ORIGINAL ARTICLE

Development of Sesame (*Sesamum indicum L*) Powder to Wheat Flour Supplemented Blend and Its Physicochemical Characterization

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Article Info:
Received: December 21, 2023
Accepted: March 29, 2024

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A B S T R A C T

The purpose of this research was to evaluate the effect of sesame flour supplementation on the physical, nutritional, and sensory qualities of bread. Sesame flour (SF) was created by oven-drying white type sesame seeds. The wheat flour (WF) was substituted with SF including T1= Control T2= Bread with WF + 10% WSF T3= Bread with WF+ 20% WSF, T4= Bread with WF+ 30% WSF. The results showed that bread's physical characteristics were significantly ($p<0.05$) improved when 30% sesame flour was used with wheat flour. Additionally, the composite bread's protein (15.86), fat (15.76), fiber (1.61), and carbohydrate (55.31) levels demonstrated increases in T4. Whereas the lowest ash content of 2.13 in T3, lowest moisture contents 5.64 exhibited decreases in T4. Whereas the highest carbohydrate was found in the T1 control 61.43 increased significantly ($p<0.05$) with increased sesame flour substitution the carbohydrate decreased. The proximate chemical analysis of the sesame flours showed similar when compared to ranges reported in the literature. Using a 9-point Hedonic scale, the physicochemical and sensory characteristics of the composite bread samples were examined. A sensory analysis revealed that the incorporation of sesame flours had a significant effect on the bread's quality, Whereas T4 70:30 composite bread was most favored for all the organoleptic attributes. Therefore, sesame flour incorporation in bread making has the capability to enhance the physicochemical, sensory characteristics with the best overall quality acceptability.

Keywords: Bread, Sesame, Quality, Nutritional.

1. INTRODUCTION

Wheat is quite possibly the most significant yield developed all throughout the planet. Bread wheat assumes a significant part among the couple of harvest species being widely developed as food source and was reasonable an essential issue to start agri-business. Wheat stands out among various cereal grains due to its notable high content of gluten protein, which lends bread dough its cohesive properties and helps it retain gas (David *et al*., 2015). Comprising 2-3% germ, 13-17% bran, and 80-85% endosperm, wheat serves as a primary source for wheat flour (Sramkova *et al.,* 2009). Nutritionally, the whole grain offers 78.10% carbohydrates, 14.70% proteins, 2.19% fats, 2.10% minerals, and notable levels of vitamins like thiamine and nutrient (Kumar *et al.,* 2011). Despite being rich in nutrients such as thiamine, riboflavin, niacin, and vitamin B, essential amino acids like lysine and threonine are lacking in wheat proteins.

Wheat undergoes common processing into flour, which serves as a fundamental ingredient in a vast array of culinary delights, ranging from bread, crumpets, and biscuits to noodles, pasta, and rolls. Additionally, it finds its way into cakes, pastries, oat bars, confections, and savory snacks. Wheat flour also contributes to the creation of crispy wafers, flavorful sauces, and delectable desserts, including specialty treats found in confectionery shops, like liquorice. Pakistani wheat varieties are become over a wide agro-climatic reach and such bare relied upon to show yield and quality and quality contrast (Ikhtiar & Alam, 2007). It is subsequently important to examine the biochemical arrangement of wheat assortments accessible for food and nourishing purposes in Pakistan, which would give a chance to investigate the accessible wheat varieties for more prominent greatness in their healthful quality.

Sesame (Sesamum indicum), also known as benniseed, is a tropical plant belonging to the Pedaliaceae family, cultivated primarily for its seeds and oil (Ikwuakam and Lawal, 2015). Sesame seeds are comprised of approximately 50% oil, 25% protein, and 20-25% carbohydrates, and they are abundant sources of iron, magnesium, copper, and calcium (Gebremichael, 2017). Additionally, sesame seeds contain phytosterols associated with lower levels of blood cholesterol (Zerihun, 2012). Defatted sesame flour contains about 55.7% protein, 29.10% carbohydrates, 9.82% residual matter, and 1.64% unprocessed fiber (Chinma *et al.,* 2012). Their dietary fiber is rich in essential amino acids crucial for growth, especially in children (Tunde-Akintunde *et al*., 2012). Sesame seeds are excellent sources of B-complex vitamins and numerous necessary minerals that play fundamental roles in bone mineralization and red blood cell production (Tunde-Akintunde *et al.,* 2012).

The ancient art of baking bread dates back to 3500 BC in Egypt bread is intimately linked to the advancement of humanity and civilization. The basic unleavened products produced in prehistoric times gave way to the light, airy ones we enjoy today. The technology used to make bread, including milling, baking, and related processes, has advanced slowly. The development of food science and technology made it feasible to regulate these many bread-making processes. It is one of the most significant staple food varieties devoured in various pieces of the world. Its utilization is consistently expanding in nations like Nigeria, because of growing populace, country metropolitan relocation and working conditions. (Alozie *et al.,* 2009).

Composite flours might be viewed as blend of flours for the creation of wheat bread, other heated items and pastas, or entirely non-wheat flour ready from combination of flour from oats, roots tubers, vegetables, crudes materials to be used for customary items. Composite flour is significant according to a practical perspective whereby through this matter wheats imports diminished. Several studies have explored the utilization of composite flour blends in bread production, including wheat-soybean blends (Udofia *et al.,* 2013), wheat-cowpea blends (Olapade and Oluwole, 2013), wheat-sesame blends (Iombor *et al.,* 2016), maize-yam blends (Bibiana *et al*., 2014), wheat-yeast fermented rice grain blends (Chinma *et al.,* 2015), and wheat-plantain blends. Consequently, this study was conducted to examined the impact of sesame flour supplementation in wheat flour on the nutritional and sensory attributes of breads enriched with sesame.

2. MATERIALS AND METHODS

2.1. Procurement of Raw Materials

Wheat flour, sesame seeds, sugar, and yeast were obtained from the Dawood Supermarket of Hyderabad. All the materials were brought to the bakery unit of the Institute of Food Science and Technology, Sindh Agriculture University Tandojam.

2.2. Preparation of Sesame Flour

After being manually sorted for stones, metals, and other impurities like dust and fine plant remnants, one kilogram of white sesame seeds was winnowed. Following that, seeds were soaked for ten minutes at 60°C in a 12% brine (NaCl). After being soaked, the seeds were dehulled by using tap water to remove the hulls from the kernels. Oven was used to dried the seeds at 60°C for 5 hrs and milled using laboratory mill according to the method described by Alopo (2001).

2.3. Composite Flour Blends Formulation

Wheat flour was supplemented with sesame flour for each treatment to ensure homogeneity in wheat blends, flours were thoroughly blended followed by sieving. To make the composite loaf of bread, these flour blends were completely combined with other ingredients.

2.4. Preparation of Bread Samples

Four different ratios 100:0, 90:10, 80:20, and 70:30 was created by blending the flour made from wheat and sesame seeds on a dry weight basis. The whole wheat flour served as the control. These flour blends were fully combined with additional ingredients to create a composite bread, which was then tested to examine how the physical, nutritional, and sensory qualities of the bread were affected when wheat flour was replaced with white sesame seed flour. The flour formulations in the study were produced based on standards methods by Shittu *et al.* (2013).

The regular dough method was implemented to create the bread dough. In order to optimize baking conditions, baking trials were carried out in a laboratory setting prior to the breads being baked. Dough and composite flours were weighed on a laboratory scale. All of the ingredients were weighed and combined into a dough using a dough mixer set to a medium speed for five to ten minutes. After resting at room temperature (25 ± 2°C) for 10 minutes, the dough was divided into pieces, each measuring 100 grams. After forming the five dough sections into balls and letting them rest for an additional ten minutes, they were molded, placed in pans, and then placed in the fermentation tray for the last proof. Samples of fermented dough were baked for 25–30 minutes at 250°C in the oven methods by Shittu *et al.* (2013). after this it was weighted and packaged into clear plastic bags. For sensory evaluation some slices were kept, and the others were dried at room temperature for chemical analysis.

2.5. Proximate Composition

Formulated bread was analyzed for proximate composition including moisture, fat, total acidity, and ash following AOAC (2007).

2.5.1. Determination of Moisture (%)

Association of Official Analytical Chemistry (AOAC, 2000) method was used to obtain the moisture content. The 5g sample was placed in a flat bottom aluminum dish that had been pre-weighed before being placed in a hot air oven set to 70–75°C for three to four hours. Samples that had dried were put in desiccators with silica gel acting as the desiccant. After samples had dried, they were placed in desiccators for an hour. The following formula was used to determine the moisture contents.

$$\text{Moisture (\%)} = \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

Where,
W_1 = weight of empty dish
W_2 = weight of dish + sample
W_3 = weight of dish + dried sample

2.5.2. Ash Content

The Association of Official Analytical Chemists technique was used to analyze the ash content in bread (AOAC, 2007). A 2g sample of bread was placed in a cleaned crucible and heated in a muffle furnace at a temperature (525 ^{o}C). After 3-5 hours, the crucibles were placed in a desiccator with moisture absorbent (silica gel) for 30 minutes before being reweighed and calculated using the procedure below.

$$\%\text{Ash} = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

2.5.3. Determination of pH Value

The pH of the sample was measured following the AOAC (2000) guidelines, employing a digital pH meter. A 10g sample was blended with distilled water. The pH meter underwent calibration using buffers at pH 4, 7, and 10 before immersing the electrode into the solution. The electrode was cleaned with tissue paper and rinsed with distilled water after the initial reading was obtained.

2.5.4 Determination of Fat (%)

The bread fat content was determined using the Mojonnier technique AOAC (2000). 2g of sample Monnier tubes were taken, then 10 ml ethanol (C2H5OH), 10 ml diethyl ether (C4H10O) (ethoxyethane), and 25 ml light petroleum (C6H14) were added and transferred to conical flash, pre-weighed, then dried at 100°C for one hour in the oven. In the second extraction, a mojonnier tube containing 15 ml of petroleum ether and diethyl ether was vigorously combined and left for an hour. After taking the conical flask out of the oven, the transparent solution was put back into it. A flask then dries in the oven at 100°C for one hour. For the third extraction, the procedure was repeated. The sample weight was taken and calculated using the supplied formula after the conical flask was kept in the desiccators for one hour.

$$\text{Fat content (\%)} = \frac{W_2 - W_1}{W_3} \times 100$$

Where, W_1 = weight of empty flask (g), W_2 = weight of flask + fat (g) and W_3= weight of sample taken (g)

2.5.5. Determination of Total Carbohydrates (%)

Total carbohydrates (%) of formulated bread samples were determined by following the method as described by through the following formula:

Carbohydrate % = 100 – (% Moisture + % Ash + % Fat + % Protein + % Fiber)

2.6. Sensorial Analysis

The sensorial characteristics of the bread sample were evaluated by the faculty of IFST. The whole wheat and composite bread were assessed for surface, shading, and general acceptability using 9 points hedonic scale in which 9 = like extremely, 8 = like very much, 7 = like Moderately, 6 = Like Slightly, 5 = Neither Like nor Dislike, 4 = Dislike slightly, 3 = Dislike Moderately, 2 = Dislike very much, 1 = Dislike Extremely as described by (Iwe,2003).

2.7. Physical Characteristics of Cake

After the bread cooled for one hour, its physical properties were measured. The bread's weight loss was calculated using the loaf volume (Cm3) and baking loss(g) was determined by using a vernier caliper by the methods of James (1995).

2.8. Statistical Analysis

The information was examined by the statistical procedure of analysis of variance (ANOVA) and the significance of the mean was computed using the Least Significant Differences (LSD) test at a 0.05% level of possibility through (SPSS-20).

3. RESULTS

3.1. Proximate Composition

The study was conducted at the Institute of Food Sciences and Technology, Sindh Agricultural University Tandojam, to assess the nutritional and sensory attributes of breads incorporating sesame. Using the AOAC (2000) method, bread compositions were examined for their proximate composition, which included moisture, protein, fat, total carbohydrates, and crude fiber. Results for these parameters are presented in Tables **1-6**.

3.2. Moisture

The results regarding the moisture content of wheat bread incorporated with sesame flour (SF) at various levels are presented in Table **1** The moisture content of wheat-sesame bread decreased with an increased level of sesame flour (SF) in wheat flour (WF). The lowest moisture content was recorded in T_2 and T_3 i.e.7.33% and 6.84% respectively. However, the bread produced with T_4 showed a minimum moisture of 5.64%.

Table 1. Moisture Content Bread Prepared from Wheat and Sesame Flour.

Treatments	RI	RII	RIII	Mean
T_1= WF 100 % Control	9.45	9.10	8.80	9.11
T_2= WF 90+ SF 10 %	7.21	7.34	7.44	7.33
T_3= WF 80+ SF 20 %	6.77	6.80	6.95	6.84
T_4= WF 70+ SF 30 %	5.40	5.66	5.88	5.64

3.3. Protein

The results regarding the protein of wheat bread incorporated with sesame flour (SF) at various levels are presented in Table **2**. The protein of wheat-sesame bread increased with an increased level of sesame flour (SF) in wheat flour (WF). The bread prepared with T_4 resulted in significant maximum protein (15.86), while the lowest protein content was recorded in T_1 and T_2 i.e. (11.2 and 14.22) respectively. However, the bread produced with T_3 showed a minimum protein (15.14).

Table 2. Protein Content of Bread Prepared from Wheat and Sesame Flour.

Treatments	RI	RII	RIII	Mean
T_1= WF 100 % Control	11.25	11.10	11.25	11.2
T_2= WF 90+ SF 10 %	14.22	14.22	14.22	14.22
T_3= WF 80+ SF 20 %	15.14	15.14	15.14	15.14
T_4= WF 70+ SF 30 %	15.86	15.86	15.86	15.86

3.4. Fat

The results regarding the fat of wheat bread incorporated with sesame flour (SF) at various levels are presented in Table **3**. The fat of wheat-sesame bread increased with increased levels of sesame flour (SF) in wheat flour (WF). The bread prepared with T_4 resulted in a significant maximum fat is (15.76), while the lowest fat content was recorded in T_1 and T_2 i.e. (4.32 and 10.22) respectively. However, the T_3 wheat-sesame bread produced with WF showed a minimum fat (13.93).

Table 3. The Fat Content of Bread Prepared from Wheat and Sesame Flour.

Treatments	RI	RII	RIII	Mean
T_1= WF 100 % Control	4.32	4.32	4.32	4.32
T_2= WF 90+ SF 10 %	10.22	10.22	10.22	10.22
T_3= WF 80+ SF 20 %	13.93	13.93	13.93	13.93
T_4= WF 70+ SF 30 %	15.76	15.76	15.76	15.76

3.5. Fiber

The results regarding the fiber of wheat bread incorporated with sesame flour (SF) at various levels are presented in Table **4**. The fiber content of wheat-sesame bread increased with an increased level of sesame flour (SF) in wheat flour (WF). The bread prepared with T_4 resulted in a significant maximum fiber (1.61), while the lowest fiber content was recorded in T_2 and T_3 i.e. (1.40 and 1.54) respectively.

Table 4. Fiber Percentage of Bread Prepared from Wheat and Sesame Flour.

Treatments	RI	RII	RIII	Mean
T_1= WF 100 % Control	0.95	0.95	0.95	0.95
T_2= WF 90+ SF 10 %	1.40	1.40	1.40	1.40
T_3= WF 80+ SF 20 %	1.54	1.54	1.54	1.54
T_4= WF 70+ SF 30 %	1.61	1.61	1.61	1.61

3.6. Ash

The results regarding the ash of wheat bread incorporated with sesame flour (SF) at various levels are presented in Table **5**. The bread prepared with T_4 resulted in a significant maximum ash value is (2.2), while the lowest ash was recorded in T_2 and T_3 i.e. (1.93 and 2.13) respectively. However, the T_1 wheat-sesame bread produced with WF showed a minimum ash (0.69).

Table 5. The Ash Content of Bread Prepared from Wheat and Sesame Flour.

Treatments	RI	RII	RIII	Mean
T_1= WF 100 % Control	0.64	0.75	0.70	0.69
T_2= WF 90+ SF 10 %	1.82	2.05	1.94	1.93
T_3= WF 80+ SF 20 %	2.14	2.20	2.05	2.13
T_4= WF 70+ SF 30 %	2.23	2.26	2.11	2.2

3.7. Carbohydrate

The results regarding the carbohydrate of wheat bread incorporated with sesame flour (SF) at various levels are presented in Table **6**. The bread prepared with T_1 resulted in a significant maximum carbohydrate (61.43), while the lowest carbohydrate content was recorded in T_3 and T_4 *i.e.* (55.02 and 55.31) respectively. However, the T_2 (54.20) wheat-sesame bread produced with WF showed a minimum carbohydrate (0.21%).

Table 6. The Carbohydrate Content of Bread Prepared from Wheat and Sesame Flour.

Treatments	RI	RII	RIII	Mean
T_1= WF 100 % Control	61.43	61.43	61.43	61`.43
T_2= WF 90+SF 10 %	54.20	54.20	54.20	54.20
T_3= WF 80+SF 20 %	55.02	55.02	55.02	55.02
T_4= WF 70+ SF 30 %	55.31	55.31	55.31	55.31

3.8. Sensory Evaluation

The wheat bread incorporated with sesame flour (SF) such as color, flavor, texture aroma, and overall acceptability regarding product carried out by the faculty members of IFST using a 9-point hedonic scale.

The results regarding the sensory characteristics of wheat bread incorporated with sesame flour (SF) at various levels are presented in Figure **1**. The result indicated that a maximum score of 7.1 was received by T_1 whereas the 6.4, score ranked to T_3. The bread prepared with the control T_3 ranked 5.20 score. The taste of bread increased with the increased level of sesame flour (SF) in wheat flour (WF). The result showed that the maximum score (6.7) was received by T_4 whereas T_2 and T_3 scored 5.6 and 6.5 respectively. The bread prepared with the control T_1 showed (6.7) score. The texture of bread increased with an increased level of sesame flour (SF) in wheat flour (WF). The results indicated that the maximum score (6.6) was received by T_2 whereas the (6.5) and (6.1) were score ranked as T_1 and T_3, respectively. The result indicated that the maximum score (6.8) was received by T_2 whereas the T1 and T_3 score ranked (6.1 and 5.9) respectively. The bread was prepared with the control T1 (6.8) score ranked.

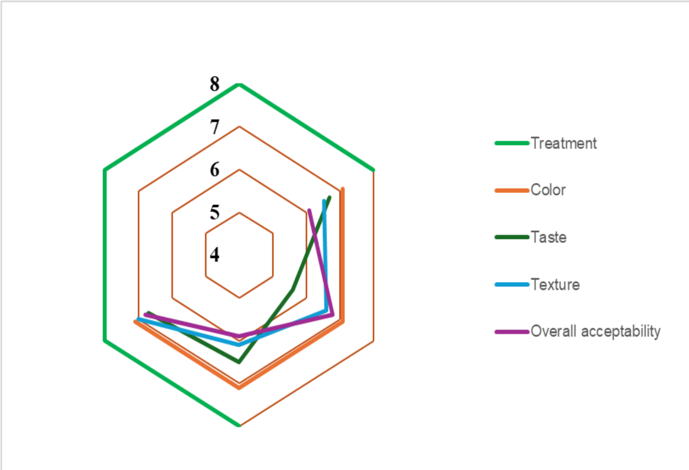

Figure 1. Sensory Score of bread prepared from wheat and sesame flour.

T1= WF 100 % Control
T2= WF 90+ SF 10 %
T3= WF 80+ SF 20 %
T4= WF 70+ SF 30 %

3.9. Physical Analysis

The physical evaluation of wheat-sesame bread such as loaf volume, weight loss, and baking loss was examined in the control sample (100:0), and the combined wheat-sesame bread is revealed in Table **7**. The result regarding composite wheat-sesame bread such as Loaf volume and loaf weight enhanced substantially ($P<0.05$) particularly for samples T_2 (90:10) and T_3 (80:20). The highest result of loaf volumes of the composite breads was recorded (392.30 and 398.00 cm3) respectively as compared to control (382.25 cm3). Our results are supported by (Shittu *et al* 2007) who observed that loaf volume has good economic effects on bread from the consumer retail perspective. The baking loss of the composite bread was recorded (at 384.24 and 387.25) respectively as contrasted to the control (382.25 cm3).

Table 7. Loaf Volume and Loaf Weight Bread Prepared from Wheat and Sesame Flour.

Treatments	Loaf volume (Cm3)	Baking loss(g)	Weight loss(g)
T_1= WF 100 % Control	382.25	386.5	384.25(g)
T_2= WF 90+ SF 10 %	392.30	384.24	384.25(g)
T_3= WF 80+ SF 20 %	398.00	387.75	384.25(g)
T_4= WF 70+ SF 30 %	395.22	380.22	384.25(g)

4. DISCUSSION

4.1. Proximate Analysis

In the diets of many people worldwide, bread is a staple food that is consumed in developed as well as developing countries. It is an important source of macro and micronutrients, including carbs, protein, fiber, vitamins, and minerals. As bread is a ready-to-eat food item and is convenient, its consumption has been steadily increasing in Pakistan. The present study shows that the bread prepared with different levels of sesame flour (SF) in wheat flour (WF) resulted in moisture content. The lowest moisture content was recorded in T_2 and T_3 i.e.7.33 and 6. 84 respectively. The variation in moisture content among food sources may result from some of the water tightly binding to food matrices, rendering it inaccessible to food microbes. Our findings align with those of Edema *et al.* (2005), who studied wheat-sesame composite bread and also observed a reduction in moisture content, potentially attributed to the high-fat content of sesame seeds. The highest pH values were recorded in T2 and T3, at 5.1 and 4.8, respectively. The rise in protein content of composite bread supplemented with sesame flour ranged from 10.3 to 14.8%, compared to the control (9.2%), partly due to the higher protein content of sesame flour compared to wheat flour (Maikinde *et al.,* 2014). This observation is consistent with Olaoye *et al*. (2006), who noted a similar increase in protein content with soy flour supplementation in bread made from composite flour of wheat, plantain, and soy flour. Similarly, Abdul Razzaq *et al.* (2012) reported an increased trend in protein content (7.06-11.84%) in cookies made from sorghum-wheat flour blends, with a concurrent increase in fiber content. The highest fat content was observed in T3 and T4, at 13.93 and 15.76, respectively. The elevated fat content in wheat-sesame bread may be attributed to the high-fat content (61.21g/100g) of sesame seeds (FAO, 2012). This finding is supported by Iombor *et al.* (2016), who also observed an increase in fat content from 3.7% (control) to a range of 5.80-10.0% in composite bread samples with sesame flour supplementation. Similarly, Omeire *et al.* (2012) found that cookies made with wheat-defatted cashew nuts and wheat brewers waste grain flour blends (2.21-4.80%) had an increasing trend in fat content. The greater fat content in sesame flour can be the reason for the observed significant ($p>0.05$) variations in fat content between the control and enriched bread samples. Wheat-sesame bread's high fiber content may help manage and prevent disorders linked to obesity and being overweight. During digestion, dietary fiber interacts with fats in the stomach to make them unavailable for absorption and transportation, controlling their metabolic destiny.

The high fiber content could likewise be utilized in the arrangement of dishes for diabetics to forestall spikes in glucose levels after admission to the feast. Malted grain has generally higher rough fiber content than wheat and this legitimizes the outcomes acquired for the treat tests. The finding adjusts to the perception of (Gernah *et al.,* 2010) for the expanding pattern in the unrefined fiber (1.32-10.82%) substances of the treats produced using wheat-brewers spent grain flour mixes. Conversely, the outcomes were higher than the unrefined fiber (1.05-1.65) treats delivered from wheat-defatted cashew nut flour mixes as announced by (Omeire *et al.,* 2012). The Ash content of a food item means its complete mineral component content. It is the inorganic buildup that stays after the expulsion of water and natural matter by warming within the sight of an oxidizing specialist (Abdul Razzaq *et al.,* 2012). The present study shows that the bread prepared with different levels of sesame flour (SF) in wheat flour (WF) resulted increase in ash content. Our results are in agreement with Omeire *et al.* (2012) who examined the comparative pattern of expanding ash content (1.65-2.20%) in treats delivered from wheat-defatted cashew nut flours. The present study shows that the bread prepared with different levels of sesame flour (SF) in wheat flour (WF) resulted in the carbohydrate content being between 61.43 and 55.31 respectively. The low carbohydrate content of the composite treats has a few medical advantages, as it helps in assimilation in the colon and diminishes clogging frequently connected with items from refined grain flours (Elleuch *et al*., 2011; Slavain, 2005).

4.2. Sensory Evaluation

The scorecards, based on 9 hedonic scales, were provided to a panel of judges consisting of faculty members from the Institute of Food Sciences and Technology. These scorecards were used to evaluate sensory attributes such as color, taste, texture, and overall acceptability for all four treatments. The mean scores for color ranged between 7.1 and 4.8. Specifically, bread sample T4 exhibited the lowest score, at 4.8, while sample T1 had the highest score, at 7.1. Generally, the color of the wheat-sesame bread decreases with the increase in sesame flour. These results are also assisted by (Iombor *et al.,* 2016) as they observed that wheat bread (control) based on color (4.67), among the bread composite of wheat-sesame test nonetheless, sample B (90:10) was generally liked for color (3.93). Based on taste, the scores for the bread range from 6.7 to 5.6. The bread sample T_1 recorded as highest score of 6.7 while the lowest value was scored by the sample T_2i.e 5.6. The results of sensory evaluations are also revealed by (Onabanjo *et al.,* 2014) who examined those biscuits created from proportion 100:0 wheat-yam composite is not essentially unique ($p≥0.05$) in taste from biscuits produced from proportion 90:10 and 70:30 wheat-yam composite flour, however, there was huge distinction ($p≥0.05$) in taste between biscuits produced using proportion 100;0 and biscuits delivered from proportion 60:40 and 50:50 wheat-yam composite flour. The mean score of texture ranged between 6.6 and 7.0. The texture of the sample (T_4) was scored 7 while the bread was prepared with a control score of 6.5. The highest value for overall acceptability was ranked in-between (6.1-6.8). The study's findings indicated that bread prepared with T_3:

80:20 wheat flour+ sesame flour showed good results in terms of physico-chemical properties.

4.3. Physical Analysis

The physical parameters of loaf volume of wheat-sesame bread were ranged in between loaf volume, baking loss, and weight loss and were determined from the control bread (100:0), and the composite bread. Physical characteristics of wheat sesame composite bread are Loaf volume, baking loss, and weight loss. Loaf volume enhanced significantly (P<0.05), particularly for all the samples. Our results are supported by (Shittu *et al*., 2007) who observed that loaf volume has a good economic effect on bread from the consumer retail perspective. Therefore, a decrease in the loaf volume during baking is not satisfactory to the economic quality of the bakers. The weight loss of wheat-sesame bread has led up to 384.25g in all the treatments. The findings of this study suggest that to produce bread with satisfactory acceptability and weight and volume characteristics similar to 100% wheat bread, a maximum supplementation level of 5% with wheat flour is necessary. Volume reductions occur when blending wheat flour with more than 5% legume and oilseed flour, as reported for sunflower (Yue *et al.,* 1991), quinoa (Chauhan *et al.,* 1992), and soybean (Ndife *et al.,* 2011) protein concentrates. After baking, the weight of the bread decreased. The shape stability and porosity of products are reduced by the increased quantity of sesame flour.

5. CONCLUSION

Research was carried out on the impact of sesame flour supplementation of wheat flour on nutritional and sensorial quality characteristics of sesame-based breads during the years 2019-20, at the Institute of Food Sciences and Technology, Sindh Agriculture University, Tandojam. Wheat flour and sesame flour were analyzed for moisture, ash, protein, fat, total carbohydrate, and crude fiber respectively. The replacement of wheat with sesame flour in bread production improved the physicochemical composition of the composite bread. The study showed that it is possible to produce bread with wheat flour and white sesame flour of acceptable quality, with replacement levels of 5% and 10%. In conclusion, the replacement of wheat with sesame flour in bread production enhanced the physicochemical properties of the composite bread. Wheat sesame bread composite bread should be commercialized, and further research should be conducted for new product development and customer satisfaction. In the end, the research results suggested that bread produced with T3 showed better results in physico-chemical composition.

6. CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

7. ACKNOWLEDGEMENTS

The research study was undertaken at Sindh Agriculture University, Tandojam Pakistan as part of the M.Sc. (Hons) research and thesis.

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