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Research Article

Finger Millet-Pumpkin Seed Choco Flakes: A Functional Breakfast Cereal

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ABSTRACT

Background: Finger millet is nutrient-rich millet with high calcium, iron, dietary fiber, and health-promoting properties, while pumpkin seeds are rich in protein, minerals, and antioxidants. Fortification of finger millet products with pumpkin seed flour may enhance their nutritional quality and consumer acceptability. Therefore, the present study aimed to develop finger millet Choco flakes fortified with pumpkin seed flour and evaluate their sensory, nutritional, and storage characteristics. **Materials and Methods:** Finger millet Choco flakes were prepared using different proportions of finger millet and pumpkin seed flour, including a control (T0) and three fortified treatments (T1-T3). The products were evaluated for sensory attributes using a 9-point hedonic scale, nutritional composition (protein, fat, moisture, ash, carbohydrate, dietary fiber, iron, and energy), and storage stability through sensory evaluation over a period of 30 days. **Results:** Among all formulations, T3 (55:15 finger millet: pumpkin seed flour) was the most preferred treatment. It recorded the highest sensory scores for appearance (7.80±0.95), colour (7.85±0.81), flavour (8.25±0.86), taste (8.45±0.94), texture (8.40±0.88), and overall acceptability (8.35±0.81), whereas the control (T0) obtained the lowest scores. Nutritional analysis showed progressive improvement with increasing pumpkin seed flour incorporation. T3 exhibited the highest protein (5.09±0.08%), fat (3.20±0.04%), iron (4.50±0.03 mg/100 g), moisture (3.43±0.02%), and dietary fiber (9.40±0.06%) contents. Conversely, carbohydrate content decreased from 82.45±0.30% (T0) to 76.00±0.34% (T3), while energy value declined from 369.89±0.84 kcal to 354.00±0.64 kcal. Ash content showed only slight variation among treatments. During storage, sensory scores gradually decreased from the 0^{th} to the 30^{th} day, indicating a decline in acceptability over time. **Conclusion:** Fortification of finger millet Choco flakes with pumpkin seed flour significantly improved sensory acceptability and nutritional quality. The T3 formulation (55:15) was identified as the optimum treatment due to its superior sensory characteristics and enhanced protein, fat, iron, and dietary fiber contents. The developed product can serve as a nutritious value-added breakfast cereal with good consumer acceptability, although a gradual reduction in sensory quality was observed during 30 days of storage.

Keywords: Choco Flakes, Finger millet, Functional food, Nutritional Analysis, and Sensory Evolution.

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INTRODUCTION

Eleusine coracana, commonly known as African millet or ragi, belongs to the Poaceae family. Its widely used name, "finger millet," comes from the characteristic finger-like branching of its panicle. It is a self-pollinating tetraploid crop species. The genus *Eleusine* includes eight diploid and tetraploid annual and perennial herb species (Vidhate *et al.*, 2022). Ragi flour is commonly consumed in the form of salted or sweetened porridge or shaped into dough balls. It is also used in preparing various feeding meals. Because of its strong tolerance to harsh agro-climatic conditions, ragi is regarded as an important food security crop, especially in marginal and drought-prone regions (Ushakumari *et al.*, 2004). Finger millet (*Eleusine coracana*), commonly known as ragi, is a rich source of calcium, magnesium, methionine, lysine, dietary fiber, amino acids, and several other essential nutrients. Regular consumption of ragi has been associated with potential health benefits, including improved management of type II diabetes, reduced risk of cardiovascular diseases and gastrointestinal cancers, support in slowing skin ageing, and prevention of hair loss. It may also help in regulating blood circulation, maintaining hemoglobin levels, supporting gut health, reducing body weight, and preventing osteoporosis, particularly in elderly women (Chandra *et al.*, 2016).

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Pumpkin seeds, commonly known in North America as "pepitas" (from the Mexican Spanish pepita de calabaza, meaning "little squash seed"), are the edible seeds of pumpkin and certain squash varieties. These seeds are typically flat, asymmetrically oval in shape, and covered with a white outer husk that reveals a light green kernel after removal. Some pumpkin varieties are naturally hull-less and are cultivated specifically for seed production (Song *et al*., 2011) Pumpkin seeds are highly dense in functional and bioactive nutrients.

While their nutritional components act as essential metabolites required for sustaining life, the functional compounds play a significant role in disease prevention and health promotion in humans. These seeds contain a high level of Potassium (K) and relatively low Sodium (Na), along with abundant minerals such as Calcium (Ca), Manganese (Mn), Phosphorus (P), and Magnesium (Mg). They are also a good source of trace elements including Zinc (Zn) and Iron (Fe) (Pham *et al*., 2017). In addition, carotenoids present in pumpkin act as antioxidants in the human body. These compounds provide multiple health benefits, including immune system enhancement and protection against oxidative stress caused by free radicals. By reducing oxidative damage, antioxidants help lower the risk of various diseases, including certain cancers and eye disorders (Mangge *et al*., 2014).

MATERIALS AND METHODS

Materials

The raw materials like ragi, pumpkin seeds, cocoa powder, jaggary powder, milk powder and butter were purchased from local market, Hyderabad.

Preparation of ragi flour

First wash the finger millet (ragi) grains thoroughly to remove any dirt and impurities, rinsing several times until the water runs clear. Then, drain and dry the grains completely under sunlight or a hot air dryer. After drying, grind the finger millet grains into a fine flour using a grinder or mill.

Preparation of pumpkin seed flour

Pumpkin seed flour is made by cleaning and drying raw pumpkin seeds, then grinding them into a fine powder using a blender or grinder. The dried seeds are ground carefully to avoid turning into butter.

Preparation of Choco flakes

It was prepared by the method of (Argade, 2024) with slight modification (Table 1). Clean raw materials and remove unwanted substance. Weigh the entire ingredients accurately. Then add water into ingredients to form dough. After that hand extrusion will be done and then place the extruded samples in tray. Put the tray in oven and bake at 180°C for 10 min. Let the ragi Choco flakes cool at the room temperature. Then the Choco flakes were packed into an air tight container.

Nutritional analysis

Crude protein content of the Choco flake's samples were determined by the Kjeldahl method according to AOAC (2000, 979.09). Fat content was estimated using an Automated Soxhlet apparatus following the AOAC (2000, 4.5.01) method. Crude fiber content was analyzed according to AOAC (2000, 920.169). Ash content of the Choco flake's samples was determined using the AOAC Method (1990). Total carbohydrate content was calculated by the difference method as described by Southgate, 1991. The energy content of the Choco flakes was calculated using the factorial method recommended by AOAC (1995).

Sensory analysis

Twenty panelist members used a nine-point hedonic scale to assess the sensory analysis of the prepared flakes, including colour, texture, flavour, taste, and overall acceptability.

Storage period

Finger millet flakes incorporated with pumpkin seed flour was be stored in air tight container. The impact of storage duration on flakes sensory qualities were assessed during the 0th day 15th day and 30th day.

Statistical analysis

The samples were analyzed three times. Using Microsoft Excel 2019 the mean score and standard deviation of three replicates for every test was determined. Using Statistical Package for Social Sciences (SPSS), a One-Way Analysis of Variance (ANOVA) was performed on all the collected data. Means were compared using LSD with threshold of $p<0.05$.

RESULTS

Sensory analysis of control and experimental Choco flakes

Sensory analysis of control and experimental Choco flakes was described in Table 2. The appearance scores of controls and experimental Choco flakes were 7.35±0.87, 7.4±0.82, 7.7±0.65 and 7.8±0.95, respectively. As shown in Table 2 the highest appearance score was observed in T3 (7.8±0.95) while the lowest was observed in control sample T0 (7.35±0.87) Figure 1. The color scores of controls and experimental Choco flakes were 7.55±0.82, 7.75±0.71, 7.8±0.89 and 7.85±0.81, respectively. The highest colour score was found in T3 (7.85±0.81) while the lowest was found in T0 (7.55±0.82) Figure 2. The flavour scores of the control and experimental Choco flakes were 7.85±0.87, 7.95±0.68, 8.05±0.68, and 8.25±0.86, respectively. The highest flavour score was observed in T3 (8.25±0.86), while the lowest was observed in the control sample T0 (7.85±0.87) Figure 3.

The taste scores of controls and experimental Choco flakes were 7.7±0.57, 7.85±0.67, 8.2±0.89 and 8.45±0.94, respectively. The highest taste scores were found in T3 (8.45±0.94) while the lowest was found in T0 (7.7±0.57), Figure 4. The texture scores of controls and experimental Choco flakes were 7.75±0.85, 8±0.72, 8.15±0.98 and 8.40±0.88, respectively. The highest texture scores were found in T3 (8.40±0.88) while the lowest was found in T0 (7.75±0.85), Figure 5. The overall acceptability scores of controls and experimental Choco flakes were 7.65±0.93,7.9±0.55, 8.15±0.67 and 8.35±0.81, respectively. The highest overall acceptability was found in T3 (8.35±0.81) while the lowest was found in T0 (7.65±0.93), Figure 6.

Nutritional properties of control and experimental samples

Nutritional properties of control and experimental sample were reported in Table 3. The protein content of the control and experimental Choco flakes increased from T0 to T3, with values of 3.93±0.14, 4.23±0.007, 4.86±0.08, and 5.09±0.08, respectively. As shown in Table 2 The highest protein content was found in sample T3 (5.09%), while the lowest was found in the control sample T0 (3.93%). The fat content of the control and experimental Choco flakes ranged from 2.72 ± 0.13 to 3.20 ± 0.04. The highest fat content was observed in sample T3 (3.20%), while the lowest was observed in the control sample T0 (2.72%).

The iron content of the control and experimental Choco flakes was 3.30±0.02, 3.51±0.02, 3.73±0.03, and 4.50±0.03, respectively. The highest iron content was found in sample T3 (4.50%), whereas the lowest was in the control sample T0 (3.30%). The fiber content of the control and experimental Choco flakes was 7.10±0.004, 8.4±0.2, 9.02±0.33, and 9.4±0.06, respectively. The highest fiber content was found in sample T3 (9.4%), while the lowest was found in the control sample T0 (7.10%).

The ash content of the control and experimental Choco flakes was 2.73±0.16, 2.68±0.14, 2.52±0.07 and 2.64±0.14 respectively. The highest ash content was observed in control sample (2.73±0.16) while the lowest was found in T2 sample (2.52±0.07). The moisture content of the control and experimental Choco flakes was 1.04±0.02, 1.23±0.08, 2.51±0.22, and 3.43±0.02, respectively. The highest moisture content was found in sample T3 (3.43%), while the lowest was found in the control sample T0 (1.04%).

The carbohydrate content of the control and experimental Choco flakes was 82.45±0.30, 80.50±0.38, 77.00±0.49, and 76.00±0.34 respectively. The highest carbohydrate content was observed in sample T0 (82.45%), while the lowest was observed in sample T3 (76.00%). The energy content of the control and experimental

Table 1: Formulation of control and Experimental Choco flakes.

Ingredients (g)	T0	T1	T2	T3
Ragi flour	70	65	60	55
Pumpkin seed flour	00	5	10	15
Butter	5.0	5.0	5.0	5.0
Cocoa powder	5.0	5.0	5.0	5.0
Milk powder	5.0	5.0	5.0	5.0
Jaggary powder	15	15	15	15

T0:70:00 (ragi flour: pumpkin seeds flour), T1:65:5 (ragi flour: pumpkin seeds flour), T2:60:10 (ragi flour: pumpkin seeds flour), T3:55:15 (ragi flour: pumpkin seeds flour).

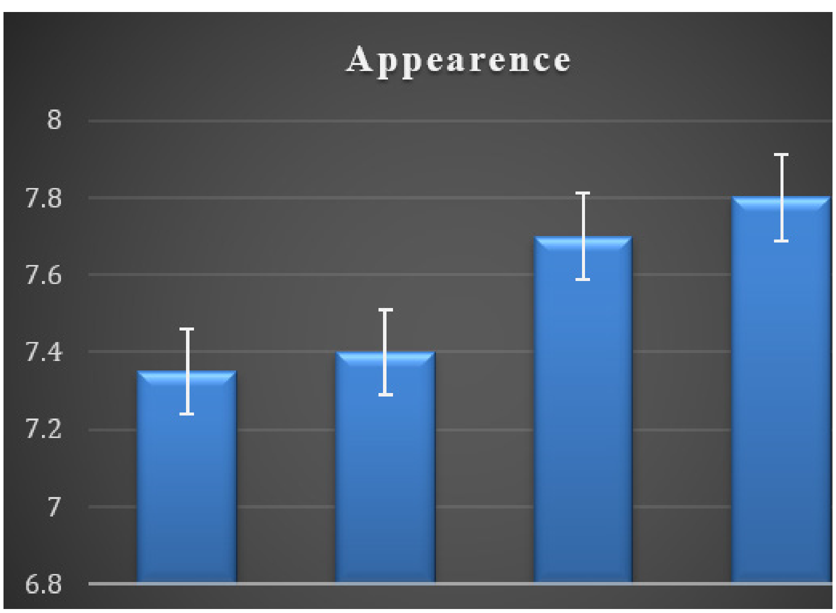

Figure 1: Appearance of control and experimental Choco flakes.

Table 2: Sensory analyses of control and experimental Choco flakes.

Sensory analysis	T0	T1	T2	T3
Appearance	7.35±0.87a	7.4±0.82a	7.7±0.65a	7.8±0.95a
Colour	7.55±0.82a	7.75±0.71a	7.8±0.89a	7.85±0.81a
Flavour	7.85±0.87a	7.95±0.68ad	8.05±0.68bde	8.25±0.86ce
Taste	7.7±0.57a	7.85±0.67ac	8.2±0.89ad	8.45±0.94bcd
Texture	7.75±0.85a	8±0.72a	8.15±0.98a	8.4±0.88a
Overall acceptability	7.65±0.93a	7.9±0.55ad	8.15±0.67bd	8.35±0.81cd

Mean values followed by different letters with subscript within the row are significantly different ($p<0.05$) 7.95±0.68.

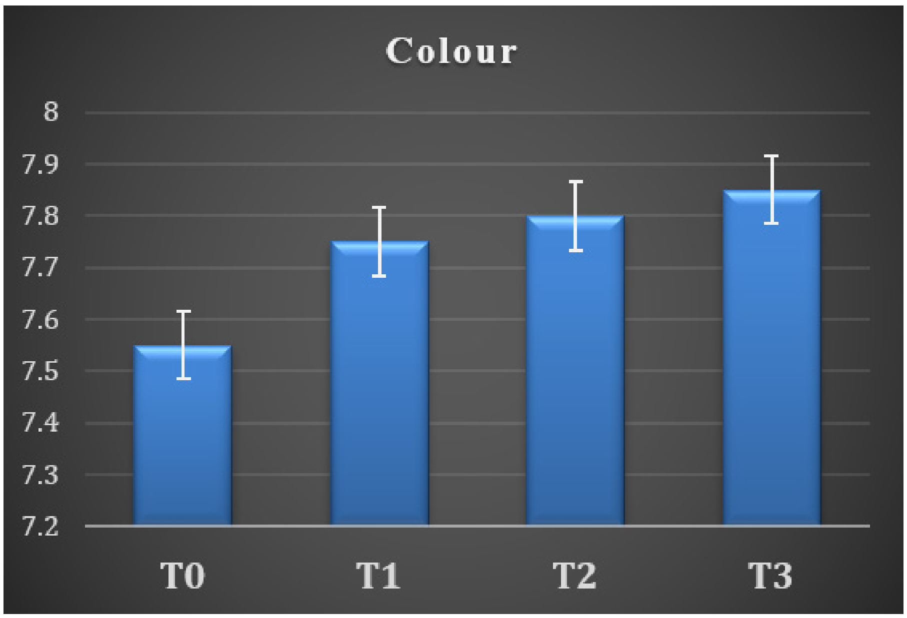

Figure 2: Colour of control and experimental Choco flakes.

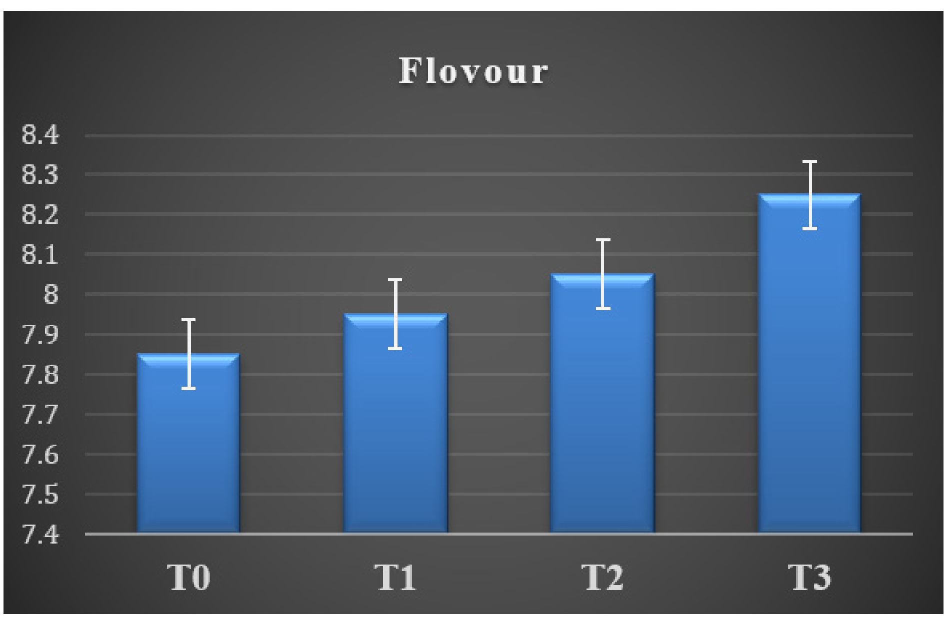

Figure 3: Flavour of control and experimental Choco flakes.

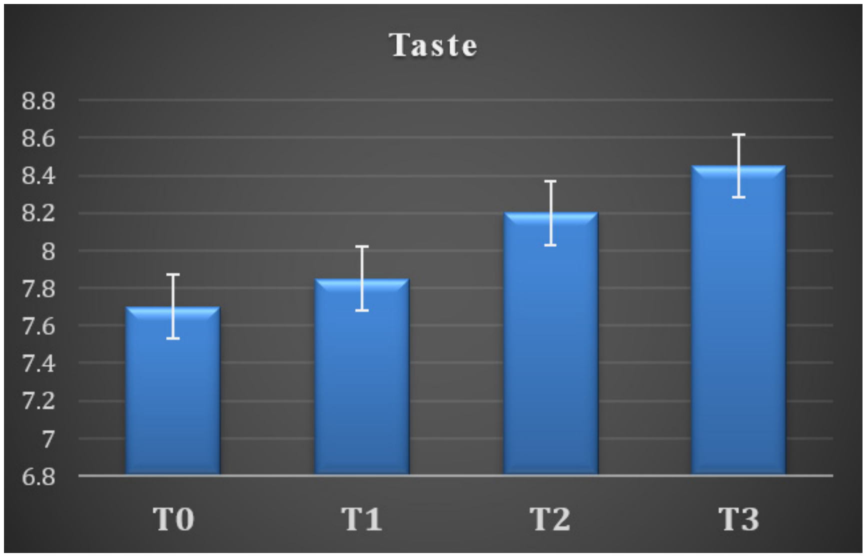

Figure 4: Taste of control and experimental Choco flakes.

Table 3: Nutritional Properties of control and experimental Choco flakes.

Nutritional Properties	T0	T1	T2	T3
Protein (%)	3.93±0.14[a]	4.23±0.007[b]	4.86±0.08[c]	5.09±0.08[d]
Fat (%)	2.72±0.13[a]	2.95±0.02[be]	3.02±0.04[ce]	3.20±0.04[d]
Iron (%)	3.30±0.02[a]	3.51±0.02[b]	3.73±0.03[c]	4.50±0.03[d]
Total Dietary Fiber (%)	7.10±0.004[a]	8.4±0.22[b]	9.02±0.33[c]	9.4±0.06[d]
Moisture (%)	1.04±0.02[a]	1.23±0.08[a]	2.51±0.22[b]	3.43±0.02[c]
Ash (%)	2.73±0.16[a]	2.68±0.14[a]	2.52±0.07[a]	2.64±0.14[a]
Energy (kcal)	369.89±0.84[a]	365.69±1.46[b]	357.92±1.87[c]	354±0.64[d]
Carbohydrates (%)	82.45±0.30[a]	80.5±0.38[a]	77±0.49[a]	76±0.34[a]

Mean values followed by different letters with subscript within the row are significantly different ($p<0.05$).

Table 4: Effect of storage period on Sensory analysis of selected Choco flakes.

Sensory analysis	0th day	15th day	30th day
Appearance	7.8±0.95[a]	7.3±1.17[ac]	6.9±0.74[bc]
Colour	7.85±0.81[a]	7.4±1.04[ac]	7.15±1.08[bc]
Flavour	8.25±0.78[a]	7.2±1.10[bd]	6.8±0.95[cd]
Taste	8.45±0.94[a]	7.15±1.08[bd]	7±0.91[cd]
Texture	8.4±0.88[a]	7.3±1.21[bd]	6.78±0.71[cd]
Overall acceptability	8.35±0.81[a]	7.4±0.94[bd]	7.05±1.05[cd]

Mean values followed by different letters with subscript within the row are significantly different ($p<0.05$).

Choco flakes was recorded as 369.89±0.84, 365.69±1.46, 357.92±1.87, and 354.00±0.64, respectively. The highest energy content was found in sample T0 (369.89), while the lowest was found in sample T3 (354.00).

Effect of Storage period on Sensory analysis of Selected Choco flakes

Effect of storage period on Sensory analysis of control and experimental Choco flakes was presented in Table 4. Hedonic scores for all sensory attributes showed a significant decrease as the storage period increased. The appearance scores of 0th, 15th and 30th day were 7.8±0.95, 7.3±1.17 and 6.9±0.74, respectively. As shown in Table 5, the highest score was recorded on the 0th day (7.8±0.95), while the lowest was observed on the 30th day (6.9±0.74) Figure 7. The colour scores of the 0th, 15th and 30th day were 7.85±0.81, 7.4±1.04 and 7.15±1.08, respectively. The highest score was recorded on the 0th day (7.85±0.81), while the lowest was observed on the 30th day (7.15±1.08) Figure 8.

The flavour scores of 0th, 15th and 30th day were 8.25±0.78, 7.2±1.10, and 6.8±0.95, respectively. The highest score was recorded on the

0th day (8.25±0.78), while the lowest was observed on the 30th day (6.8±0.95) Figure 9. The taste scores of 0th, 15th and 30th day were, 8.45±0.94, 7.15±1.08 and 7±0.91 respectively. The highest score was recorded on the 0th day (8.45±0.94), while the lowest was observed on the 30th day (7±0.91) Figure 10. The decrease in taste scores during storage may be due to loss of freshness and changes occurring in the product over time which affected the overall acceptability of taste.

The texture scores of 0th, 15th and 30th day were, 8.4±0.88, 7.3±1.21 and 6.78±0.71 respectively. The highest score was recorded on the 0th day (8.4±0.88), while the lowest was observed on the 30th day (6.78±0.71) Figure 11. The overall acceptability scores of 0th, 15th and 30th day were, 8.35±0.81, 7.4±0.94 and 7.05±1.05 respectively. The highest score was recorded on the 0th day (8.35±0.81), while the lowest was observed on the 30th day (7.05±1.05) Figure 12.

DISCUSSION

The present results are similar with (Adedokun and Jike, 2022) reported that the appearance score of control flakes were (3.73) lesser than the experimental flakes (4.27). The appearance scores are increased due to color texture and overall visual appeal of the Choco flakes. This is similar with the findings of (Novriani *et al.*, 2024) stated that the colour scores of controls PFTF0 (3.87) was lower than the experimental fakes PFTF3 (4.07). The increase

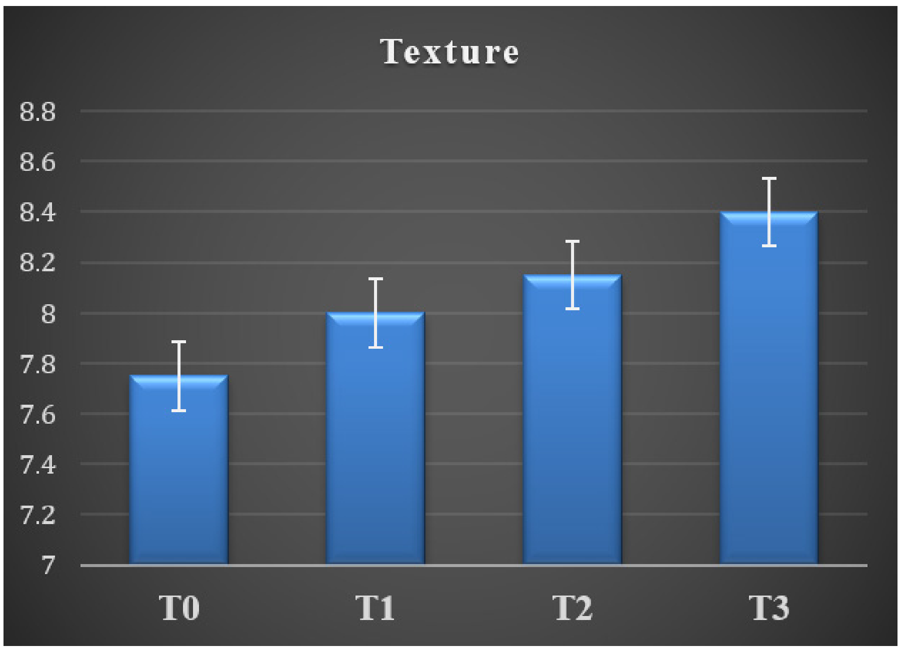

Figure 5: Texture of control and experimental Choco flakes.

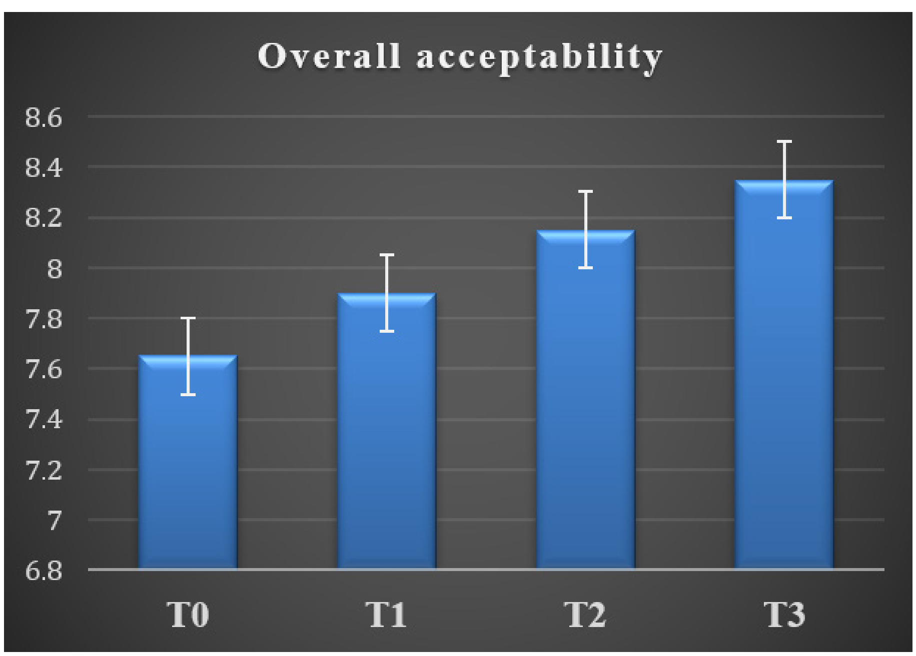

Figure 6: Overall acceptability of control and experimental Choco flakes.

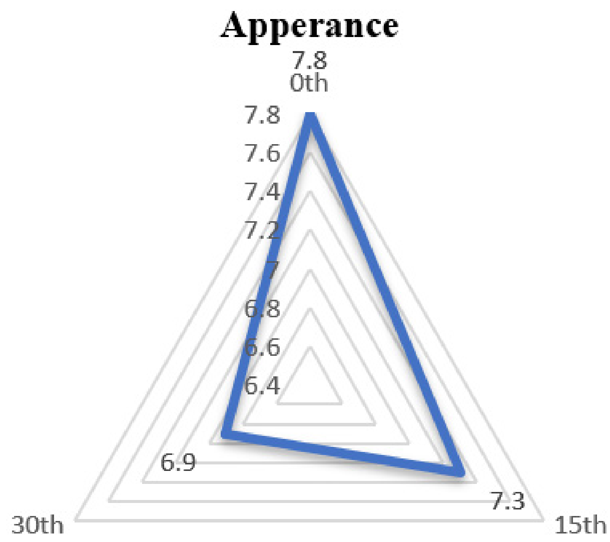

Figure 7: Effect of storage period on Appearance of selected Choco flakes.

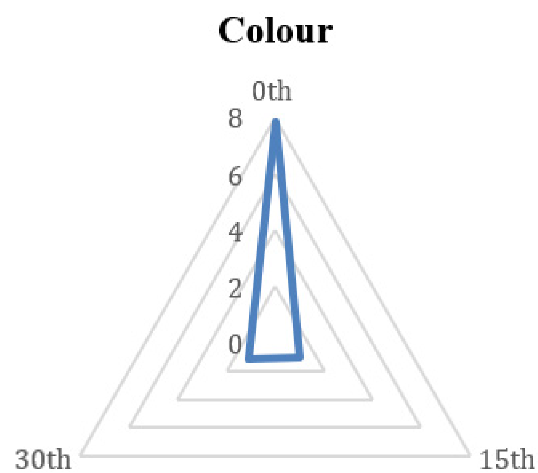

Figure 8: Effect of storage period on colour of selected Choco flakes.

in colour score may be due to the added ingredients might have enhanced the overall visual quality.

These results are similar with the findings of (Okezie *et al.*, 2024) reported that the flavor score of the control sample S1 (6.57±1.55) was lower than that of the experimental sample S4 (6.67±1.45). This implies that the flakes prepared with high proportions of composite flours had a more appealing flavour. This is similar with the findings of (Husna *et al.*, 2020) stated that the taste scores of controls 0 (1.16±0.47) was lower than the experimental flakes 30 (2.84±0.69). The taste scores of the flakes increased with the incorporation of composite flour due to its distinctive flavor heat processing may reduce the strong flavor and enhanced the sweet taste of flakes.

This is similar with the findings of (Awogbenja *et al.*, 2024) stated that the texture scores of controls were A (4.60±1.67) was lower than the experimental flakes F (5.40±1.67). Products prepared from composite flour blends were were generally acceptable the flakes containing moderate levels of flour incorporation was the most preferred. This similar with the findings of (Okezie *et al.*, 2024) reported that the overall acceptability scores of controls S1 (5.97b±1.38) was lower than the experimental flakes (6.73a±0.87). This preference for experimental flakes may be due to the higher proportion of composite flours used in formulations.

This is similar with the (Simon *et al.*, 2025) also found that the higher protein content in experimental samples the MGS5 sample had higher protein content (18.56%) than the control sample MM1 (9.81%). Increasing the incorporation levels of pumpkin seeds flour may enhanced the protein content of the Choco flakes. This is similar with the findings of (Fitriani *et al.*, 2024) stated that the higher fat content was found in experimental flakes (F4: 3.71%) compared to the control sample (3.25%). The lipid content of the control flakes was lower due to the absence of composite flours. The increase in lipid content observed in experimental flakes may be attributed to the higher incorporation of pumpkin seed flour blends, which contributed additional fat content to the flakes.

This result is similar to the findings of (Taniya *et al.*, 2020) observed that the iron content of FBC2 flakes (8.144%) was higher than that of the control sample. The increase in iron content of flakes may due to incorporation of ragi and pumpkin seeds flour. Higher levels of these flours in the formulation contributed to the enhanced iron content of the developed flakes. This result is similar to the findings of (Adebanjo *et al.*, 2020) who stated that the fiber content of the 80M:20C flakes (3.35%) was higher than that of the control sample (2.05%). The increase in the fiber content may be due to incorporation of higher levels of these flours in the formulation contributed to the increased fiber content of developed flakes.

This result is similar to the findings of (Ratna *et al.*, 2021) stated that the content of D40 (1.91) was lower than that of control sample D0 (2.29). The decrease in ash content was observed in T2 may be due to the flour blends in the formulation, which resulted in reduced total mineral content of the flakes. These findings are similar with (Offia *et al.*, 2025) found higher moisture content in sample Mb30 (11.28%) compared to the control sample W100 (9.82%). The increase in moisture content may be due to the higher absorption capacity of the flours.

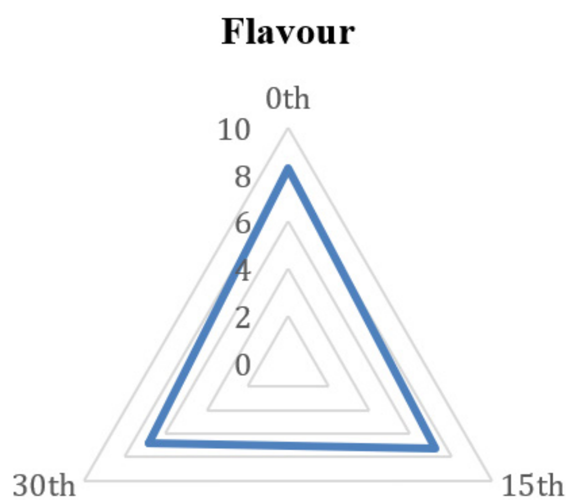

Figure 9: Effect of storage period on flavour of selected Choco flakes.

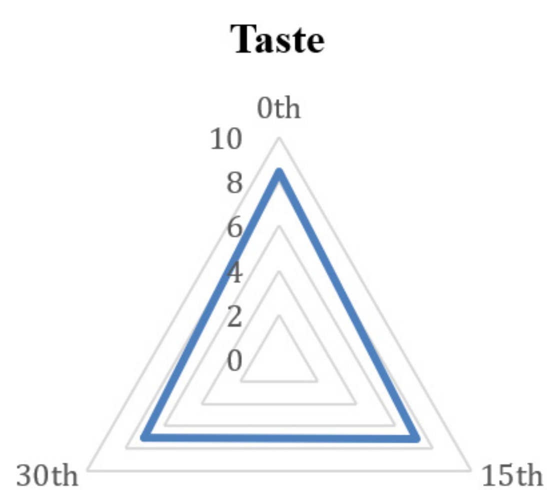

Figure 10: Effect of storage period on taste of selected Choco flakes.

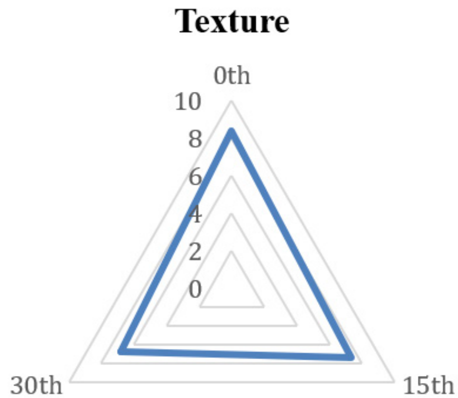

Figure 11: Effect of storage period on texture of selected Choco flakes.

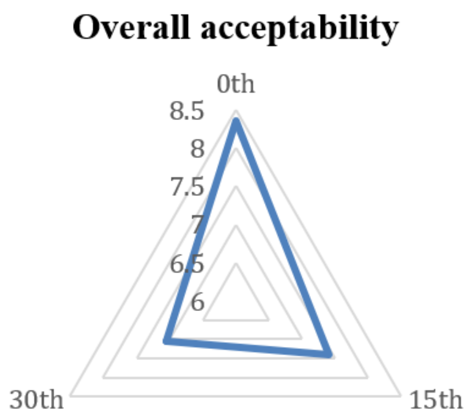

Figure 12: Effect of storage period on overall acceptability of selected Choco flakes.

These results are similar with the findings of (Sherly *et al.*, 2025) reported that the highest carbohydrate content in T0 (86.71%) and the lowest in T3 (69.69%). The decrease in carbohydrates content may be due to the increased incorporation of pumpkin seed flour in the formulations. These findings are similar with (Abiola *et al.*, 2022) also observed the highest energy content in T0 (382.19) and the lowest in T5 (379.99). The decrease in energy content may due to the changes in the composition of flour blends used in formulations. These findings are similar with (Andrew *et al.*, 2006) also stated similar results control sample (7.0) and then the experimental flakes (4.1). The control flakes were higher than the experimental flakes. The gradual decrease in appearance scores during storage may be due to changes in colour, texture, and overall visual quality of the flakes over time.

These findings are similar with the (Surekha *et al.*, 2019) who also stated similar results control (8.60) and then the experimental flakes (8.00). The control flakes were higher than the experimental flakes. The decrease in colour score during storage may due to the storage conditions which me lead to fading of original colour. These findings are similar with (Andrew *et al.*, 2006) stated that the similar results control sample (6.1) and then the experimental flakes (3.7). The control flakes were higher than the experimental flakes. The decrease in flavour score during storage may be due to the loss of flavour compounds and storage conditions may also affect natural flavour of flakes over a time period.

These findings are similar with the (Surekha *et al.*, 2019) stated that the similar results control (8.76) and then the experimental flakes (7.70) The control flakes were higher than the experimental flakes. The decrease in texture scores during storage may be due to loss of crispness over time. These findings are similar with (Andrew *et al.*, 2006) reported that the similar control sample (6.5) had higher scores than the experimental sample (3.7). Overall, the control flakes showed better overall acceptability compared to the experimental flakes. The decrease in overall acceptability during storage may be due to changes in colour falvour taste and texture over time which reduced the overall acceptability.

CONCLUSION

The present study was carried out to develop and evaluate finger millet choco flakes fortified with pumpkin seed flour. Sensory evaluation revealed significant differences among the treatments. The study concluded that finger millet choco flakes fortified with pumpkin seed flour can be successfully developed with improved nutritional and sensory qualities. Incorporation of pumpkin seed flour significantly increased protein, fat, iron, and dietary fibre contents while maintaining good sensory acceptability. Among all the formulations, treatment T3 was found to be the most acceptable based on sensory evaluation. Although sensory scores decreased slightly during storage, the product remained acceptable up to 30 days. Therefore, the developed finger millet Choco flakes can be considered a nutritious ready-to-eat functional food product suitable for health-conscious consumers.

ACKNOWLEDGEMENT

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ABBREVIATIONS

FRAP: Ferric Reducing Antioxidant Power; **TSS:** Total Soluble Solids; **RSM:** Response Surface Methodology; **TPC:** Total Phenolic Content; **TAC:** Total Antioxidant Capacity; **HMF:** 5-Hydroxymethylfurfural; **PH:** Potential of Hydrogen; **SPSS:** Statistical Package for Social Science; **LSD:** Least Significant Difference; **TA:** Titratable Acidity; **DPPH:** 2,2-Diphenyl-1-Picrylhydrazyl.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ETHICAL STATEMENT

The sensory evaluation adhered to institutional guidelines, with informed consent obtained from all participants prior to their participation.

AUTHORS CONTRIBUTION

Conceptualization: KJ and DPK; Experiments: SN; Data analysis: KJ, SN, DPK, MM and BS; Supervision: KJ; Funding: DPK, MM and BS; Manuscript writing: SN, KJ and DPK.

SUMMARY

Developed finger millet Choco flakes fortified with pumpkin seed flour to improve nutritional quality and consumer acceptability.

Finger millet provided high calcium, iron, dietary fibre, and health-promoting properties.

Pumpkin seed flour enhanced the product with protein, minerals, healthy fats, and antioxidants.

T3 achieved the highest sensory scores for appearance, colour, flavour, taste, texture, and overall acceptability, while the control (T0) received the lowest scores.

Nutritional analysis showed a progressive increase in protein, fat, iron, moisture, and dietary fibre from T0 to T3.

T3 recorded the highest nutrient values: protein (5.09%), fat (3.20%), iron (4.50%), moisture (3.43%), and dietary fibre (9.4%).

Carbohydrate content decreased from 82.45% to 76.00%, while energy decreased from 369.89 kcal to 354.00 kcal with increased pumpkin seed flour incorporation.

Ash content showed only slight variation among the different treatments.

Storage study indicated a gradual decline in sensory scores over 30 days, although the product remained acceptable during the storage period.

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