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Antioxidant activity (DPPH percentage) of dietary fibre enriched prebiotic biscuit

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Abstract

The main objective of this study was to evaluate the antioxidant content (DPPH %) of recently baked biscuits. In this study, prebiotics were added in varying amounts to the experimental biscuits while being left out of the control biscuits. A prebiotic was used, oat powder. Customers' interest was piqued by the nutritive qualities of bakery goods and their potential for use in feeding programmes and crises. After analysis of DPPH (%), it was found that the mean value of DPPH percentage of control (T₀) biscuit was 14.66% and mean value of DPPH (%) of experimental (T₁, T₂ and T₃) biscuit were 25.00%, 28.00% and 30% respectively. The results from the previous analysis showed that there was a significant difference between (T₀) & (T₂), (T₁) & (T₃); (T₀) & (T₃) and (T₁) & (T₁) & (T₃) at $p < 0.01$. There was insignificantly difference between (T₁) & (T₂); (T₂) & (T₃).

Keywords: Antioxidant, bakery products, dietary fibre, DPPH, prebiotics, oats

Introduction

A biscuit is a prepared food that belongs to the baked food category. A biscuit is a crisp food made from weak gluten wheat flour as the main ingredient, along with numerous auxiliary ingredients like sugar (or without), oil, and other excipients via flour blending, moulding, baking, and other processes. Biscuits have less than 6% moisture by weight (Hu *et al.*, 2022) ^[3].

It is customary to prepare biscuits primarily with wheat flour, oil, and sugar. Biscuits are ready-to-eat foods. Technology for biscuits has recently advanced quickly in order to enhance their nutritious qualities. The purpose of this study was to identify methods for enhancing biscuits' nutritional value and any potential health advantages (Goubgou *et al.*, 2021) ^[2].

Biscuits contain both core and auxiliary components. Optional secondary ingredients include salt, an egg, an emulsifier, starter (sodium bicarbonate, ammonium bicarbonate), milk powder, and flavouring spices. Flour, fat/oil, sugar, and water are the main components among these (Mancebo *et al.*, 2015) ^[4].

A biscuit with a lot of dietary fibre was made for this investigation. The component of a plant that resists intestinal digestion in the human large intestine is known as total dietary fibre. Because total dietary fibre has been demonstrated to have positive impacts on human health and physical function, consuming a lot of it is linked to a lower occurrence of common illnesses and disorders in modern civilisations (Parveen, 2017) ^[6].

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 "Antioxidant activity of dietary fibre enriched prebiotic biscuit" was carried out to analyse the DPPH content (%) of newly prepared biscuit.

Materials and methods

The experiments related to "Antioxidant activity of dietary fibre enriched prebiotic biscuit" 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.

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Treatment combinations (Mondal *et al.*, 2022) [5].

T₀= Oats powder (0%): Wheat Flour (80 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175 °C for 15 Mins.

T₁= Oats powder (10 g): Wheat Flour (70 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175 °C for 15 Mins.

T₂= Oats powder (15g): Wheat Flour (65 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175 °C for 15 Mins.

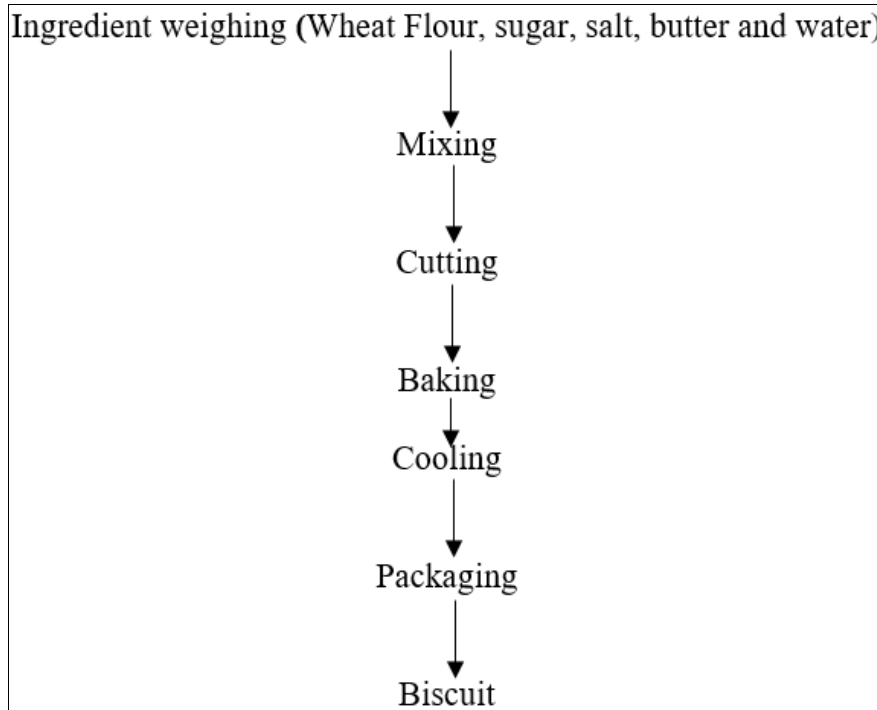
T₃= Oats powder (20 g): Wheat Flour (60 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175 °C for 15 Mins.

No. of Treatment: 4 +1 =5

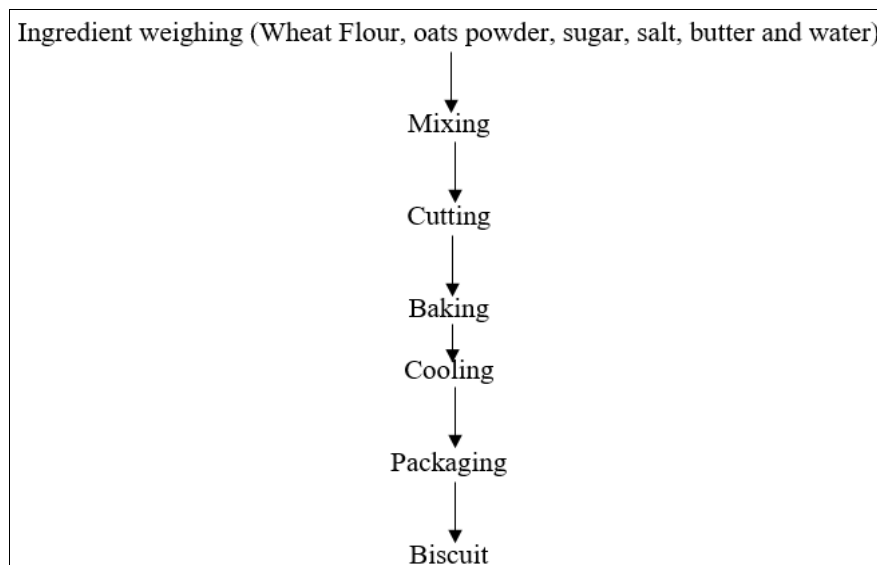
No of replication: 03

Total no of trials: 15

Flow chart for the preparation of biscuit (control biscuit) (Uchenna & Omolayo, 2017) [7]



Flow chart for the preparation of biscuit (experimental biscuit) (Uchenna & Omolayo, 2017) [7]



Antioxidant analysis of newly prepared probiotic functional kulfi

DPPH free radical-scavenging assay: With a few small changes to the test sample concentration and DPPH concentration mixture, the method was utilised to calculate the capacity to scavenge DPPH free radicals. 1 ml of the test sample was put into a test tube, shaken vigorously, and

allowed to sit for 15 minutes in the dark before the absorbance at 517 nm was measured using 0.1 mM of DPPH made in ethanol. The normal curve between 0 and 30 M Trolox was linear. Results are expressed as M Trolox equivalents (TE) per gramme of wet basis (Sahreen *et al.*, 2010) [8].

Statistical analysis

Factorial Analysis and Critical Difference (C.D.) were used for the physico-chemical and antioxidant parameters for developed cookies, and Two-Way Analysis of Variance (ANOVA) technique and Critical Difference (C.D.) were used for developed dough, in order to assess the statistical significance of the research findings. For all analyses, means and standard deviations were computed. The mean and standard deviation of three parallel measurements is used to express all data.

Results and discussions

This research study entitled “Antioxidant activity of dietary fibre enriched prebiotic biscuit” was carried out in the Laboratory of Nutrition, Mahishadal Raj College to develop dietary fibre enriched prebiotic biscuit by using oats in different percentage.

Table 1: Descriptive statistics of DPPH (%) of control (T₀) and experimental (T₁, T₂, T₃) newly developed products

Treatment	T ₀	T ₁	T ₂	T ₃
observations N	3	3	3	3
sum	44.0000	75.0000	84.0000	90.0000
mean	14.6667	25.0000	28.0000	30.0000
sample std. dev.	1.5275	1.0000	1.0000	1.0000
std. dev. of mean SE	0.8819	0.5774	0.5774	0.5774

Following DPPH (%) analysis, it was discovered that the control (T₀) biscuit's mean DPPH percentage was 14.66% and that the mean DPPH (%) of the experimental (T₁, T₂, and T₃) biscuits was 25.00%, 28.00%, and 30%, respectively.

Table 2: One-way ANOVA of DPPH (%) of control (T₀) and experimental (T₁, T₂, T₃) newly developed products

Source	Sum of squares SS	degrees of freedom	mean square MS	F statistic	p-value
Treatment	418.2500	3	139.4167	104.5625	9.3188e-07
Error	10.6667	8	1.3333		
Total	428.9167	11			

Table 3: Significance and insignificance results of treatments

Treatments pair	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inference
T ₀ vs T ₂	15.5000	0.0010053	** <i>p</i> <0.01
T ₁ vs T ₃	20.0000	0.0010053	** <i>p</i> <0.01
T ₀ vs T ₃	23.0000	0.0010053	** <i>p</i> <0.01
T ₁ vs T ₂	4.5000	0.0514788	insignificant
T ₁ vs T ₃	7.5000	0.0032169	** <i>p</i> <0.01
T ₂ vs T ₃	3.0000	0.2253626	insignificant

The results from the previous analysis showed that there was a significant difference between (T₀) & (T₂), (T₁) & (T₃); (T₀) & (T₃) and (T₁) & (T₁) & (T₃) at *p*<0.01. There

was insignificantly difference between (T₁) & (T₂); (T₂) & (T₃).

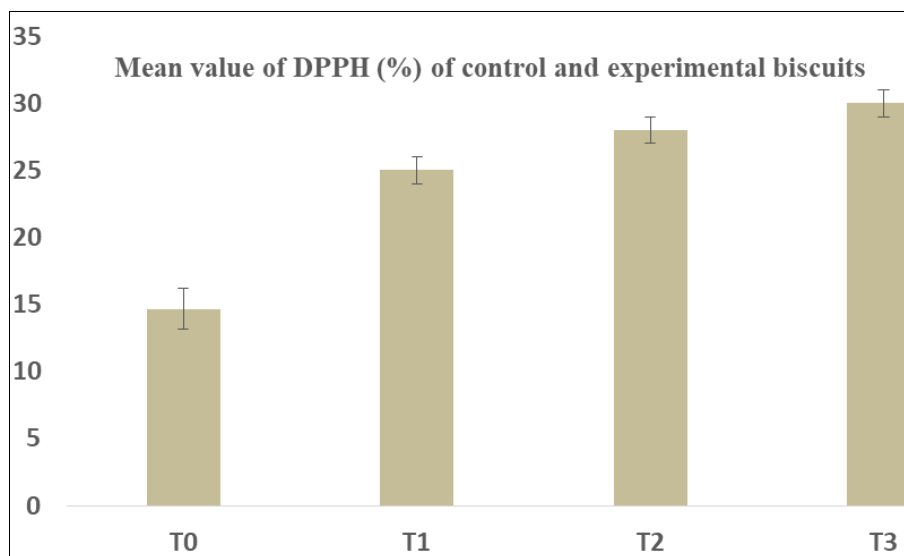


Fig 10: Graphical representation of DPPH (%) of newly prepared biscuit

Conclusion

After DPPH (%) analysis, it emerged that the control (T₀) biscuit's mean DPPH percentage was 14.66% and that the mean DPPH (%) of the experimental (T₁, T₂, and T₃) biscuits was 25.00%, 28.00%, and 30%, respectively. According to the findings of the previous study, the variance

between (T₀) & (T₂), (T₁) & (T₃), (T₀) & (T₃), and (T₁) & (T₁) & (T₃) was statistically significant at *p*<0.01. The difference between (T₁) and (T₂) and (T₂) and (T₃) was negligible.

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