The cookies with different levels of pumpkin seeds powder compared with control cookies

Physical properties of cookies

Table (5) showed that the weight increased in control cookies from 13.24 g to 15.61g in blend with 15% pumpkin seeds and diameter was decreased from 11.35 cm in control cookies to 6.65cm in blend contained 15% pumpkin seeds; this may be attributedto the fact that pumpkin seeds powder had dietary fiber which absorbsincreased amounts of water causingan increase in weight and reductionin diameter. These results were confirmed by **McWatters*et al.* (2003)**who reported that the cookies prepared from wheat flour and pumpkin seeds powder had decreased heights and diameters and greater weights; these influences were increased with increasing the level of substitution of wheat flour with pumpkin seeds powder.

The finding showed that the high and spread ratio of different blends of cookies was reduced when substituting wheat flour with pumpkin seeds powder. **McWatters (2003)** indicated that the binding of free water to hydrophilic parts through the mixing caused increased dough viscosity by that means limiting cookie spread. Moreover, it has been pointed out that the spread ratio is influenced by the competition of recipes for the ability to use water; flour or any other component absorbs water through the dough, and mixing will lower it **(Giami*et al.,* 2005).**

Table 5: Effect of pumpkin seeds on the physical properties of cookies

Treatments	**Weight (g)**	**Diameter (cm)**	**High (cm)**	**Spread ratio D/H**
Control	13.24±11.24	11.35±10.15	1.8±0.01	6.30±0.42
Pumpkin seeds 5%	13.36±10.39	9.72±0.98	1.6±0.01	6.08±0.31
Pumpkin seeds10%	14.52±12.28	8.13±0.73	1.4±0.01	5.81±0.48
Pumpkin seeds 15%	15.61±14.39	6.65±0.54	1.2±0.01	5.54±0.44

Values are mean and SD (n = 3); where: Mean values in the same with the letter are significantly different at 0.05 levels.

Color measurement of cookies

Mendoza *et al.* (2006) showed that the color well correlates with other physical, chemical, and sensorial characteristics to produce high-quality products. In addition, color plays a great role in external quality in food industries and food engineering research.

Findings of color parameters of cookies prepared from various levels of pumpkin seed preparations are given in Table (6). From the results,it was noticed that the lightness (L*) of the cookies has a lowering trend with making greater replacement; decreasing values of L* point out that the cookies were darker at higher levels of replacement than to the control sample. This may be due to theMaillard reaction which is formed from binding amino acids and sugars through baking the cookies **(Mildner-Szkudlarz *et al.,* 2013 and Walker *et al.,* 2014).** Furthermore, when levels of pumpkin seeds powder in cookies increased the redness was lower in a* value and yellowness reduced in b* value. **Acun and Gül (2014**) found a reduction in the color values of darkness L* and yellowness b*, and increase in redness a* in cookies substituted with pumpkin seeds, which was in approval with our results. It is known that pumpkin seeds have high amounts ofpolyphenolic compounds **(Walker *et al.,* 2014).**

Table 6: Effect of pumpkin seeds on the color values of cookies

Treatments	L*	a*	b*
Control	4958± 3.71 a	7.33 ± 0.81a	27.88 ± 2.52a
Pumpkin seeds 5%	47.32 ±3.65b	9.08 ± 0.90b	29.71 ± 2.83b
Pumpkin seeds10%	44.09 ± 3.53c	9.83 ± 1.01c	33.27 ± 3.47c
Pumpkin seeds 15%	40.29 ± 3.14d	10.19 ± 1.13d	37.53 ± 3.62d

Values are mean and SD (n = 3); where: Mean values in the same with the letter are significantly different at 0.05 levels.

Texture profile analysis of cookies

The results from Table (7) indicated that the hardness of cookies increased when the amount of added pumpkin seeds powder was increased in the different blends. The hardness of the control cookie was 35 N and it was made greater by the use of pumpkin flour, furthermore, considerable increase gradually was noticed only at the levels 5, 10, and 15% pumpkin flour (49.26, 54.15 and 58.39 N, respectively).

Springiness, cohesiveness, and resilience lowered using pumpkin seeds powder. Moreover, the considerable lowering was noticed only in the cookies with blends at 15% pumpkin seeds powder. These results may be attributed to dough weakening causing high amounts of fiber, lessening dough ability to trap leavening gas **(Plyer, 1988).** The chewiness of cookies with 5, 10, and15% pumpkin seeds was increased by the presence of pumpkin flour (31.26, 32.24 and 34.10%), however, control cookies hadthe lowest chewiness (29.37%). Also, **Gomez *et al.* (2003)** observed an identical trend for bread with the addition of fibers to makegreater chewiness of tested breads.

Table 7: Effect of added pumpkin seeds on cookies by texture profile analysis

Treatments	**Hardness (N)**	**Springiness (%)**	**Cohesiveness (%)**	**Resilience (%)**	**Chewiness (N)**
Control	45.27±3.25^{c}	90.27±8.19^{a}	79.38±7.31^{a}	49.19±4.19^{a}	29.37±2.76^{c}
Pumpkin seeds 5%	49.26±4.12^{b}	87.53±7.26^{a}	77.25±7.24^{a}	48.22±5.13^{a}	31.26±2.97^{b}
Pumpkin seeds10%	54.15±5.16 ^{a}	82.68±8.01^{ab}	75.34±6.89^{ab}	47.15±3.94^{ab}	32.24±3.12^{b}
Pumpkin seeds 15%	58.39±5.24^{a}	78.29±6.54^{b}	72.12±7.05^{b}	46.11±4.16^{b}	34.10±2.87^{a}

Values are mean and SD (n = 3); where: Mean values in the same with the letter are significantly different at 0.05 levels.

CONCLUSION

The above research studies confirmed that the pumpkin seeds have nutritional properties, and also produces delicious products as cookies. The nutrient composition analysis of pumpkin seeds showed that these are very nutritious and provide many essential nutrients for health. The pumpkin seeds play a significant role in providing micronutrients, vitamins, and natural antioxidants.

Due to high mineral and protein contents as well as high availability of such constituents of pumpkin seeds, the pumpkin seed flour can be utilized as a recipe and/or protein complement, in a variety of local foods such as bakery products (cookies) and as the thickener in a food system.

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