International Journal of Food Science and Nutrition
www.foodsciencejournal.com
ISSN: 2455-4898
Received: 24-02-2022, Accepted: 08-03-2022, Published: 24-03-2022
Volume 7, Issue 1, 2022, Page No. 54-60

Sensory evaluation of dietary fibre enriched prebiotic biscuit

Rita Mondal[1], Pragya Tiwari[2], Ranajit Kumar Khalua[3*]
[1] SACT- Department of Nutrition and Home Since, Mahishadal Raj College & PhD Scholar, CMJ University, Meghalaya, India
[2] Department of Home Science, CMJ University, Jorabat, Meghalaya, India
[3] Vice principal & Associate Professor, Narajole Raj College, West Bengal, India

Abstract
The main objective of this research study was to develop dietary fibre enriched prebiotic biscuit and to evaluate sensory analysis of newly prepared biscuit. In this research study, control biscuit was developed without prebiotics and experimental biscuit was prepared by different percentage of prebiotics. As a prebiotics oats powder was used. The nutritional value of bakery goods and their potential for use in feeding programmes and emergencies captured the attention of customers. After sensory analysis, it was found that T_2 treatment combination was showed higher overall acceptability.

Keywords: bakery products, dietary fibre, prebiotics, oats, sensory evaluation

Introduction
In 19th century, European is habituated with a famous food which has less moisture, easily stored, & also fulfil hunger, this is none other than 'Biscuits'. The word Biscuit is derived from Latin word 'Panis biscotus'; that means two times cooked bread construct for sailors & it is known as 'Marine biscuits'. The definition of biscuit is 'hard dry bread that transported to sea' by Dr. Samuel Johnson. British first made this kind of biscuits name as crackers, wafers, cookies (Manley, 2011) [5].
In vast technology decades varieties, taste & other organoleptic features of biscuits are different. With comparison of other snack food items, biscuits have minimal processing charges, easily transported, easily consumed, & have lingered shelf life (Hooda & Jood, 2005) [2].
Mamat and Hill (2018) [4] reported that various studies have highlighted that, biscuits nourish nutritive efficacy. Flour, fat, sugar containing biscuits converts to nutritious & energy contained snack item. People intake this renowned snack foods in very much convenient way. Multiple studies have governed about fortified biscuits. Biscuit is regarded as prompt snacks food that is utilised in emergency situation.
Biscuit contains various constituents like flour, fat/oil, sugar, water along with some main constituents are also used to develop biscuits like salt, egg, emulsifier, starter such as sodium bicarbonate, ammonium bicarbonate, milk powder, seasoning constituents. Ingredients are very much altered in different type of biscuits. Complex & heterogenous dough like wheat flour dough consist flour, sugar, fat they possess texture, colour, flavour.
Krystyjan *et al*. (2015) [3] noted that biscuits are very much used as popular snacks that is very much simple for intake. It has prolonged shelf life. These foods are mostly sweet their fore sugar have to be modified according to dietary parameter.
It has high amount of fat & surrounding environmental conditions may hamper the quality of biscuits. Ambient conditions are oxidation, in that hydroperoxides are generated which is caused quantity of secondary reaction along with aldehyde, ketone, acids & another volatile compounds, therefore fallen down the quality, flavour, colour & gathering some toxic compounds which shows great problem in food sector (Arepally *et al*., 2020) [1].
This research study was carried out to develop dietary fibre enriched prebiotic biscuit. As a source of dietary fibre and prebiotics, oats are used in this experimental biscuit.

Aims and Objectives
Keeping in view the above-mentioned importance of prebiotics, with health benefits of oats, a research study on "Development of dietary fibre enriched prebiotic biscuit and it's Nutritional analysis" was carried out with the following goals in mind.
1. To optimize/standardize the ratio of oats powder in biscuit.
2. To evaluate the sensory properties of newly prepared biscuit.

Materials and methods
The experiments related to "Development of Dietary fibre enriched prebiotic biscuit and its Nutritional analysis" carried out in the research laboratory of Nutrition, Mahishadal Raj College, W.B., India.

Procurement of raw material
For preparation of biscuit, the raw ingredients like Oat powder, Wheat Flour, sugar, oil, Baking Powder were purchased from local market of Mahishadal.

Treatment combinations

T_0= Oats powder (0%): Wheat Flour (80 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175^0C for 15 Mins.

T_1= Oats powder (10 g): Wheat Flour (70 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175^0C for 15 Mins.

T_2= Oats powder (15g): Wheat Flour (65 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175^0C for 15 Mins.

T_3= Oats powder (20 g): Wheat Flour (60 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175^0C for 15 Mins.

No. of Treatment: 4 +1 =5

No of replication: 03

Total no of trials: 15

Sensory Evaluation

A semi-trained panel of 10 judges assessed the cookies' sensory qualities using a 9-point hedonic scale.

- Texture
- Colour
- Taste
- Flavour
- Overall acceptability

Flow chart for the preparation of biscuit (control biscuit) (Uchenna & Omolayo, 2017) [6]

Ingredient weighing (Wheat Flour, sugar, salt, butter and water)

↓

Mixing

↓

Cutting

↓

Baking

↓

Cooling

↓

Packaging

↓

Biscuit

Flow chart for the preparation of biscuit (experimental biscuit) (Uchenna & Omolayo, 2017) [6]

Ingredient weighing (Wheat Flour, oats powder, sugar, salt, butter and water)

↓

Mixing

↓

Cutting

↓

Baking

↓

Cooling

↓

Packaging

↓

Biscuit

Statistical analysis

To determine the statistical significance of the research data, Factorial Analysis and Critical difference (C.D) used for physico-chemical and antioxidant parameters for developed cookies and Two-Way Analysis of Variance (ANOVA) technique and Critical difference (C.D) was used for developed dough. Means & SD's were calculated for all analysis. All values are expressed as mean and standard deviation of five parallel measurements.

Results and discussions

This research study entitled "Development of Dietary fibre enriched prebiotic biscuit and its Nutritional analysis" was carried out in the Laboratory of Nutrition, Mahishadal Raj College to develop dietary fibre enriched prebiotic biscuit by using oats in different percentages.

Table 1: Sensory Evaluation of newly prepared prebiotic biscuit

	Sensory parameters				
Treatments	**Texture**	**Colour**	**Taste**	**Flavour**	**Overall acceptability**
T0	6.1 ± 0.11	6.3 ± 0.17	6.5 ± 0.28	6.7 ± 0.28	6.4 ±0.23
T1	7.2 ± 0.11	6.6 ± 0.34	6.4 ± 0.23	7.1 ± 0.40	6.7 ± 0.23
T2	7.1 ± 0.11	8.7 ± 0.28	7.6 ± 0.17	7.9 ± 0.28	7.8 ±0.17
T3	6.5 ± 0.11	6.2 ± 0.28	6.9 ± 0.23	6.3 ± 0.17	6.4 ± 0.23

Table 1.1: *Descriptive statistics of texture of control (T_0) and experimental (T_1, T_2, T_3) newly developed products*

Treatments	**T_0**	**T_1**	**T_2**	**T_3**
Observations N	3	3	3	3
Mean	6.1000	7.2000	7.1000	6.5000
Sample variance	0.0400	0.0400	0.0400	0.0400
Sample std. dev.	0.2000	0.2000	0.2000	0.2000
Std. dev. of mean SE	0.1155	0.1155	0.1155	0.1155

After descriptive statistical analysis of texture, it was found that the mean value of texture of control (T_0) biscuit was 6.1 and mean value of texture of experimental biscuit were 7.2, 7.1 and 6.5 respectively.

Table 1.2: One-way ANOVA of texture of control (T_0) and experimental (T_1, T_2, T_3) newly developed products

Source	**Sum of squares SS**	**Degrees of freedom**	**Mean square MS**	**F statistic**	**p-value**
treatment	2.4225	3	0.8075	20.1875	0.0004
error	0.3200	8	0.0400		
total	2.7425	11			

Table 1.3 significance and insignificance results of treatments

Treatments pair	**Tukey HSD Q statistic**	**Tukey HSD p-value**	**Tukey HSD inference**
a vs b	9.5263	0.0010053	** p<0.01
a vs c	8.6603	0.0012698	** p<0.01
a vs d	3.4641	0.1442067	insignificant
b vs c	0.8660	0.8999947	insignificant
b vs d	6.0622	0.0114004	* p<0.05
c vs d	5.1962	0.0259323	* p<0.05

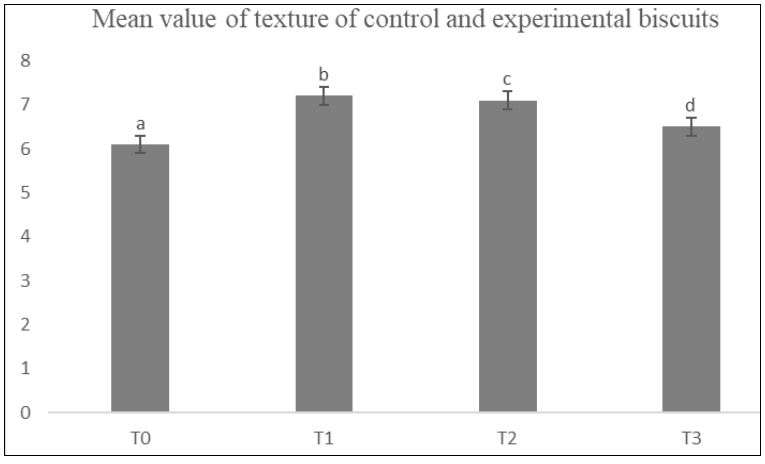

Fig 1: graphical representation of texture of newly prepared biscuit

Table 2: *Descriptive statistics of colour of control (T_0) and experimental (T_1, T_2, T_3) newly developed products*

Treatments	T_0	T_1	T_2	T_3
Observations N	3	3	3	3
Mean	6.3000	6.6000	8.7000	6.2000
Sample variance	0.0900	0.3600	0.2500	0.2500
Sample std. dev.	0.3000	0.6000	0.5000	0.5000
Std. dev. of mean SE	0.1732	0.3464	0.2887	0.2887

After descriptive statistical analysis of colour, it was found that the mean value of colour of control (T_0) biscuit was 6.3 and mean value of texture of experimental biscuit were 6.6, 8.7 and 6.2 respectively.

Table 2.1: One-way ANOVA of colour of control (T_0) and experimental (T_1, T_2, T_3) newly developed products

Source	Sum of squares SS	Degrees of freedom	Mean square MS	F statistic	p-value
treatment	12.5100	3	4.1700	17.5579	0.0007
error	1.9000	8	0.2375		
total	14.4100	11			

Table 2.2: significance and insignificance results of treatments

Treatments pair	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inferfence
a vs b	1.0662	0.8620437	insignificant
a vs c	8.5298	0.0014073	** p<0.01
a vs d	0.3554	0.8999947	insignificant
b vs c	7.4636	0.0033171	** p<0.01
b vs d	1.4216	0.7334779	insignificant
c vs d	8.8852	0.0010736	** p<0.01

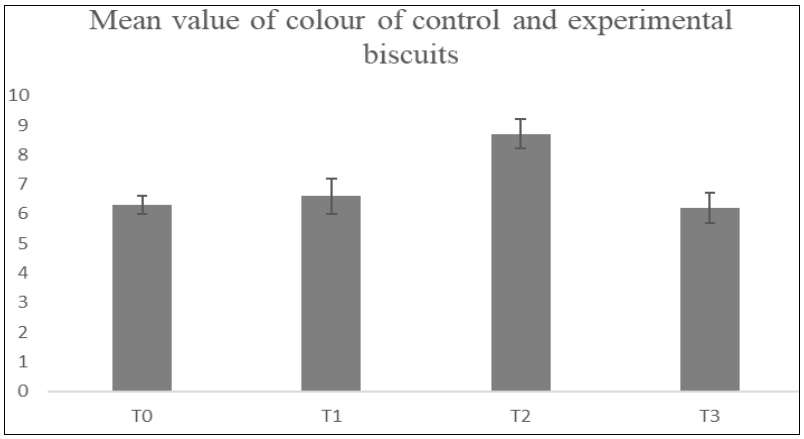

Fig 2: *graphical representation of colour of newly prepared biscuit*

Table 3: *Descriptive statistics of taste of control (T_0) and experimental (T_1, T_2, T_3) newly developed products*

Treatments	T_0	T_1	T_2	T_3
Observations N	3	3	3	3
Mean	6.5000	6.4000	7.6000	6.9000
Sample variance	0.2500	0.1600	0.0900	0.1600
Sample std. dev.	0.5000	0.4000	0.3000	0.4000
Std. dev. of mean SE	0.2887	0.2309	0.1732	0.2309

After descriptive statistical analysis of taste, it was found that the mean value of taste of control (T_0) biscuit was 6.5 and mean value of texture of experimental biscuit were 6.4, 7.6 and 6.9 respectively.

Table 3.1: *One-way ANOVA of taste of control (T_0) and experimental (T_1, T_2, T_3) newly developed products*

Source	Sum ofsquares SS	Degrees of freedom	Mean square MS	F statistic	p-value
treatment	2.6700	3	0.8900	5.3939	0.0253
error	1.3200	8	0.1650		
total	3.9900	11			

Table 3.2: *significance and insignificance results of treatments*

Treatments pair	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inferfence
a vs b	0.4264	0.8999947	insignificant
a vs c	4.6904	0.0426026	* p<0.05
a vs d	1.7056	0.6307548	insignificant
b vs c	5.1168	0.0280131	* p<0.05
b vs d	2.1320	0.4769299	insignificant
c vs d	2.9848	0.2285924	insignificant

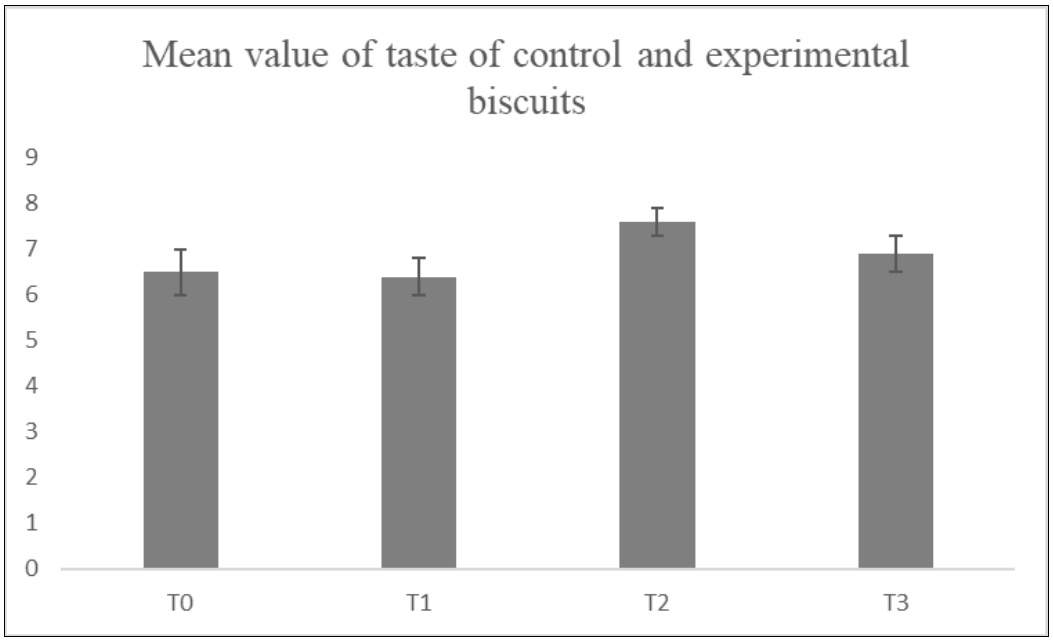

Fig 3: *graphical representation of taste of newly prepared biscuit*

Table 4: *Descriptive statistics of flavour of control (T_0) and experimental (T_1, T_2, T_3) newly developed products*

Treatments	T_0	T_1	T_2	T_3
Observations N	3	3	3	3
Mean	6.7000	7.1000	7.9000	6.3000
Sample variance	0.2500	0.4900	0.2500	0.0900
Sample std. dev.	0.5000	0.7000	0.5000	0.3000
Std. dev. of mean SE	0.2887	0.4041	0.2887	0.1732

After descriptive statistical analysis of flavour, it was found that the mean value of flavour of control (T_0) biscuit was 6.7 and mean value of texture of experimental biscuit were 7.1, 7.9 and 6.3 respectively.

Table 4.1: One-way ANOVA of flavour of control (T_0) and experimental (T_1, T_2, T_3) newly developed products

Source	Sum of squares SS	Degrees of freedom	Mean square MS	F statistic	p-value
treatment	4.2000	3	1.4000	5.1852	0.0279
error	2.1600	8	0.2700		
total	6.3600	11			

Table 4.2: significance and insignificance results of treatments

Treatments pair	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inferfence
a vs b	1.3333	0.7654207	insignificant
a vs c	4.0000	0.0848179	insignificant
a vs d	1.3333	0.7654207	insignificant
b vs c	2.6667	0.3056558	insignificant
b vs d	2.6667	0.3056558	insignificant
c vs d	5.3333	0.0227057	* p<0.05

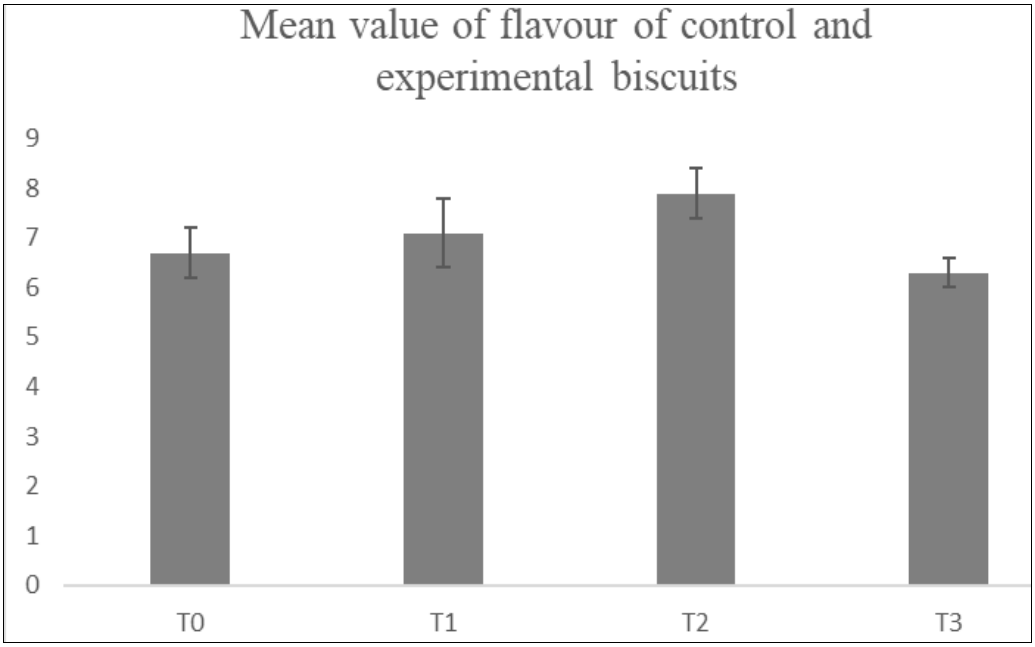

Fig 4: graphical representation of flavour of newly prepared biscuit

Table 5: *Descriptive statistics of overall acceptability of control (T_0) and experimental (T_1, T_2, T_3) newly developed products*

Treatments	T_0	T_1	T_2	T_3
Observations N	3	3	3	3
Mean	6.4000	6.7000	7.8000	6.4000
Sample variance	0.1600	0.1600	0.0900	0.1600
Sample std. dev.	0.4000	0.4000	0.3000	0.4000
Std. dev. of mean SE	0.2309	0.2309	0.1732	0.2309

After descriptive statistical analysis of overall acceptability, it was found that the mean value of overall acceptability of control (T_0) biscuit was 6.4 and mean value of texture of experimental biscuit were 6.7, 7.8 and 6.4 respectively.

Table 5.1: One-way ANOVA of overall acceptability of control (T_0) and experimental (T_1, T_2, T_3) newly developed products

Source	Sum of squares SS	Degrees of freedom	Mean square MS	F statistic	p-value
treatment	3.9825	3	1.3275	9.3158	0.0055
error	1.1400	8	0.1425		
total	5.1225	11			

Table 5.2: Significance and insignificance results of treatments

Treatments pair	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inferfence
a vs b	1.3765	0.7498081	insignificant
a vs c	6.4236	0.0081899	** p<0.01
a vs d	0.0000	0.8999947	insignificant
b vs c	5.0471	0.0299859	* p<0.05
b vs d	1.3765	0.7498081	insignificant
c vs d	6.4236	0.0081899	** p<0.01

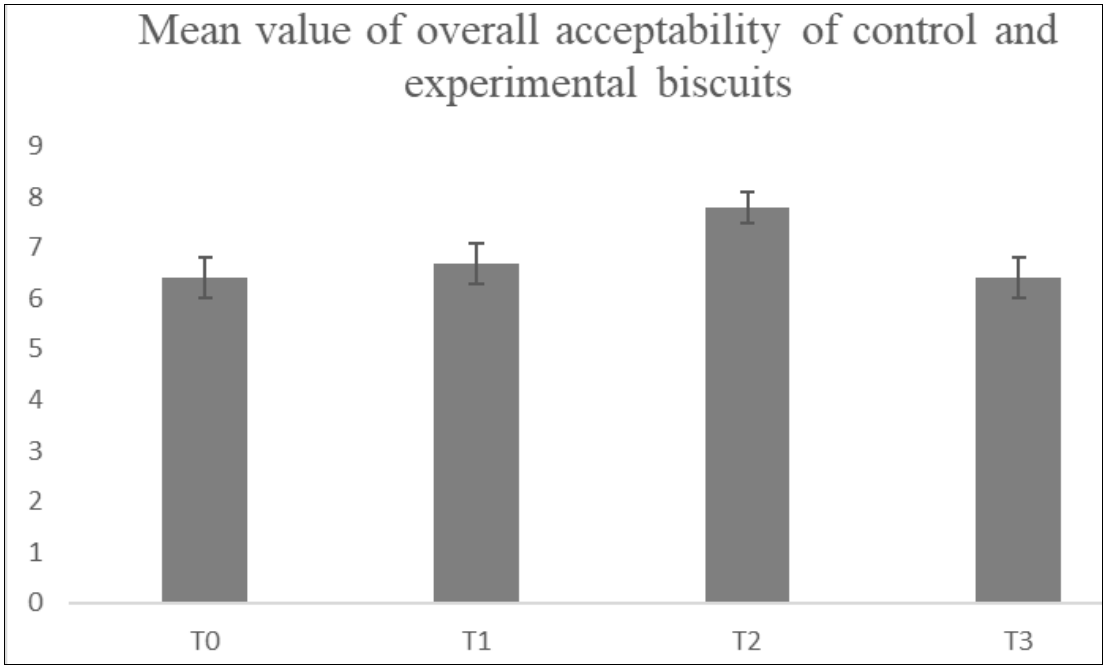

Fig 5: Graphical representation of overall acceptability of newly prepared biscuit

Conclusion

After conducting a descriptive statistical analysis of texture, it was discovered that the control (T0) biscuit's mean texture score was 6.1 and the experimental biscuit's score was 7.2, 7.1, and 6.5, respectively. Following a descriptive statistical study of colour, it was discovered that the control (T0) biscuit's mean value of colour was 6.3 and the experimental biscuit's mean values of texture, 6.6, 8.7, and 6.2. After conducting a descriptive statistical analysis of taste, it was discovered that the control (T0) biscuit's mean value of taste was 6.5 and the experimental biscuit's mean values of texture were 6.4, 7.6, and 6.9, respectively. After descriptive statistical analysis of flavour, it was found that the mean value of flavour of control (T_0) biscuit was 6.7 and mean value of texture of experimental biscuit were 7.1, 7.9 and 6.3 respectively. After descriptive statistical analysis of overall acceptability, it was found that the mean value of overall acceptability of control (T_0) biscuit was 6.4 and mean value of texture of experimental biscuit were 6.7, 7.8 and 6.4 respectively.

References

1. Arepally D, Reddy RS, Goswami TK, Datta AK. Biscuit baking: A review. Lwt,2020:131:109726.
2. Hooda S, Jood S. Organoleptic and nutritional evaluation of wheat biscuits supplemented with untreated and treated fenugreek flour. Food chemistry,2005:90(3):427-435.
3. Krystyjan M, Gumul D, Ziobro R, Korus A. The fortification of biscuits with bee pollen and its effect on physicochemical and antioxidant properties in biscuits. LWT-Food Science and Technology,2015:63(1):640-646.
4. Mamat H, Hill SE. Structural and functional properties of major ingredients of biscuit. International food research journal, 2018, 25(2).
5. Manley D. (Ed.). Manley's technology of biscuits, crackers and cookies. Elsevier, 2011.
6. Uchenna CJ, Omolayo FT. Development and quality evaluation of biscuits formulated from flour blends of wheat, bambara nut and aerial yam. Annals of Food Science and Technology,2017:18:51-56.