

Whey Protein Concentrate Enriched Biscuits

Beena Munaza, S.G.M.Prasad, Bazilla Gayas

Department of Food and Dairy Technolgy, Sam Hagginbotton Institute of Agriculture Technology and Sciences-Deemed to be University, Allahabad (UP)

Abstract- The present study was carried out with the objective to prepare whey protein enriched biscuits by supplementing wheat flour with whey protein concentrate at different levels of substitution, to assess the nutritional quality and storage stability of the product. The product was further analysed for cost. Control and three experimental treatments were prepared with varying proportions of whey protein concentrate - 4%, 7% and 10%. Each treatment was replicated three times. Sensory evaluation of the biscuits was carried out using 9 point hedonic scale. The data obtained during the study was analysed statistically using analysis of variance and critical difference techniques. On the basis of results it was concluded that treatment T₃ containing 10% WPC was best regarding sensory characteristics – colour and appearance, taste and flavour, body and texture and overall acceptability of the product. All the experimental treatments and control were also analysed chemically using AACC and AOAC procedures. Chemical analysis showed that the moisture content of the biscuits varied from 1.24 – 2.13 and the highest moisture content was found in T₃ which contained highest amount of WPC, the moisture content also increased with the storage time. Estimation of protein content of sample showed high improvement in nutritional value of whey protein enriched biscuits with a maximum value of 21.86%. There was linear increase in ash content of the product from 0.30 – 1.11.

Based on the results it was concluded that the whey protein enriched biscuits containing 10% WPC were high as comparable to control and other treatments in sensory characteristics (colour and appearance, flavour and taste, body and texture & overall acceptability). The chemical analysis for moisture content, ash content, protein content and crude fibre content was rating T₃ > T₂ > T₁ > T₀.

Index Terms- Biscuit, Whey Protein Concentrate.

I. INTRODUCTION

Today's health conscious consumers are increasingly making food choices based on a food's ability to provide health benefits, such as enhancing body functions or reducing the risk for certain disease. Many traditional dairy ingredients provide unprecedented opportunities for the food industry to improve existing and/or develop new products with unique health benefits. New technologies to isolate dairy ingredients and emerging research identifying biological roles for dairy ingredients, such as whey proteins, are leading to growing interest in their potential use in functional foods (Smithers et al., 1996).

Whey has all along been considered as a waste product and looked upon seriously by the environmentalists and technologists

due to its potent polluting strength. However, it is no longer considered a waste product but a treasure chest of nutritionally rich whey protein, which has been unlocked by the modern processing technology, enabling them to recover economically in their native form. The advent of this technology has been a great boon to recover these precious solids in the form of whey protein concentrate (WPC). The whey proteins are potentially nutritional and functional food ingredients for use in a wide range of food types and can replace expensive ingredients such as egg white and milk proteins (Jayaprakasha, 1992).

Biscuits are confectionery dried to very low moisture content. According to Fayemi (1981), biscuit is defined as a small thin crisp cake made from unleavened dough. Biscuits are an important baked product in human diet and are usually eaten with tea and are also used as weaning food for infants. The school children who are often under weight (ACC/SCN, 1987) use them as snack. The ingredients are simple; they contain soft wheat flour, shortening, sugar, fat, eggs. These ingredients are considered to be low in nutritive and biological values since soft wheat flour used for the production of biscuits is deficient in several nutrients including some vitamins, mineral elements as well dietary fiber (Awan et al., 1991) and contains only 7 to 10% protein (Yamazaki and Greenwood, 1981). Wheat flour lacks certain essential amino acids such as lysine, tryptophan and threonine (Kent, 1975); hence, the low nutritive value of biscuits is an issue of great concern because biscuits are the most commonly eaten snacks by school children who need more protein per unit body weight than adults. The need of production of biscuits with a suitable amount and high biological value of protein will help in developing of nutritionally balanced biscuits to produce high density protein biscuits.

The present study was carried out to find out the effect of addition of different proportion of Whey Protein Concentrate on nutritional composition and sensory characteristics of biscuits.

II. MATERIALS AND METHODS

Biscuits were prepared using creamery method for making biscuit dough. The ingredients used in biscuits were flour blends (100g), sugar (30g), shortening (20g), milk powder (2.0g), sodium chloride (1g), sodium bicarbonate (0.5g), ammonium bicarbonate (1g), vanilla essence (0.2 ml), water (20 ml) and skimmed milk powder. Four flour blends, prepared with wheat flour and whey protein concentrate were 100:0, 96:4, 93:7, 90:10. The dough was sheeted to a thickness of 3.5 mm with the help of an aluminium platform and frame. The sheeted dough was cut in to a square shape using a moulder. The cut dough was transferred to aluminium tray. The biscuits were baked in an electric oven maintained at 205⁰C for 10minutes. The baked

biscuits were cooled for about 30 minutes, packed into LDPE bags for further analysis.

Nutritional composition

Moisture content, Ash content, Fat content, Crude Fiber and Beta carotene in different biscuits samples were determined as per standard methods (AOAC, 2000). Total carbohydrates value was obtained by subtracting total of moisture, protein, fat, crude fiber and ash content from 100.

Sensory characteristics

Sensory attributes of biscuits samples packed in LDPE were evaluated in fresh condition. Hedonic scale rating was used for evaluation of biscuit samples. The result of sensory characteristics of biscuit samples from wheat flour, whey protein concentrate and other ingredient and packed in LDPE were evaluated in terms of different attributes namely: colour, flavour, taste, texture and overall acceptability.

Details of treatment combinations

TREATMENTS	WPC (%)	FLOUR (%)
T ₀	0	100
T ₁	4	96
T ₂	7	93
T ₃	10	90

T₀ – The product was prepared without supplementing WPC to the flour.

T₁– The product was prepared by supplementing the wheat flour with WPC in the ratios 96:4

T₂– The product was prepared by supplementing the wheat flour with WPC in the ratios 93:7

T₃– The product was prepared by supplementing the wheat flour with WPC in the ratios 90:10

III. RESULTS AND DISCUSSIONS

On evaluation of result it was found that there was an increase in moisture content in biscuit samples with increase in the level of whey protein concentrate from 4% to 10%. The increased ash content was due to high percentage of mineral content present in whey protein concentrate, therefore there was significant difference between samples. As wheat flour, whey protein concentrate was having lower fat content, therefore the total fat content of biscuits is majorily a function of externally added fat during biscuit preparation. It was found that there was linear increase in protein content in the biscuit sample with increase in level of whey protein concentrate from 4 to 10% which was obvious. However there was no significant difference in the crude fiber content of the biscuits.

Sensory attributes of all biscuit samples packed in LDPE were evaluated in fresh condition at ambient temperature. Hedonic scale rating was used for evaluation of biscuit samples. Different attributes selected were colour, flavour, taste, texture and overall acceptability. The mean overall acceptability scores of more than 7.5 for biscuit sample containing 10% whey protein concentrate indicated the commercial scope for manufacturing good quality high protein biscuits.

Table 1: Effect of Whey Protein Concentrate on Physico- chemical characteristics of Biscuits

	Moisture	Ash	Fat	Protein	Crude fiber	Carbohydrate
T ₀	1.24	0.30	22.10	10.45	0.37	65.54
T ₁	1.52	0.48	21.79	15.79	0.39	60.04
T ₂	1.67	0.66	21.39	17.82	0.39	58.07
T ₃	2.13	1.11	21.27	21.38	0.39	53.72

Table 2: Effect of Whey Protein Concentrate on Sensory characteristics of Biscuits

	Colour	Taste	Texture	Flavour	Overall Acceptability
T ₀	7.67	8.00	7.67	8.00	7.77
T ₁	8.00	8.33	8.00	8.33	8.10
T ₂	8.33	8.67	8.33	8.67	8.40
T ₃	8.67	9.00	8.67	9.00	8.77

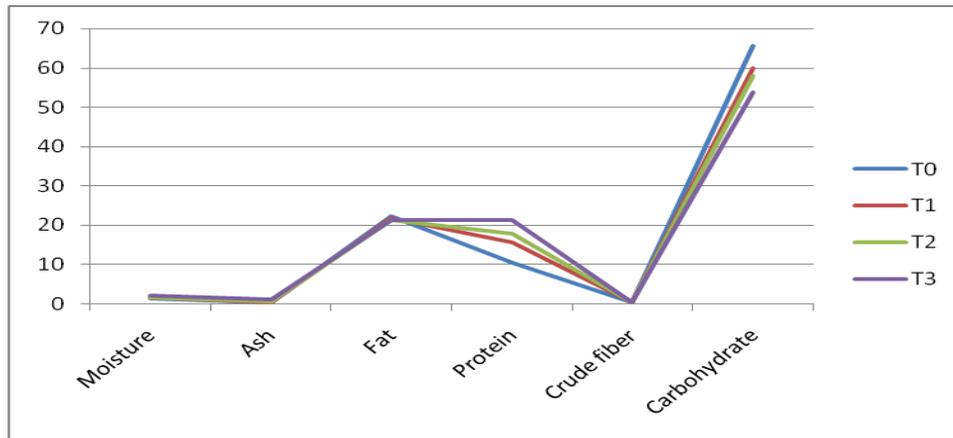


Fig. 1: physico-chemical properties of WPC enriched biscuits

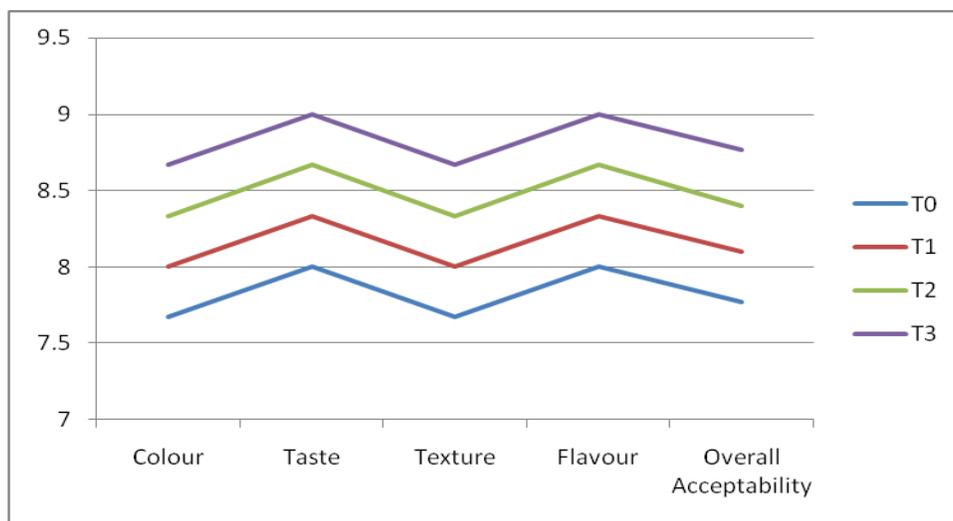


Fig. 2: Sensory Characteristics of WPC enriched biscuits

IV. SUMMARY AND CONCLUSION

Biscuit samples of high nutrition were formulated from wheat flour and Whey Protein Concentrate. The composition and nutritive value of biscuit samples represent balanced quantity of carbohydrate, protein, fat, crude fiber and ash and these samples were acceptable in sensory evaluation.

Moisture, ash and protein content of the experimental biscuit samples increased with the level of incorporation of whey protein concentrate while Fat content of biscuit sample decreased slightly. The crude fibre content of the biscuit samples was almost same in all the treatments.

The study showed that whey protein enriched biscuits may be a suitable source of proteins as biscuit is a mass consumption item and is consumed by every age group. Recently, the potential use of dairy ingredients in a variety of food products to enhance health has captured the attention of food industry. Whey proteins are recognized as physiologically functional food ingredients. WPCs are the most valuable ingredients and contribute to a great extent in the development of new food products as they are capable of fulfilling the diverse functional properties.

REFERENCES

- [1] AOAC, (1984). Official Methods of Analysis of the Association of Official Analytical Chemist's (Ed. William, S.) 14 Ed., Association of Official Analytical Chemist's Inc., Virginia, USA, p. 160 (fat estimation), p.303 (ash estimation) and p. 303 (microkjeldhal).
- [2] AACC, (2000). Approved methods of the American Association of Cereal Chemists. 10th Edition. American association of Cereal Chemist, Inc. USA. Moisture- p.1-2.
- [3] Awan JA, Salim-ur-Rehman, Ullah E, Siddique MI, Aziz T., (1991). Nutrition of wheat flour in Islamic perspective. JAPS, 1(2): 1-7.
- [4] Fayemi PO., (1981). Home Economics Teacher Guide. *Ibadan Macmillian Nigeria Publisher Ltd., P. 201*
- [5] Jayapraskasha, H. M., (1992). Membrane processing applications for production of whey powder and whey protein concentrates. Ph.D. Thesis, National Dairy Research Institute, Deemed University, Karnal, India.
- [6] Kent, N.L., (1983). Technology of cereals. *Third Edition. Pergamon Press, Oxford*
- [7] Smithers G.W.; F.J. Ballard; A.D.Copeland; K.J. De Silva; D.A. Dionysius; G.L. Francis; C. Godard; P.A. Grieece; G.H. McIntosh; I.R. Mitchell; R.J. Pearce; G.O. Regester., (1996). New opportunities from the isolation and utilization of whey proteins. Dairy Science. 79. 1454-1460.
- [8] Yamazaki WT, Greenwood C (1981). Soft wheat: Production, breeding, milling and uses. *American Association of Cereal Chemists, ST, Paul, Minnesota, USA, pp. 45-49.*

AUTHORS

First Author – Beena Munaza, M.Tech Student, Department of Food and Dairy Technolgy, Sam Hagginbotton Institute of Agriculture Technology and Sciences-Deemed to be University, Allahabad (UP), e.mail:beenamunaza@gmail.com

Second Author – S.G.M.Prasad, Associate Professor, Department of Food and Dairy Technolgy, Sam Hagginbotton Institute of Agriculture Technology and Sciences-Deemed to be University, Allahabad (UP),

Third Author – Bazilla Gayas, M.Tech Student, Department of Food and Dairy Technolgy, Sam Hagginbotton Institute of Agriculture Technology and Sciences-Deemed to be University, Allahabad (UP),