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RESEARCH PAPER

Development of Bagels from Osmo-Convective Dried Cashew Apple Flour and its Quality Characteristics

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ABSTRACT

Bakery products are an important part of a balanced diet and today, a wide variety of such products can be found on supermarket shelves. Bagels were prepared from dough's containing refined wheat flour and osmo-convective dried cashew apple powder composite as C1 (95:05%), C2 (90:10%), C3 (85:15%), C4 (80:20%) and C5 (75:25%). And using various temperature, i.e., T1 (180 °), T2 (200 °) and T3 (220 °). Bagels prepared from osmo-convective dried cashew apple powder of the best treatment (90:05) (Refined wheat flour: cashew apple powder). baked at a temperature 180°C and baking time is 20 minutes. The quality parameters i.e., moisture content 28.04 % (db.) %, fat content 7.14 %, protein content 8.49 %, ash content 5.96 %, fiber content 6.45 %, carbohydrate 44.91 %, was found to be best. The bagels of treatment C1 i.e. 5% osmo-convective dried cashew apple powder obtained highest score in all sensory attributes. i.e., colour (8.200±0.13), flavour (8.133±0.16), Texture (8.200±0.21), Taste (8.200±0.18), and overall acceptability (8.133±0.13).

Keywords: Osmo-convective dried cashew apple flour, bagels, proximate composition, sensory attributes, value added product

The initial introduction of Cashew apple (*Anacardium occidentale* L.) a member of *Anacardiaceae* family. The development and maturity of cashew apple are coherent with the nut maturation. The cashew apple can reach up to an average length x breadth of 11 × 5 cm which is 8 to 10 times more than that of respective nut size. The matured cashew apples are spherical or cylindrical in shape (Preethi *et al.* 2019). 'Vengurla-4' is one of the preferred varieties by farmers of Konkan region because of larger size (> 7.5 g) of cashew nut and higher productivity. At present about 90 95 % cashew apple is wasted, owing to its rapid perishable nature, lack of harvesting techniques, improper post-harvest handling and non-adoption of cashew processing technologies (Salvi *et al.* 2016).

Baked products are good carrier for fibre enrichment, since they have become indispensable part of our life and are ideal for supplementation due to palatability, compactness, convenience and long shelf-life of the product and being widely consumed by every individual irrespective of age (Sahni, 2017; and Wade, 1988).

The excellent qualities of cashew apple offer immense opportunities for its processing to various

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value-added products. Commercial exploitation of cashew apple is the need of the hour considering its vast potential in enhancing the income from cashew plantations. It is one of the prime areas of utilizing the indigenous fruit and opens up wider market possibilities and hence tremendous scope for commercialization (Sobhana, 2019). Drying of cashew apple into powder is an excellent alternative to increase its shelf life. It allows conversion of perishable materials into stabilized products by lowering the water activity into appropriate levels (Uchoa *et al.* 2009).

Bagels originated in southern Germany the word bagel was derived from germen word for a round loaf of bread (Meloan and Doerry 1988). Bagels are very popular breakfast or snack bakery product in United states, Europe, Asia Pacific, Middle East, Africa, and Central and South America (Manzoor *et al.* 2024). Although the origins of bagels are unclear, it is believed that they were created in the 17th century in Poland as a response to anti-Semitic laws that prevented Polish Jews from baking bread. Bagel is a doughnut-shaped yeast-leavened bread roll that is characterized by a crisp, shiny crust, a dense interior, and is shaped by hand and the major ingredients used in bagel manufacturing are flour, yeast, salt, and sweetening (Hunt *et al.* 2025). This present study was thus undertaken with the objective of utilizing osmo-convective dried cashew apple flour for human consumption as a source of dietary fibre and protein. Development of bagels from osmo-convective dried cashew apple flour.

MATERIALS AND METHODS

Materials

Cashew apple required for experimentation was collected from the Vengurla, Tal. Vengurla, Dist. Sindhudurg. The cashew apple was cleaned, washed with water and the damaged, infected apples were removed before beginning of experiments. The cashew apple slices of 'Vengurla-4' variety having 5 mm thickness, 60 °B osmotic concentration and 50 °C syrup temperature and 210 minutes osmotic drying were dried in the convective hot air dryer at 50 °C were grounded by using hammer mill (Make: M/S. Sagar Engineering Works Pvt. Ltd, Kudal) and pass through the 0.150 mm sieve to obtain osmo convective dried cashew apple powder. The experimental work was carried out in Department of Post harvest Engineering of Post Graduate Institute of Post Harvest Technology and Management, Killa Roha.

Methods

1. Bagels Making

Fig. 1. Shows the process technology for preparation of bagels from osmo-convective dried cashew apple flour. The osmo-convective dried cashew apple flour of varied levels (5%, 10%, 15%, 20%, 25%) and refined wheat flour of varied levels (95%, 90%, 85%, 80%, 75%) were mixed together. Mixed well up to foam formation, which was defected through visual observation.

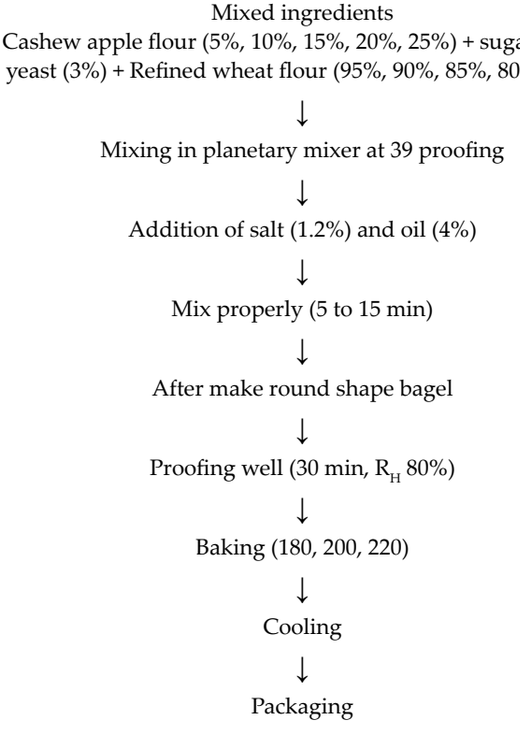
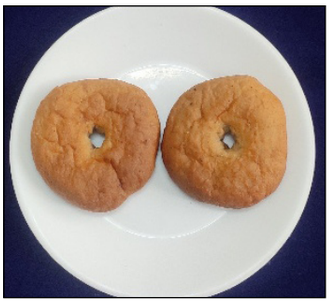


Fig. 1: Process flow chart for preparation of bagels from osmo-convective dried cashew apple flour



(C1T1)

(C1T2)

(C1T3)

(C2T1)

(C2T2)

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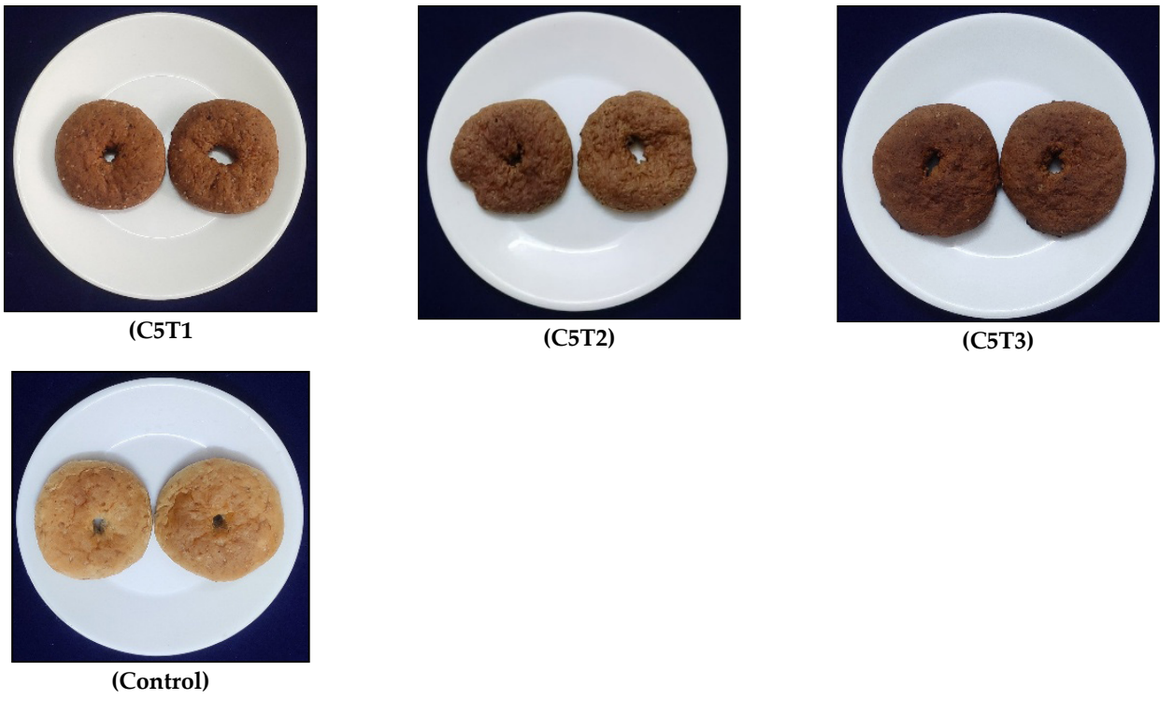


Fig. 2: Osmo convective dried cashew apple flour bagels in various concentrations and different baking temperatures; (C1= 5 % Cashew apple flour; C2=10 %Cashew apple flour; C3= 15% Cashew apple flour; C4=20% Cashew apple flour, C5=25 % Cashew apple flour). T1= 180°; T2=200 °; T3= 220°)

The mixture was added with the sugar (4%), yeast (1.2%), improver (1.2%) and salt (1.2%), edible oil (4%), water (50 ml) were used as per treatment combination to make flour composition, and it was added according to the treatment, and it was added into the earlier dough mass and the mixture was thoroughly mixed to a homogeneous mixture to form a dough. The dough poured proofing well and giving the round shape. The bagels were placed in baking tray and baked in oven at about 180°, 200 and 220° for 20-30 min. Control sample was procured from the market and considered as a control for comparison with the above treatments.

Evaluation of Quality Parameter for development of bagels from osmo-convective dried cashew apple flour

1. Moisture content (%)

Initial moisture content of the sample osmo-convective dried cashew apple flour C1 to C5 and temperature T1 to T3 determined by AOAC (2010). 5 g of bagel sample were taken into the moisture box with lid. The initial weight of moisture box was recorded. The sample were exposed to 105°C ±1°C for 24 hr in a hot air oven (Make M/s: Aditi Associate, Mumbai. Model: ALO-136). The final weight was recorded. The moisture content of sample was determined by equation (1);

$$\text{Moisture content (\% db.)} = \frac{W_2 - W_1}{W_3 - W_1} \times 100 \qquad \ldots(1)$$

Where,

W_1= Weight of moisture box, g

W_2= Weight of moisture box + sample g

W_3= Weight of moisture box + oven dried sample g

2. Fat content (%)

Fat content of bagel sample prepared from osmo-convective dried cashew apple flour composition C1

to C5 and temperature T1 to T3 determined using Solvent extraction in a soxhlet apparatus as described by James, (1995). Two grams of each bagel sample wrapped in filter paper and placed in a soxhlet reflux flask which is connected to a condenser on the upper side and to a weighted oil extraction flask full with two hundred mili petroleum ether. The ether was brought to its boiling point the vapour condensed into the reflux flask immersing the samples completely for extraction to take place on filling up the reflux flask siphons over carrying the oil extract back to the boiling solvent in the flask. The process of boiling, condensation, and reflux was allowed to go for hours before the defatted samples were removed. The oil extract in the flux was dried in the oven 60° for thirty minutes and weighted. The experiment was repeated for three times replication. The average reading reported.

$$\% \text{ Fat} = \frac{W_4 - W_3}{W_2 - W_1} \times 100 \quad \ldots(2)$$

Where,

W_1 = Weight of oven dried thimble,

W_2 = Weight of sample used,

W_3 = Weight of round bottom flask,

W_4 = weight of round bottom flask with fat residue

3. Ash content (%)

The ash content of bagel sample prepared by osmo-convective dried cashew apple flour composition C1 to C5 and temperature T1 to T3 determined using the method of AOAC (1990) porcelain crucible were dried and cooled in desiccators before weighing. Five grams of the bagel sample were weighted into the crucible and the weight was taken. The crucible containing the samples were placed into the muffle furnace at 500°. This temperature was maintained for three hours. The muffle furnace was allowed to cool; the crucible were then brought out, cooled and weighted. The ash content was calculated as follows the experiment was repeated for three times for replication the average reading reported.

$$\text{Ash content \%} = \frac{(W_2 - W_1)}{(\text{Weight of sample})} \times 100 \quad \ldots(3)$$

Where,

W_2 = Weight of crucible + ash,

W_1 = Weight of empty crucible

4. Protein content (%)

Protein content of bagels sample prepared by osmo-convective dried cashew apple flour composition C1 to C5 and temperature T1 to T3 determined by a micro-Kjeldahl distillation method (AOAC, 1990). The sample were digested by heating with concentrated sulphuric acid (H_2SO_4) in the presence of digestion mixture, potassium sulphate (K_2SO_4) and copper sulphate ($CUSO_4$). The mixture was made alkaline with 40% NaOH. Ammonium sulphate thus formed. Released ammonia which collected in 4% boric acid solution and titrated again with standard HCL. The percent nitrogen content of the sample was calculated by the formula given below. Protein content was calculated by using equation (4);

$$\% \text{ (N)} = 1.4 \times (\text{ml HCL} - \text{ml blank}) \times \text{Conc. of } \frac{HCL}{Weight} \text{ of sample (g)} \quad \ldots(4)$$

$$\% \text{ Protein} = \% \text{ N} \times \text{Factor (6.25)} \quad \ldots(5)$$

5. Crude Fiber (%)

About 2 g fat free residue of bagel sample were taken and then transferred to the digestion flask. 200 ml boiling sulphuric acid was added and immediately the flask was connected to condenser. The flask was heated, boiled by frequently rotating for 30 min. and the volume was maintained with hot water. Then filtered through filter cloth in a fluted funnel. The residue was washed on cloth with hot water or potassium sulphate solution. The residue was returned to digestion flask by washing with hot water. 200 ml boiling sodium hydroxide was added and boiled for 30 min. The volume was adjusted with boiling water, filtered through the muslin cloth and the residue free of alkali was washed. The residue

was transferred into crucible and washed with 15 ml alcohol and the crucible was dried at 110° for 2 hours. The crucible was cooled in desiccators and weighted the crucible was ignited in the furnace at 550° for 30 min then cooled and weighted. The loss in weight represented the crude fiber. The experiment was repeated three times and average reading was repeated.

$$\text{Crude Fiber (\%)} = \frac{(W_1 - W_2)}{\text{Weight of sample (g)}} \times 100 \quad \ldots(6)$$

Where,

W_1 = Weight of material before ashing (g)

W_2 = Weight of material after ashing (g)

6. Carbohydrate (%)

Carbohydrate content fresh bagels sample prepared from osmo-convective dried cashew apple flour composition C1 to C5 and temperature T1 to T3 determined by a subtracting the total sum of protein, fiber, ash and fat from the product sample James, (1995). The carbohydrate was calculated by using following equation (7);

$$\text{\% Carbohydrate} = 100 - (\text{\%protein} + \text{\% fat} + \text{\% fiber} + \text{\% ash} + \text{\% moisture content}) \quad \ldots(7)$$

7. Colour

A colour of bagel sample prepared from osmo-convective dried cashew apple flour composition C1 to C5 and temperature T1 to T3 measured by (Make: M/s Konika Minolta, Japan; Model Meter CR-400). The colour of bagel sample prepared from osmo-convective dried cashew apple flour were measured in dark room. The equipment was calibrated by placing on the white tile. After the calibration is over, the bagel prepared from osmo-convective dried cashew apple flour was placed in the petri dish and keeping the colori reader on the top of the product and colour was measured. The colour was measured as per 10°/D_{65} (ASTM) standard. It represents *L*, *a* and *b* value. Degree of lightness or darkness of the sample was represented by '*L*' value, redness or greenness by '*a*' and yellowness to blueness by '*b*' value on hunter scale.

Sensory Evaluation

Bagels baked at three different temperatures 180 °C, 200 °C and 220 °C were served in plate after cooling at ambient temperature to trained panelists (i.e. students and staff members of Post Graduate Institute of Post harvest Technology and Management Killa Roha, Raigad). The Trained panel of student and staff evaluated the samples at different aspects such as color, flavour, texture and appearance using 9-point hedonic scale. All samples were blindly coded with alphabets and numbers.

STATISTICAL ANALYSIS

All the analysis reported in this study was performed in triplicate and data obtained is reported as mean ± standard deviation. The data obtained was analysed statistically to determine statistical significance of treatments. Completely Randomized Design (CRD) was used to test the significance of results. The analysis of variance revealed at significance of S.E and C.D. at 5 percent level. The research data was statistically analysed by following method described by Panse and Sukhatme (1967).

To identify the best treatment for bagels, the quality characteristics of bagels having sweetness with maximum sensory score of colour and appearance, taste, texture and overall acceptability is considered.

RESULTS AND DISCUSSION

Effect of concentrations (%) of Osmo-convective Dried Cashew apple flour and baking temperature (°C) on Moisture content of bagels

Fig. 3 Shows the effect of incorporation of Osmo-convective Dried Cashew apple flour (%) and baking temperature (°C) on the moisture content (%) of bagels prepared from osmo-convective dried cashew apple flour. The moisture content range for all the treatments 21.14-33.27%. As the osmo-convective dried cashew apple flour increase from 5 to 25%, the moisture content increases from 21.14-33.27%.

Similarly baking temperature increases from 180° to 220°, the moisture content decreases. As both the osmo-convective dried cashew apple flour (%) and baking temperature (°C) increase the combined effect of these two shows that the moisture content of the bagels shows the increasing and decreasing trend.

Table 1 shows the ANOVA for effect of various concentrations of cashew apple flour (C1=5%, C2=10%, C3=15%, C4=20%, C5=25%) on moisture content % of osmo-convective dried cashew apple flour bagels was significant at $p \leq 0.05$. Similarly, the effect of baking temperatures (i.e., T1=180°C, T2=200°C, T3=220°C) on moisture content % of osmo-convective dried cashew apple flour bagels has significant at $p \leq 0.05$. The interactive effect of concentrations (%) and temperature (°C) of baking on moisture content % was also significant at $p \leq 0.05$. The moisture content increased when the substituting of refined wheat flour by osmo-convective dried cashew apple flour. This might be due to a higher insoluble dietary fiber of the cashew apple flour which provides high capacity to retain water (Tharshini *et al.* 2018).

Balinska, (2008) observed that the bagels prepared from wheat flour as the concentration of wheat flour increases the moisture content in bagel increase from 24.63 to 27.08%.

Similarly, Manzoor *et al.* 2024 reported that bagels prepared from banana peel flour and lavender, as the concentration of banana peel flour increases from 5 to 15% the moisture content in bagel increases from 28.68 to 29.64%. According to Melito and Brian, 2012 reported that the gluten free doughnuts made from rice flour and baked at 130-140° temperature the moisture content of doughnuts decreases from 23.06 to 22.02%.

Similarly, John *et al.* 2021 reported that doughnuts prepared from plantain and cocoyam flours 0 to 35% and 0 to 50% the moisture content in doughnuts increases from 16.29-20.15 %. Similarly, Joshi *et al.* 2024 doughnuts made from finger millet flour increases from 5 to 20% the moisture content in doughnut increase from 16.11 to 21.23%. According, Oke *et al.* 2017 reported that doughnuts prepared from wheat flour with breadfruit flour 0 to 50% the moisture content decreases from 30.9 to 19.3%.

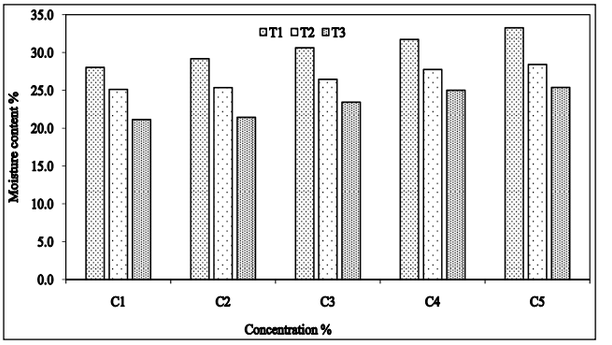


Fig. 3: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and baking temperature (°C) on Moisture content of bagels. (C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). T1= 180°; T2=200°; T3= 220°)

Table 1: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on Moisture content of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	28.043 ± 0.03	25.130 ± 0.03	21.140 ± 0.11	24.771
C2	29.190 ± 0.02	25.370 ± 0.07	21.450 ± 0.08	25.336
C3	30.633 ± 0.07	26.473 ± 0.04	23.438 ± 0.03	26.848
C4	31.743 ± 0.05	27.763 ± 0.12	25.017 ± 0.07	28.174
C5	33.270 ± 0.02	28.420 ± 0.11	25.390 ± 0.05	29.026
Mean B	30.575	26.631	23.287	
Control	29.85±0.02			
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.029		0.010	
Factor(B)	0.022		0.008	
Factor (A × B)	0.050		0.017	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Effect of concentrations (%) of Osmo-convective Dried Cashew apple flour and baking temperature (°C) on protein content of bagels

Fig. 4 Shows the effect of incorporation of Osmo-convective Dried Cashew apple flour (%) and baking temperature (°C) on the protein content (%) of bagels prepared from osmo-convective dried cashew apple flour. The protein content for all the treatments 7.00 to 9.19%. As the osmo-convective dried cashew apple flour increase from 5 to 25%, the protein content increases from 7.00 to 9.19%. Similarly baking temperature increases from 180° to 220°, the protein content decreases. As both the osmo-convective dried cashew apple flour (%) and baking temperature (°C) increase the combined effect of these two shows that the protein content of the bagels shows the increasing and decreasing trend.

Table 2 shows the ANOVA for effect of various concentrations of cashew apple flour (C1=5%, C2=10%, C3=15%, C4=20%, C5=25%) on protein content % of osmo-convective dried cashew apple flour bagels was significant at $p \leq 0.05$. Similarly, the effect of baking temperatures (i.e., T1=180°C, T2=200°C, T3=220°C) on protein content % of osmo-convective dried cashew apple flour bagels has significant at $p \leq 0.05$. The interactive effect of concentrations (%) and temperature (°C) of baking on protein content % was also significant at $p \leq 0.05$. The protein content increased when the substituting of refined wheat flour by osmo-convective dried cashew apple flour. This might be due to cashew apple flour replaces a portion of wheat flour, the relative content of other nutrient like protein and fiber content increases (Tharshini *et al.* 2018).

Similarly, Manzoor *et al.* 2024 reported that bagels prepared from banana peel flour and lavender, as the concentration of banana peel flour increases from 5 to 15% the protein content in bagel increases from 11.65 to 12.43%. Balinska, (2008) observed that the bagels prepared from wheat flour as the concentration of wheat flour increases the protein content in bagel increase from 7.09 to 9.14%.

Similarly, John *et al.* 2021 reported that doughnuts prepared from plantain and cocoyam flours 0 to 35% and 0 to 50% the protein content in doughnuts increases from 4.54-9.36 %. Similarly, Joshi *et al.* 2024 doughnuts made from finger millet flour increases from 5 to 20% the protein content in doughnut increase from 4.81-8.98%. According, Oke *et al.* 2017 reported that doughnuts prepared from wheat flour with breadfruit flour 0 to 50% the protein content increases from 2.98 to 12.0%.

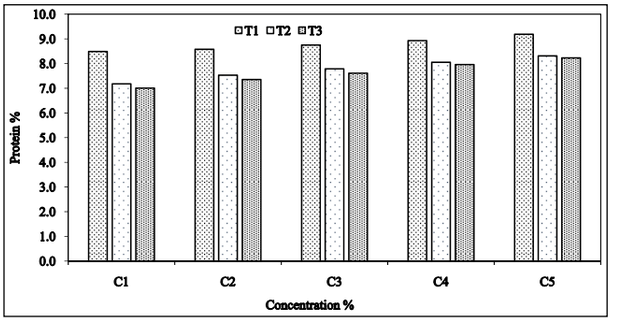


Fig. 4: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and baking temperature (°C) on protein content of bagels. (C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). T1= 180°; T2=200°; T3= 220°).

Table 2: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on protein content of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	8.490 ± 0.02	7.180 ± 0.06	7.007 ± 0.04	7.559
C2	8.580 ± 0.04	7.530 ± 0.09	7.353 ± 0.13	7.821
C3	8.753 ± 0.07	7.790 ± 0.03	7.613 ± 0.01	8.052
C4	8.930 ± 0.15	8.053 ± 0.05	7.963 ± 0.09	8.315
C5	9.190 ± 0.09	8.313 ± 0.11	8.230 ± 0.07	8.577
Mean B	8.788	7.773	7.6332	
Control	8.24 ± 0.01			
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.027		0.009	
Factor(B)	0.021		0.007	
Factor (A × B)	0.047		0.016	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

4.3 Effect of concentrations (%) of Osmo-convective Dried Cashew apple flour and baking temperature (°C) on fat content of bagels.

Fig. 5 Shows the effect of incorporation of Osmo-convective Dried Cashew apple flour (%) and baking temperature (°C) on the fat content (%) of bagels prepared from osmo-convective dried cashew apple flour. The fat content for all the treatments 5.02-9.14%. As the osmo-convective dried cashew apple flour increase from 5 to 25%, the fat content increases from 5.02-9.14%. Similarly baking temperature increases from 180° to 220°, the fat content decreases. As both the osmo-convective dried cashew apple flour (%) and baking temperature (°C) increase the combined effect of these two shows that the fat content of the bagels shows the increasing and decreasing trend.

Table 3 shows the ANOVA for effect of various concentrations of cashew apple flour (C1=5%, C2=10%, C3=15%, C4=20%, C5=25%) on fat content % of osmo-convective dried cashew apple flour bagels was significant at $p \leq 0.05$. Similarly, the effect of baking temperatures (i.e., T1=180°C, T2=200°C, T3=220°C) on fat content % of osmo-convective dried cashew apple flour bagels has significant at $p \leq 0.05$. The interactive effect of concentrations (%) and temperature (°C) of baking on fat content % was also significant at $p \leq 0.05$. The fat content increased when the substituting of refined wheat flour by osmo-convective dried cashew apple flour. This might be due to baking process osmo-convective dried cashew apple flour contribute more solids including lipids they increasing the proportion of fat in the final baked good (Melito and Brian, 2012).

Similarly, Manzoor *et al.* 2024 reported that bagels prepared from banana peel flour and lavender, as the concentration of banana peel flour increases from 5 to 15% the fat content in bagel increases from 5.25 to 7.21%. According to Melito and Brian, 2012 reported that the gluten free donuts made from rice flour, as the concentration of rice flour increases the fat content in donut increases from 26.3 to 32.2%.

Similarly, John *et al.* 2021 reported that doughnuts prepared from plantain and cocoyam flours 0 to 35% and 0 to 50% the fat content in doughnuts increases from 38.35-46.35%. Similarly, Joshi *et al.* 2024 doughnuts made from finger millet flour increases from 5 to 20% the fat content in doughnut increase from 22.97 to 23.20%. According, Oke *et al.* 2017 reported that doughnuts prepared from wheat flour with breadfruit flour 0 to 50% the fat content increases from 5.82 to 7.89%.

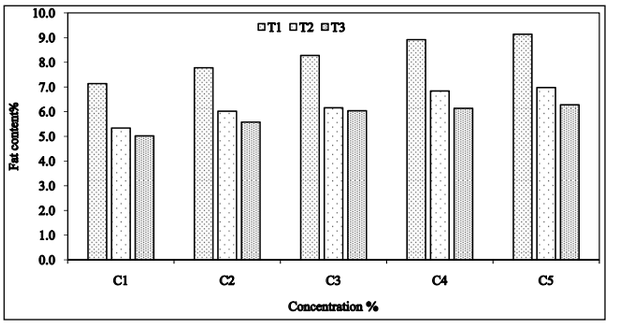


Fig. 5: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and baking temperature (°C) on fat content of bagels. (C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). T1= 180°; T2=200°; T3= 220°)

Table 3: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on fat content of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	7.140 ± 0.03	5.340 ± 0.01	5.020 ± 0.05	5.833
C2	7.780 ± 0.12	6.020 ± 0.03	5.580 ± 0.12	6.460
C3	8.280 ± 0.03	6.160 ± 0.09	6.040 ± 0.06	6.826
C4	8.920 ± 0.07	6.840 ± 0.05	6.140 ± 0.02	7.300
C5	9.140 ± 0.09	6.980 ± 0.17	6.280 ± 0.07	7.466
Mean B	8.252	2.628	5.182	
Control	8.64 ± 0.01			
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.026		0.009	
Factor(B)	0.020		0.007	
Factor (A × B)	0.044		0.015	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Effect of concentrations (%) of Osmo-convective Dried Cashew apple flour and baking temperature (°C) on ash content of bagels

Fig. 6 Shows the effect of incorporation of Osmo-convective Dried Cashew apple flour (%) and baking temperature (°C) on the ash content (%) of bagels prepared from osmo-convective dried cashew apple flour. The ash content for all the treatments 3.14-6.84%. As the osmo-convective dried cashew apple flour increase from 5 to 25%, the ash content increases from 3.14-6.84%. Similarly baking temperature increases from 180° to 220°, the fat content decreases. As both the osmo-convective dried cashew apple flour (%) and baking temperature (°C) increase the combined effect of these two shows that the ash content of the bagels shows the increasing and decreasing trend.

Table 4 shows the ANOVA for effect of various concentrations of cashew apple flour (C1=5%, C2=10%, C3=15%, C4=20%, C5=25%) on ash content % of osmo-convective dried cashew apple flour bagels was significant at $p \leq 0.05$. Similarly, the effect of baking temperatures (i.e., T1=180°C, T2=200°C, T3=220°C) on ash content % of osmo-convective dried cashew apple flour bagels has significant at $p \leq 0.05$. The interactive effect of concentrations (%) and temperature (°C) of baking on ash content % was also significant at $p \leq 0.05$. The ash content increased when the substituting of refined wheat flour by osmo-convective dried cashew apple flour.

Similarly, Manzoor *et al.* 2024 reported that bagels prepared from banana peel flour and lavender, as the concentration of banana peel flour increases from 5 to 15% the ash content in bagel increases from 4.04 to 7.34%. Balinska, (2008) observed that the bagels prepared from wheat flour as the concentration of wheat flour increases the ash content in bagel increase from 2.96 to 6.07%.

Similarly, John *et al.* 2021 reported that doughnuts prepared from plantain and cocoyam flours 0 to 35% and 0 to 50% the ash content in doughnuts increases from 1.49-2.6%.

Similarly, Joshi *et al.* 2024 doughnuts made from finger millet flour increases from 5 to 20% the ash content in doughnut increase from 1.67 to 1.83%. According, Oke *et al.* 2017 reported that doughnuts prepared from wheat flour with breadfruit flour 0 to 50% the ash content increases from 2.00 to 2.28%.

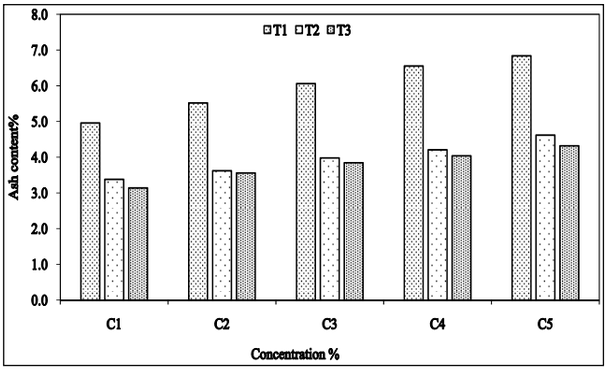


Fig. 6: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and baking temperature (°C) on ash content of bagels. (C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). T1= 180°; T2=200°; T3= 220°)

Table 4: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on ash content of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	4.960 ± 0.03	3.380 ± 0.08	3.141 ± 0.03	3.827
C2	5.522 ± 0.13	3.621 ± 0.07	3.560 ± 0.06	4.234
C3	6.060 ± 0.05	3.980 ± 0.01	3.844 ± 0.13	4.628
C4	6.554 ± 0.09	4.207 ± 0.12	4.040 ± 0.05	4.933
C5	6.840 ± 0.07	4.620 ± 0.09	4.320 ± 0.07	5.260
Mean B	5.987	3.961	3.781	
Control	4.46 ± 0.03			
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.027		0.009	
Factor(B)	0.021		0.007	
Factor (A × B)	0.048		0.016	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Effect of concentrations (%) of Osmo-convective Dried Cashew apple flour and baking temperature (°C) on fiber content of bagels

Fig. 7 Shows the effect of incorporation of Osmo-convective Dried Cashew apple flour (%) and baking temperature (°C) on the fiber content (%) of bagels prepared from osmo-convective dried cashew apple flour. The fiber content for all the treatments 3.85-7.90 %. As the osmo-convective dried cashew apple flour increase from 5 to 25%, the fiber content increases from 3.85-7.90 %. Similarly baking temperature increases from 180° to 220°, the fiber content decreases. As both the osmo-convective dried cashew apple flour (%) and baking temperature (°C) increase the combined effect of these two shows that the fiber content of the bagels shows the increasing and decreasing trend.

Table 5 shows the ANOVA for effect of various concentrations of cashew apple flour (C1=5%, C2=10%, C3=15%, C4=20%, C5=25%) on fiber content % of osmo-convective dried cashew apple flour bagels was significant at $p \leq 0.05$. Similarly, the effect of baking temperatures (i.e., T1=180°C, T2=200°C, T3=220°C) on fiber content % of osmo-convective dried cashew apple flour bagels has significant at $p \leq 0.05$. The interactive effect of concentrations (%) and temperature (°C) of baking on fiber content % was also significant at $p \leq 0.05$. The fiber content increased when the substituting of refined wheat flour by osmo-convective dried cashew apple flour. This might be due to cashew apple flour replaces a portion of wheat flour, the relative content of other nutrient like protein and fiber content increases (Tharshini *et al.* 2018).

Similarly, Manzoor *et al.* 2024 reported that bagels prepared from banana peel flour and lavender, as the concentration of banana peel flour increases from 5 to 15% the fiber content in bagel increases from 2.17 to 4.27%. Balinska, (2008) observed that the bagels prepared from wheat flour as the concentration of wheat flour increases the fiber content in bagel increase from 5.67 to 8.96%.

Similarly, John *et al.* 2021 reported that doughnuts prepared from plantain and cocoyam flours 0 to 35% and 0 to 50% the fiber content in doughnuts increases from 0.34-3.12 %. Similarly, Joshi *et al.* 2024 doughnuts made from finger millet flour increases from 5 to 20% the fiber content in doughnut increase from 0.63 to 3.11%. According, Oke *et al.* 2017 reported that doughnuts prepared from wheat flour with breadfruit flour 0 to 50% the fiber content increases from 1.76 to 4.79%.

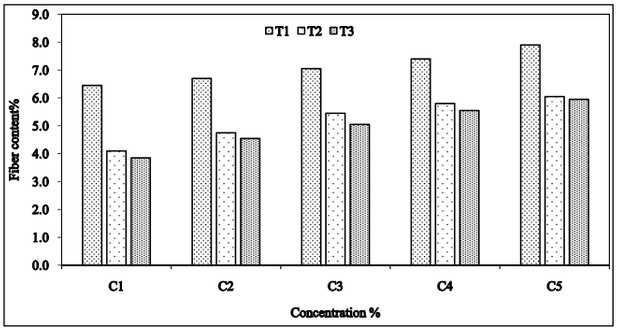


Fig. 7: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and baking temperature (°C) on fiber content of bagels. (C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). T1= 180°; T2=200°; T3= 220°)

Table 5: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on fiber content of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	6.450 ± 0.03	4.100±0.09	3.850 ± 0.03	4.800
C2	6.700 ± 0.13	4.750±0.12	4.547 ± 0.013	5.332
C3	7.050 ± 0.05	5.450±0.07	5.050 ± 0.09	5.850
C4	7.400 ± 0.09	5.800±0.04	5.550 ± 0.07	6.250
C5	7.900 ± 0.06	6.050±0.02	5.950 ± 0.01	6.633
Mean B	7.10	5.230	4.989	
Control	6.05 ± 0.01			
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.027		0.009	
Factor(B)	0.021		0.007	
Factor (A × B)	0.046		0.016	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Effect of concentrations (%) of Osmo-convective Dried Cashew apple flour and baking temperature (°C) on carbohydrate content of bagels.

Fig. 6 Shows the effect of incorporation of Osmo-convective Dried Cashew apple flour (%) and baking temperature (°C) on the carbohydrate content (%) of bagels prepared from osmo-convective dried cashew apple flour. The carbohydrate content for all the treatments 42.70 to 59.54 %. As the osmo-convective dried cashew apple flour increase from 5 to 25%, the carbohydrate content increases. Similarly baking temperature increases from 180° to 220°, the carbohydrate content decreases. As both the osmo-convective dried cashew apple flour (%) and baking temperature (°C) increase the combined effect of these two shows that the carbohydrate content of the bagels shows the increasing and decreasing trend.

Table 6 shows the ANOVA for effect of various concentrations of cashew apple flour (C1=5%, C2=10%, C3=15%, C4=20%, C5=25%) on carbohydrate content % of osmo-convective dried cashew apple flour bagels was significant at $p \leq 0.05$. Similarly, the effect of baking temperatures (i.e., T1=180°C, T2=200°C, T3=220°C) on carbohydrate content % of osmo-convective dried cashew apple flour bagels has significant at $p \leq 0.05$. The interactive effect of concentrations (%) and temperature (°C) of baking on carbohydrate content % was also significant at $p \leq 0.05$. The carbohydrate content increased when the substituting of refined wheat flour by osmo-convective dried cashew apple flour. This might be due to during baking process a significant portion of the dough's moisture evaporates due to heat exposer (180-220°) however, carbohydrate, starch are non-volatile and they do not evaporate (Tharshini *et al.* 2018).

Balinska, (2008) observed that the bagels prepared from wheat flour as the concentration of wheat flour increases the carbohydrate content in bagel increase from 45.67 to 49.62%.

Similarly, reported that Similarly, John *et al.* 2021 reported that doughnuts prepared from plantain and cocoyam flours 0 to 35% and 0 to 50% the carbohydrate content in doughnuts increases from 42.20-49.18%. Similarly, Joshi *et al.* 2024 doughnuts made from finger millet flour increases from 5 to 20% the carbohydrate content in doughnut increase from 42.39 to 53.58%. According, Oke *et al.* 2017 reported that doughnuts prepared from wheat flour with breadfruit flour 0 to 50% the carbohydrate content increases from 26.4 to 35.5%.

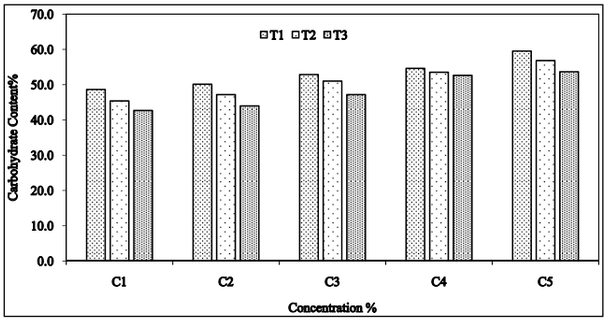


Fig. 8: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and baking temperature (°C) on carbohydrate content of bagels. (C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). (T1= 180°; T2=200°; T3= 220°)

Table 6: Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on carbohydrate content of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	48.649±0.03	45.422±0.09	42.701 ± 0.07	45.590
C2	50.150±0.12	47.190±0.01	44.003 ± 0.07	47.114
C3	52.881±0.03	51.031±0.07	47.211±0.13	50.374
C4	54.643±0.09	53.540±0.04	52.671±0.08	53.618
C5	59.540±0.14	56.843±0.15	53.671 ± 0.09	56.684
Mean B	53.172	50.805	48.0514	
Control	41.083 ± 0.11			
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.024		0.008	
Factor(B)	0.018		0.006	
Factor (A × B)	0.041		0.014	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on sensory colour of bagels

Fig. 9 shows the effect of various concentrations of cashew apple flour (i.e., 5%, 10%, 20%, 15%, 25%) and baking temperatures (i.e. 180°C, 200°C, 220°C) on the sensory colour of osmo-convective dried cashew apple flour bagels. It was observed that the range of sensory colour for all concentrations and baking temperatures was from 6.633 to 8.200.

Table 7 shows that the ANOVA for colour of sensory analysis. Highest colour score was observed at C1T1 i.e. 8.20 and lowest was observed at C5T3 i.e. 6.63. Control sample bagel was sensory colour score 8.00±0.11From all five concentrations and three baking temperatures, Treatment C1T1 gives higher sensory score. The effect of osmo-convective dried cashew apple flour concentrations (%) shows the significant effect $p \leq 0.05$. Similarly, baking temperature (°C) has significant effect $p \leq 0.05$ on the colour of bagels. The combined effect of osmo-convective dried cashew apple flour (%) and baking temperature (°C) has significant effect $p \leq 0.05$ on the colour of bagel sample.

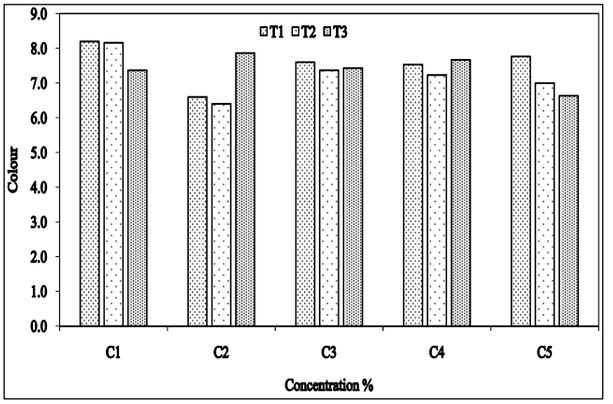


Fig. 9: Effect of concentrations (%) of osmo-convective Dried Cashew apple flour and temperature (°C) on sensory Colour of bagels. C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). (T1= 180°; T2=200°; T3= 220°)

Table 7: Effect of concentrations (%) of Osmo-convective Dried Cashew apple flour and temperature on sensory colour of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	8.200±0.13	8.160±0.17	7.367±0.12	7.922
C2	6.600±0.20	6.400±0.14	7.867±0.20	6.956
C3	7.600±0.16	7.367±0.13	7.433±0.17	7.467
C4	7.533±0.12	7.233±0.15	7.667±0.16	7.478
C5	7.767±0.13	7.000±0.12	6.633±0.10	7.133
Control	8.00±0.11			
Mean B	7.540	7.240	7.393	
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.321		0.107	
Factor(B)	0.249		0.083	
Factor (A × B)	0.550		0.186	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on sensory taste of bagels

Fig. 10 shows the effect of various concentrations of cashew apple flour (i.e., 5%, 10%, 15%, 20%, 25%) and baking temperatures (i.e. 180°C, 200°C, 220°C) on the sensory taste of osmo-convective dried cashew apple flour bagels. It was observed that the range of sensory taste for all concentrations and baking temperatures was from 6.56-8.20.

Table 8 shows that the ANOVA for flavour of sensory analysis. Highest taste score was observed at C1T1 i.e. 8.20 % and lowest was observed at C1T3 i.e. 6.56 %. Control sample bagel was sensory taste score 8.1±0.15 From all five concentrations and three baking temperatures, Treatment C1T1 gives higher sensory score. The effect of osmo-convective dried cashew apple flour concentrations (%) shows the significant effect $p \leq 0.05$. Similarly, baking temperature (°C) has significant effect $p \leq 0.05$ on the taste of bagels. The combined effect of osmo-convective dried cashew apple flour (%) and baking temperature (°C) has significant effect $p \leq 0.05$ on the taste of bagel sample.

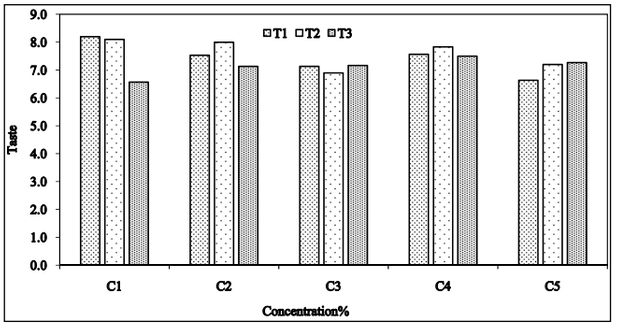


Fig. 10: Effect of concentrations (%) of osmo-convective Dried Cashew apple flour and temperature (°C) on sensory taste of bagels. C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). T1= 180°; T2=200°; T3= 220°)

Table 8: Effect of concentrations (%) of Osmo-convective Dried Cashew apple flour and temperature on sensory taste of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	8.200±0.18	8.100±0.11	6.567±0.12	7.622
C2	7.533±019	8.000±0.09	7.133±0.17	7.556
C3	7.133±0.11	6.900±0.14	7.167±0.13	7.067
C4	7.567±0.08	7.833±0.13	7.500±0.14	7.633
C5	6.633±0.10	7.200±0.09	7.267±0.12	7.033
Control	8.1±0.15			
Mean B	7.413	7.607	7.127	
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.522		0.174	
Factor(B)	0.405		0.135	
Factor (A × B)	0.903		0.301	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on sensory flavour of bagels

Fig. 11 shows the effect of various concentrations of cashew apple flour (i.e., 5%, 10%, 15%, 20%, 25%) and baking temperatures (i.e. 180°C, 200°C, 220°C) on the sensory flavour of osmo-convective dried cashew apple flour bagels. It was observed that the range of sensory flavour for all concentrations and baking temperatures was from 6.66-8.13.

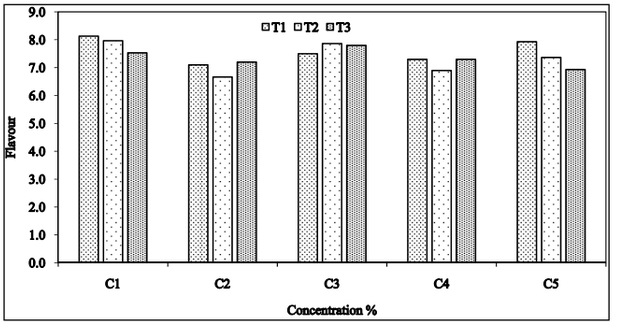


Fig. 11: Effect of concentrations (%) of osmo-convective Dried Cashew apple flour and temperature (°C) on sensory flavour of bagels. C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). (T1= 180°; T2=200°; T3= 220°)

Table 9: Effect of concentrations (%) of osmo-convective Dried Cashew apple flour and temperature on sensory flavour of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	8.133±0.16	7.967±0.13	7.533±0.11	7.878
C2	7.100±0.08	6.667±0.10	7.200±0.14	6.989
C3	7.500±0.13	7.867±0.15	7.800±0.11	7.722
C4	7.300±0.09	6.900±0.08	7.300±0.16	7.167
C5	7.933±0.12	7.367±0.13	6.933±0.08	7.411
Control	8.00±0.11			
Mean B	7.593	7.353	7.353	
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.322		0.111	
Factor(B)	0.258		0.086	
Factor (A × B)	0.576		0.192	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Table 9 shows that the ANOVA for flavour of sensory analysis. Highest colour score was observed at C1T1 i.e. 8.13 % and lowest was observed at C2T2 i.e. 6.56 %. Control sample bagel was sensory taste

score 8.00±0.11 From all five concentrations and three baking temperatures, Treatment C1T1 gives higher sensory score. The effect of osmo-convective dried cashew apple flour concentrations (%) shows the significant effect $p \leq 0.05$. Similarly, baking temperature (°C) has significant effect $p \leq 0.05$ on the flavour of bagels. The combined effect of osmo-convective dried cashew apple flour (%) and baking temperature (°C) has significant effect $p \leq 0.05$ on the flavour of bagel sample.

Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on sensory texture of bagels

Fig. 12 shows the effect of various concentrations of cashew apple flour (i.e., 5%, 10%, 15%, 20%, 25%) and baking temperatures (i.e. 180°C, 200°C, 220°C) on the sensory texture of osmo-convective dried cashew apple flour bagels. It was observed that the range of sensory texture for all concentrations and baking temperatures was from 6.53-8.20.

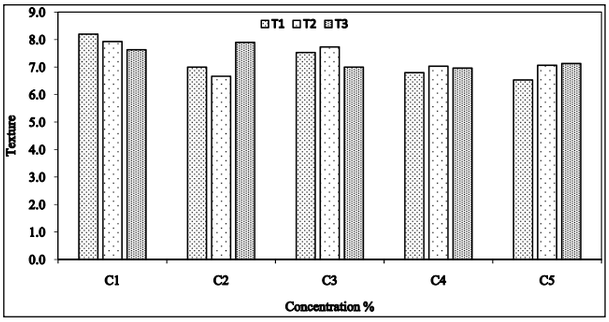


Fig. 12: Effect of concentrations (%) of osmo-convective Dried Cashew apple flour and temperature (°C) on sensory texture of bagels. C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). T1= 180°; T2=200°; T3= 220°)

Table 10 shows that the ANOVA for texture of sensory analysis. Highest texture score was observed at C1T1 i.e. 8.13 % and lowest was observed at C2T2 i.e. 6.56 %. Control sample bagel was sensory texture score 7.9±0.10 From all five concentrations and three baking temperatures, Treatment C1T1 gives higher sensory score. The effect of osmo-convective dried cashew apple flour concentrations (%) shows the significant effect $p \leq 0.05$. Similarly, baking temperature (°C) has significant effect $p \leq 0.05$ on the flavour of bagels. The combined effect of osmo-convective dried cashew apple flour (%) and baking temperature (°C) has significant effect $p \leq 0.05$ on the texture of bagel sample.

Table 10: Effect of concentrations (%) of osmo-convective Dried Cashew apple flour and temperature on sensory texture of bagels

Concentrations / Temperature	T1	T2	T3	Mean A
C1	8.200±0.21	7.933±0.14	7.633±0.13	7.922
C2	7.000±0.15	6.667±0.08	7.900±0.20	7.189
C3	7.533±0.11	7.733±0.09	7.000±0.14	7.422
C4	6.800±0.10	7.033±0.12	6.967±0.11	6.933
C5	6.533±0.15	7.067±0.09	7.133±0.10	6.911
Control	7.9±0.10			
Mean B	7.213	7.287	7.327	
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.271		0.093	
Factor(B)	0.216		0.072	
Factor (A × B)	0.483		0.161	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Effect of concentrations (%) of Osmo-Convective Dried Cashew apple flour and temperature (°C) on sensory overall acceptability of bagels

Fig. 13 shows the effect of various concentrations of cashew apple flour (i.e., 5%, 10%, 15%, 20%, 25%) and baking temperatures (i.e. 180°C, 200°C, 220°C) on the sensory overall acceptability of osmo-convective dried cashew apple flour bagels. It was observed that the range of sensory overall acceptability for all concentrations and baking temperatures was from 6.53-8.13.

Table 11 shows that the ANOVA for overall acceptability of sensory analysis. Highest overall acceptability score was observed at C1T1 i.e. 8.13 % and lowest was observed at C2T2 i.e. 6.53. Control sample bagel was sensory overall acceptability

score 8.00±0.08 From all five concentrations and three baking temperatures, Treatment C1T1 gives higher sensory score. The effect of osmo-convective dried cashew apple flour concentrations (%) shows the significant effect $p \leq 0.05$. Similarly, baking temperature (°C) has significant effect $p \leq 0.05$ on the overall acceptability of bagels. The combined effect of osmo-convective dried cashew apple flour (%) and baking temperature (°C) has significant effect $p \leq 0.05$ on the overall acceptability of bagel sample.

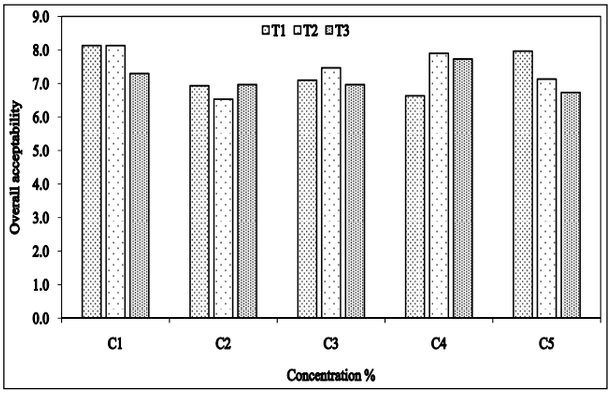


Fig. 13: Effect of concentrations (%) of osmo-convective Dried Cashew apple flour and temperature (°C) on sensory taste of bagels. C1= 5 %Cashew apple flour; C2=10 %Cashew apple flour; C3= 15%Cashew apple flour; C4=20%Cashew apple flour, C5=25 %Cashew apple flour). T1= 180°; T2=200°; T3= 220°)

Best Treatment from the concentration and baking temperature of osmo-convective dried cashew apple flour bagels

The desirable properties of osmo-convective dried cashew apple flour muffins i.e., moisture content, protein content, fat content, ash content, fiber and carbohydrate content, has been achieved at concentration of flour (C1T1): 95%:05% (refined wheat flour and dried cashew apple flour) and baking temperature at 180°. as discussed in table 12.

Table 11: Effect of concentrations (%) of osmo-convective Dried Cashew apple flour and temperature on sensory overall acceptability of bagels

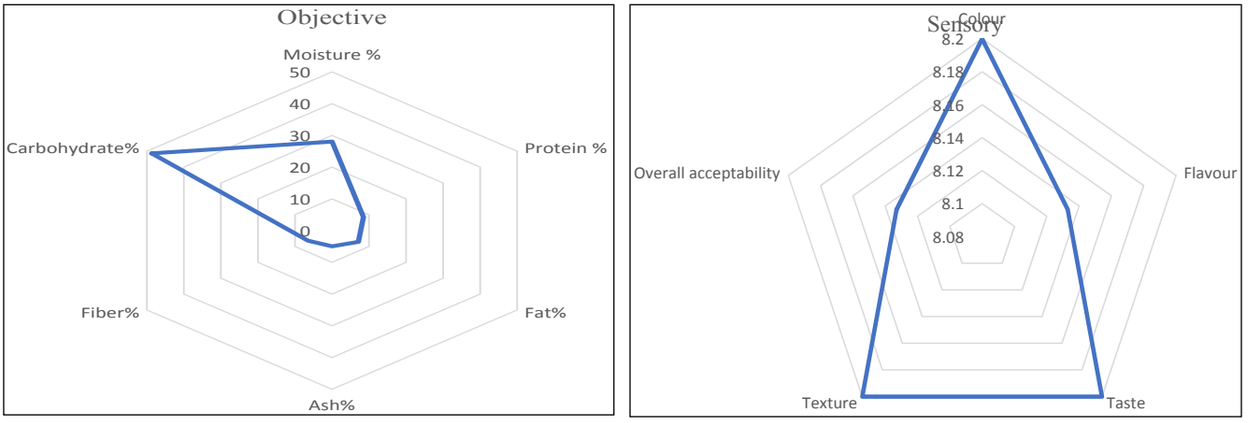
Concentrations / Temperature	T1	T2	T3	Mean A
C1	8.133±0.13	8.033±0.11	7.300±0.10	7.856
C2	6.933±0.12	6.533±0.08	6.967±0.16	6.811
C3	7.100±0.15	7.467±0.12	6.967±0.11	7.178
C4	6.633±0.08	7.900±0.16	7.733±0.14	7.422
C5	7.967±0.13	7.133±0.11	6.733±0.15	7.278
Control	8.00±0.08			
Mean B	7.353	7.433	7.140	
Factors	**C.D.**		**SE(m)**	
Factor(A)	0.314		0.105	
Factor(B)	0.243		0.081	
Factor (A × B)	0.543		0.181	

Cashew apple flour: Refined Wheat Flour (C1=5:95, C2=10:90, C3=15:85, C4=20:80, C5=25:75) Baking Temperature (T1;180°, T2;200°, T3;220°)

Similarly, the best sensory scores for sensory colour, sensory flavour, sensory taste, sensory texture and sensory overall acceptability have been observed as osmo-convective dried cashew apple flour bagels Concentration (95%:05%); Baking Temperature (180°C) and at as shown in Fig. 14. Therefore all these proportion at the best treatment are given in Table 12 and Fig. 14 respectively.

Table 12: Various parameters for the best treatment for osmo-convective dried cashew apple flour bagels concentration (95%:05%); Baking Temperature (180°C)

Objective Parameters						Sensory Parameters				
MC (%)	**Protein (%)**	**Fat (%)**	**Ash (%)**	**Fiber (%)**	**Carbohydrate (%)**	**Colour**	**Flavour**	**Taste**	**Texture**	**OA**
28.043	8.490	7.140	4.960	6.450	44.917	8.200	8.133	8.200	8.200	8.133



Objective Parameters *Subjective Parameters*

Fig. 14: (a) Objective and **(b)** Subjective Parameters for Best Treatment. Concentration of flour (C1T1): 95%:05% (refined wheat flour and cashew apple flour) and Baking Temperature: 180°C

CONCLUSION

1. The best quality of osmo-convective dried cashew apple flour bagels, can be produced with incorporation of osmo-convective dried cashew apple flour 5% and baking temperature at 180°. With physicochemical properties, Moisture content (db.) 28.043%, fat content 7.140%, protein content 8.490%, ash content 4.960%, fiber content 6.450%, carbohydrate 48.649%, with highest sensory score in all sensory attributes. i.e., colour (8.200), flavour (8.133), Texture (8.200), Taste (8.100), and overall acceptability (8.133).

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