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Effect of storage on the proximate analysis of cookies containing sesame, flax and pumpkin seeds

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Abstract
Sesame seeds, flax seeds and pumpkin seeds are nutritional rich commodities that can be incorporated in cookies formulations to prepared nutritional dense products. Such products because of their nutritional status could fulfil the nutritional needs of today's world.

Keywords: antioxidant activity, storage stability, sesame seeds, flex seeds

Introduction

The nutritional value of native plants, wild vegetables and protein-rich edible seeds is of great importance. These plants are of great concern when seeking to unravel the problem of adequate food. The latest studies also indicated that a considerable number of native plant species have elevated nutritional value. Conversely, a number of such plants have been recognized, but data on their chemical composition is not adequate for further studies. One of them is sesame, which has been suggested as a possible resource to resolve the dilemma of micronutrient shortage in modern nutrition [1].

Sesame seeds are used for oil production with high quality of ranges and found in different colors like creamy white and black.4According to nutritional point of view sesame also play a major role and its oil used for different food and salads developments it's beneficial for good health. Proximate composition of sesame is 5.60% moisture, 8.94% ash, 6.60% crude fiber, 38.54% fat and 16.63% crude protein, 62.23% carbohydrate. This suggests that it may be an excellent basis of protein, minerals, carbohydrate and unsophisticated fiber [2]. Consequently, considering the anti-nutritional aspects, it can be used as a profitable source to complement animal and human usage. The greater % of oil content in seeds and their good physical and chemical characteristics build them suitable for marketable withdrawal. More importantly, it holds a high content of flavonoids and alkaloids, indicating the anti-oxidant and medicinal features of various components of sesame seeds [3].

The residual fiber part of flax seed is soluble and has the aptitude to reduce cholesterol levels in the body and improve the levels of blood sugar. A fairly large amount of lignin, soluble fiber, ALA and other phytochemicals are found in flax seed, which can bring many advantages to health. Protein and soluble fiber are called fla xseed mucus, which has been exposed to have cholesterol-lowering, blood-lipid-lowering and atherosclerotic effects, and has a encouraging effect on blood sugar metabolism9. Due to the dietary and well-being fortification worth of seeds, pumpkin seeds have acknowledged extensive concentration in modern years. Seeds are an admirable resource of protein and have pharmacological actions such as anti-diabetic, anti-fungal, anti-bacterial, anti-inflammatory and anti-oxidant consequences [4].

Cookies are the most popular and favorite snacks of all ages, because they are low cost, convenient, have a long shelf life and provide many essential nutrients. Due to the increase in urbanization and the number of working women, consumption of baked goods has increased significantly. By manufacturing high price nutrition baking products, the food industry can make use of this development to realize its own benefits. Among all categories of snack foods, baked goods are the largest in quantity in the world. Cookies are not regarded as staple food like bread, but because of the long shelf life it is possible to provide a large amount of fiber, which can be mass produced and distributed [5].

Material and Method

Manufacturing procedure

Refined wheat flour, flax seed powder, pumpkin seed powder, fat, sugar and baking powder, ammonium bi carbonate, salt, used for biscuit making were procured from a local market in Lahore. All the chemicals/ reagents used were of analytical grade.

Procurement of raw material

The raw materials such as sesame seeds, flax seeds and pumpkin seeds were procured from local market in Lahore. All the seeds were dried by sun drying method. The ingredients required for preparation of cookies such as refined wheat flour, sugar, ghee, salt, baking powder and ammonium bicarbonate were also purchased from local market in Lahore.

Preparation of cookies

Four types of cookies were prepared according the following protocol. Control cookies were comprised of all the ingredients required for cookies preparation except any kind of seeds powder as mentioned above. C_1, C_2 and C_3 were prepared by the addition of 2% sesame powder, 2% flax seeds powder, and 2% pumpkin seeds powder, respectively, along with the standard formula. The standard formula used comprised of all-purpose flour, baking soda, brown sugar, butter and eggs. Wheat flour was taken and sieved through 250 micron particle size sieves. All the other ingredients such as (sesame seeds powder, flax seeds powder, pumpkin seeds powder, sugar, salt and baking

powder) were incorporated uniformly and mixed thoroughly. All-purpose flour, water and vanilla essence were added to produce batter. It was rolled on a clean dust free surface, followed by its cutting into smaller sizes each with height 0.5 cm and diameter 3 cm. All the cookies were placed on baking tray that was then baked in oven at 170 ºC for 18 minutes. The baked cookies were allowed to cool down followed by their packing in moisture proof packaging for further analysis. The cookies were stored for a time period of 60 days and analyzed for their quality characteristics, proximate composition, sensory evaluation and microbiological analysis.

Determination of Moisture Content

Initially 5 gram sample was weighed with weighing balance. China dish was weighed separately. The sample (within china dish) was placed in the hot air oven (Model was DO-1-30/02 Pakistan Council of Scientific, and Industrial Research, Pakistan) at a temperature of 105±5 ºC for 8 hours. The sample was weighed three times to check if there is any further reduction in weight. The cookies sample was determined by using the method 934-01 of (AOAC, 2006) [6].

Determination of Crude fat

Sample (moisture free) was weighed (10 gram) and wrapped in the filter paper. It was placed in the soxhlet apparatus. Hexane was used as the extracting solvent and apparatus was turned on. After five to six washings, sample was removed from the apparatus. At the end, sample was weighed for determination of fat content (AOAC, 2006) [6].

Determination of Crude fiber

Crude fiber in defatted samples was estimated by digesting the sample initially with H_2SO_4 (1.25%) for a time period of 30 minutes and then by NaOH solution (1.25%) through Labconco Fibertech (Labconco Corporation Kansas, USA) as defined in AOCC (2006) [6]. After digestion, samples were subjected to filtration and then washed with distilled water. The residual was analyzed for its weight and put inside the muffle furnace at 550-650°C temperature till white or grey ash was found. At the end, crude fiber content in all samples were estimated by applying the following formula.

$$\text{Crude Fiber (\%)} = \frac{\text{Weight loss on ignition (g)}}{\text{weight of sample (g)}} \times 100$$

Determination of Total ash

Ash percentage of all samples was determined as per the method described in AOAC (2006) [6]. Samples were put in muffle furnace (Model was MF-1/02, Pakistan Council of Scientific and Industrial Research, Pakistan) after charring, at a temperature of 550 to 600 ºC. Once the sample is converted into whitish or grey ash, it was put out of furnace and weighed.

Determination of Crude protein

Determination of crude protein content in samples was done in following steps.

Digestion

Samples were taken in the digestion flask along with 5 gram of digestion mixture (Potassium sulfate: Copper sulfate: Iron sulfate, 100:10:5g). Concentrated sulfuric acid was added afterwards in the digestion flask and it was placed in the fume hood. The digestion process was continued until the light green color appeared. The volume of digested material was made about 250 mL in flask.

Distillation

After digestion, sample (10 mL) was taken with 40% sodium hydroxide (10 mL) in the conical flasks. The distillate was gathered with 4% boric acid (10 mL) by using an indicator (methyl red). The ammonium borate was made and the bubbles were produced and the maximum ammonia was trapped.

Titration

The last step comprised of titration for the determination of nitrogen percentage. The distillate was titrated against H_2SO_4 solution (0.1 N) till the end point (light golden). At the end, crude protein was determined by applying the following formula.

$$\text{N (\%)} = \frac{[\text{Volume of H2SO4} \times \text{Volume of distillate (250mL)}]}{\text{volume of distillate taken} \times \text{Weight of sample}} \times 100$$

Crude protein = N (%) × 6.25

Determination of Nitrogen free extracts (NFE)

The determination of NFE from cookies sample contains (sesame seeds powder, flax seeds powder and pumpkin seeds powder) was carried out by applying following formula.

NFE (%) = Moisture content + Total Ash + Crude Protein + Crude Fiber + Crude Fat

Results and Discussion

Moisture content of cookies

Moisture content in food is one of the most authoritative properties and is usually measured in different foods. The moisture content in all the cookies samples *i.e.* C_0 (control), C_1 (2% sesame seeds powder, C_2 (2% flax seeds powder), and C_3 (2% pumpkin seeds powder) was estimated on day 1, 30 and 60 of storage. The statistical analysis was employed to assess the influence of treatments and storage days on moisture content of treated cookies samples. The moisture content of control cookies was 4.40±0.09% that increased to 4.89±0.21% on day 30 and to 5.18±0.41% on day 60 of storage. Cookies prepared from 2% sesame seed powder (C_1) showed a decline in moisture content (3.71±0.04) from control. The moisture content in C_1 increased with storage interval of 60 days to 4.92±0.28%. Likewise cookies made with 2% flax seeds powder (C_2) depicted a moisture content of 4.01±0.13% that increased to 4.93±0.31% and 5.74±0.52% on day 30 and day 60 of storage. C_3 (2% pumpkin seeds powder) cookies showed a moisture content of 3.98±0.42 on day 0, that increased to 4.87±0.27 and 5.61±0.19% on day 30 and day 60 of storage time (Table 1). Ganorkar (2013) [7], determined proximate composition of flax seeds and the results showed that it contain amount of moisture content. The analysis showed average moisture content as 3.4%.

Table 1: Effect of treatments and storage on moisture content of cookies.

Treatments	Storage (Days)			Mean
	0	30	60	
C_0	4.40±0.09	4.89±0.21	5.18±0.41	$4.82±0.76^{AB}$
C_1	3.71±0.04	4.11±0.08	4.92±0.28	$4.25±0.68^{C}$
C_2	4.01±0.13	4.93±0.31	5.74±0.52	$4.89±0.49^{A}$
C_3	3.81±0.11	4.87±0.27	5.61±0.19	$4.76±0.72^{B}$
Mean	$3.98±0.42^{c}$	$4.70±0.29^{b}$	$5.36±0.38^{a}$	

Ash content of cookies

In the present study, sesame seeds, flax seeds and pumpkin seeds powder was added in cookies to improve their nutritional value. The mean value for ash content of all the treatments and during their storage period of 60 days are presented in table 5.2. The ash content in control was 0.82±0.03% that declined to 0.80±0.04% on day 30 and 0.79±0.05% on day 60 of storage period. The ash content in C_1 was found to be 0.87±0.05% that reduced to 0.85±0.03% and 0.82±0.03% on day 30 and day 60 of storage, respectively. Ash content in C_2 was found to be 0.91±0.02% that was reduced to 0.90±0.05% on day 30 and 0.87±0.04% on day 60 of storage period. Ash percentage in C_3 was 0.97±0.09% on day 0 that declined to 0.95±0.01% and 0.91±0.01% on day 30 and day 60 of storage, respectively.

Ganorkar (2013) [7], determined proximate composition of flax seeds and the results showed that it contain superior amount of ash. The analysis showed average ash content as 3.4%.

Table 2: Effect of treatments and storage on ash content of cookies

Treatments	Storage (Days)			Mean
	0	30	60	
C_0	0.82±0.03	0.80±0.04	0.79±0.05	$0.80±0.02^{D}$
C_1	0.87±0.05	0.85±0.03	0.82±0.03	$0.85±0.03^{C}$
C_2	0.91±0.02	0.90±0.05	0.87±0.04	$0.89±0.02^{B}$
C_3	0.97±0.09	0.95±0.01	0.91±0.01	$0.94±0.03^{A}$
Mean	$0.89±0.07^{a}$	$0.88±0.05^{ab}$	$0.85±0.06^{b}$	

Fat content of cookies

The fat content in control were 14.6±0.17% that declined to 14.1±0.14% and 13.5±0.09% on day 30 and day 60 of storage. Fat content in C_1, were 15.3±0.21% that declined during storage period of 60 days *i.e.* 14.7±0.11%. The fat content in C_2, were found to be 15.9±0.25% that experienced a decline to 15.6±0.09% on day 30 and to 15.1±0.08 on day 60 of storage time. Likewise fat percentage in cookies prepared with 2% pumpkin seeds powder (C_3) was 15.7±0.21% that reduced to 15.4±0.08% and 15.2±0.07% on day 30 and day 60 of storage, respectively.

Olagunju (2013) [8], determined proximate composition of flax seeds and the results showed that it contain superior amount of fat. The analysis showed average fat, content as 41%,

Table 3: Effect of treatments and storage on fat content (%) of cookies

Treatments	Storage (Days)			Mean
	0	30	60	
C_0	14.6±0.17	14.1±0.14	13.5±0.09	$14.07±0.51^{C}$
C_1	15.3±0.21	15.1±0.16	14.7±0.11	$15.03±0.43^{B}$
C_2	15.9±0.25	15.6±0.09	15.1±0.08	$15.53±0.29^{A}$
C_3	15.7±0.21	15.4±0.08	15.2±0.07	$15.43±0.38^{B}$
Mean	$15.38±0.35^{a}$	$15.05±0.14^{b}$	$14.63±0.08^{c}$	

Fiber content of cookies

The fiber content in C_0 was 0.32±0.05% that declined to 0.31±0.02% and 0.29±0.03% on storage time of 30 and 60 days, respectively. Sesame seed powder cookies (C_1), depicted fiber content of 0.36±0.01, 0.35±0.03 and 0.32±0.01% on day 0, 30 and 60 days, respectively. Cookies made with flax seeds powder (C_2), showed fiber content of 0.34±0.03 on day 0 that declined to 0.32±0.01% and 0.28±0.02% on day 30 and day 60 of storage time, respectively. Fiber content in C_3 comes out be 0.33±0.02%, 0.31±0.05% and 0.28±0.02% on day 0, 30 and 60 of storage period, respectively.

Gernah (2014) [9], determined proximate composition of flax seeds and the results showed that it contain superior amount of dietary fiber. The analysis showed average dietary fiber content as 28%.

Table 4: Effect of treatments and storage on fiber content (%) of cookies.

Treatments	Storage (Days)			Mean
	0	30	60	
C_0	0.32±0.05	0.31±0.02	0.29±0.03	$0.31±0.02^{BC}$
C_1	0.36±0.01	0.35±0.03	0.32±0.01	$0.34±0.03^{A}$
C_2	0.34±0.03	0.32±0.01	0.29±0.04	$0.32±0.02^{B}$
C_3	0.33±0.02	0.31±0.05	0.28±0.02	$0.31±0.04^{BC}$
Mean	$0.34±0.02^{a}$	$0.32±0.03^{b}$	$0.30±0.05^{c}$	

Protein content

The protein content in control cookies were found to be 8.32±0.67% that reduced to 8.11±0.56 on day 30 and to 7.78±0.41% on day 60 of storage. Protein content in C_1 comes out to be 10.09±0.86% because of the good quantity of protein present in sesame seeds powder. The protein percentage experienced a decline of up to 9.65±0.29 during storage time of 60 days. The C_2 showed protein content of about 12.28±0.97% that declined to 12.01±0.97% on day 30 and to 11.68±0.71% on day 60 of storage time. The protein content in C_3 comes out to be 15.53±0.83% that reduced to 15.04±0.86% and 14.39±0.28% on day 30 and day 60 of storage time, respectively.

Omran (2016) [10], determined proximate composition of flax seeds and the results showed that it contain superior amount of protein. The analysis showed average protein content as 20%.

Table 5: Effect of treatments and storage on protein content (%) of cookies

Treatments	Storage (Days)			Mean
	0	30	60	
C_0	8.32±0.67	8.11±0.56	7.78±0.41	$8.07±0.48^{D}$
C_1	10.09±0.86	9.97±0.39	9.65±0.29	$9.90±0.51^{C}$
C_2	12.28±0.97	12.01±0.97	11.68±0.72	$11.99±0.29^{B}$
C_3	15.53±0.83	15.04±0.86	14.39±0.28	$14.99±0.54^{A}$
Mean	$11.56±1.78^{a}$	$11.28±1.67^{b}$	$10.88±1.53^{c}$	

NFE content

The NFE content in control cookies were found to be 76.17±1.89% on day 0 the declined to 74.18±0.97% on day 30 and to 73.04±0.69% on day 60 of storage. Cookies prepared with 2% sesame seeds extract depicted NFE content of 80.43±1.24%, 78.65±1.01% and 74.98±0.57% on day 0, 30 and 60 of storage, respectively. NFE content in flaxseeds powder cookies (C_2), were 80.99±1.67% on day 0 and 78.71±0.78% on day 30 and 75.87±0.72% on day 60 of

storage period. Pumpkin seeds based cookies (C_3) showed NFE content of 76.21±2.01% that reduced to 74.87±0.58% and 73.35±0.69% on day 30 and day 60 of storage.
Malkanthi (2018) [11], determined proximate composition of flax seeds and the results showed that it contain superior amount of NFE. The analysis showed average NFE as 20%.

Table 6: Effect of treatments and storage on NFE content (%) of cookies

Treatments	Storage (Days)			Mean
	0	30	60	
C_0	76.17±1.89	74.81±0.97	73.04±0.69	$74.67±1.19^{BC}$
C_1	80.43±1.24	78.65±1.01	74.98±0.57	$78.02±2.02^{AB}$
C_2	80.99±1.67	78.71±0.78	75.87±0.72	$78.52±2.17^{A}$
C_3	76.21±2.01	74.87±0.58	73.35±0.69	$74.81±1.78^{BC}$
Mean	$78.45±2.09^{a}$	$76.76±2.09^{b}$	$74.31±1.08^{c}$	

Conclusion

In the present project, cookies were supplemented with sesame seeds, flax seeds and pumpkin seeds powder with the objective to improve the nutritional content, physical attributes and sensory acceptability of resultant products. The Cookies prepared were of improved nutritional content as highlighted by their better protein, fiber, ash, fat and moisture content. Moreover, the addition of sesame seeds, flax seeds and pumpkin seeds produce products with better acceptability giving C_2 highest score among all. Storage study also revealed the significant product after 60 days period in terms of nutritional value, sensory quality and microbial load. Thus it can be concluded that sesame seeds, flax seeds and pumpkin seeds can be utilized in cookies as well as other bakery products to provide nutrition dense foods to combat the present dilemma of life style related disorders that are mainly associated with unbalanced diet and lifestyle.

References

1. Anilakumar KR, Pal A, Khanum F, Bawa AS. Nutritional, medicinal and industrial uses of sesame (*Sesamum indicum* L.) seeds-an overview. Agriculture Conspectus Scientificus. 2010; 75(4):159-68.
2. Unal MK, Yalçın H. Proximate composition of Turkish sesame seeds and characterization of their oils. Grasas y aceites. 2008; 59(1):23-6.
3. Obiajunwa EI, Adebiyi FM, Omode PE. Determination of essential minerals and trace elements in Nigerian sesame seeds, using TXRF technique. Pakistan Journal of Nutrition. 2005; 4(6):393-5.
4. Ibrügger S, Kristensen M, Mikkelsen MS, Astrup A. Flaxseed dietary fiber supplements for suppression of appetite and food intake. Appetite. 2012; 58(2):490-5.
5. Khouryieh H, Aramouni F. Physical and sensory characteristics of cookies prepared with flaxseed flour. Journal of the Science of Food and Agriculture. 2012; 92(11):2366-72.
6. AOAC. Official methods of analysis for protein. Association of official analytical chemists. 18th Ed. Arlington VA 2209, USA. AOAC 984.13, 2005, 04:31.
7. Ganorkar PM, Jain RK. Flaxseed: A nutritional punch. International Food Research Journal. 2013; 20(2):519-525.
8. Olagunju I, Ifesan BOT. Nutritional Composition and Acceptability of Cookies Made from Wheat Flour and Germinated Sesame (*Sesamum indicum*) Flour Blends. British Journal of Applied Science & Technology. 2013; 3(4):702-713.
9. Gernah, Anyam K. Production and Quality Assessment of Protein–Rich Biscuits from Blends of Wheat and Defatted Sesame Flours. International Journal of Food Processing Technology. 2014; 1:27-31.
10. Omran AO, Ibrahim OS, Mohamed ZEM. Quality characteristics of biscuit prepared from wheat and flaxseed flour. Advances in Food Science. 2016; 38:129-138.
11. Malkanthi HHA, Umadevi SH. Effect of dried pumpkin pulpand seed powder on physical, chemicaland sensory properties of biscuits. International Journal of Scientific Research. 2018; 7:93-98.