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Shikha
Department of Food Science and
Nutrition Chandra Shekhar Azad
Agriculture University of
Agriculture and Technology,
Kanpur, Uttar Pradesh, India

Rashmi Singh
Department of Food Science and
Nutrition Chandra Shekhar Azad
Agriculture University of
Agriculture and Technology,
Kanpur, Uttar Pradesh, India

MPS Yadav
Department of A.H.D, Chandra
Shekhar Azad Agriculture
University of Agriculture and
Technology, Kanpur,
Uttar Pradesh, India

Correspondence
Shikha
Department of Food Science and
Nutrition Chandra Shekhar Azad
Agriculture University of
Agriculture and Technology,
Kanpur, Uttar Pradesh, India

Effects of whey supplementation on physico-chemical evaluation of developed cookies

Shikha, Rashmi Singh and MPS Yadav

Abstract

Whey is one of the major byproducts of the dairy industry all over the world. It contains about 40% of the total solids present in milk and is rich in organic matter that commands high Biological Oxygen Demand (BOD) of about 30,000 to 50,000 mg/liter, for which it is considered as a serious pollutant and entails expensive treatment before its disposal. Even though many attempts have been made to utilize whey successfully in food products, it has still not been utilized effectively in items of mass consumption. An attempt has been made in the present study to utilize Buffalo milk whey for optimizing the conditions of production of cookies. Cookies are one of the fastest rising items of consumption throughout the world. Cookies has become one of the most desirable snack for both youth and elderly people due to their low manufacturing cost, more convenience, long shelf life and ability to serve as a vehicle for important nutrients to suit changing lifestyles. Whey and water was incorporated into cookies dough in the ratio of 25:75, 50:50, 75:25 and 100:0 respectively and subjected to baking temperatures of 175 °c. The effects of whey incorporation on proximate aspects of the cookies were studied. The optimized cookies made by incorporation of 100% whey contained 88.68% Total solid, 24.53% fat, 9.92% protein, 1.09% ash and 53.15% carbohydrate. The proximate composition of the experimental sample differed slightly from that of the control sample.

Keywords: Whey, cookies, proximate composition, cereals and dough

1. Introduction

Snack food consumption has been on the increase as a result of urbanization and increase in the number of working women. Food based industry can exploit this development by fabricating nutritious snack foods. Cookies has become one of the most desirable snack for both youth and elderly people due to their low manufacturing cost, more convenience, long shelf life and ability to serve as a vehicle for important nutrients. Cookies are not considered as staple food as like bread, but are feasible fiber carriers because of their long shelf life and thus enable large scale production and widespread distribution. In many countries, cookies are prepared with fortified or composite flour to increase its nutritive value. Cookies are convenient snacks product dried to a very low moisture content taken among young people and adult to provide energy. This food is made from unleavened dough. It is produced from a mixture of flour and water which may contain fat, sugar and other ingredients mixed together into dough which is rested for a period and passed between rollers to make a sheet. It provides an excellent means of improving the nutritional quantity of foods through incorporation of less expensive high quality protein, minerals, vitamins and has been employed in food product enrichment. Cookies are small, flat dessert treats, commonly formed into a circular shape. They constitute an important component of the diet. Among the bakery products, cookies are most significant and an important food product used as snacks by children and adults all over the world. However, these are most commonly relished by school going children, who need more protein per unit body weight than adults.

Whey is the watery part of milk that remains after separation of curd / coagulated products that result from acid or proteolytic enzyme mediated coagulation of milk. It is major by-product of dairy industry, during manufacture of products like paneer, channa, chakka, cheese, casein, etc. In the manufacturing of these products, about 10- 20 percent portion of milk is recovered as the desired end product and remaining 80-90 percent liquid portion is the whey. Whey is one of the largest by-products of world dairy industry.

Whey, extracted from milk, is a wholesome protein source known to be “high quality protein,” as it contains all nine of the essential amino acids. Protein fortification of bakery products is of current interest because of increasing awareness in consumer towards health and quality of bakery products. The amount of protein in the diets of people living in developed countries has become a topic of both controversy and interest in recent years. The interest has centered around a hypothesis, based largely on epidemiologic evidence, which suggests that lack of dietary protein may be a contributing factor in a number of non-infectious diseases malnutrition in children. Malnutrition is presently prevalent all-around the globe. In this perspective, the extremely thoughtful matter is dietetic issues about protein energy malnutrition (Iqbal *et al.*, 2006) [3]. Existence level of malnutrition is challenged and generally shifted from 30 to 60% in elderly people. In addition to providing protein, many other health benefits have been attributed to consumption of whey proteins enriched cereal products. Whey protein has been proven to have positive effect in a number of areas, including immune support, cancer therapy, hypertension/cholesterol control (cardio-vascular health), mental health (improve cognitive power and memory power), reduce risk of type 2 diabetes, weight management and infant nutrition. Thus, the present study was aimed to study the effect of whey incorporation on proximate composition of cookies.

2. Materials and Method

Buffalo milk was procured from CSAUA&T, (AHD Department) Kanpur, India and milk was coagulated using citric acid and whey was drained through muslin and filled

into bottle for further use. Soft wheat flour, sugar, shortening (Amul Butter) were procured from local market of Kanpur (India) and kept at room temperature for further use. All chemicals used were of analytical grade.

2.1 Preparation of cookies

Cookies were prepared using four levels of whey and water ratio along with wheat flour. The ingredients were mixed thoroughly. The dough was aged for 30 min and then sheeted manually by means of rolling pin. The cookies were cut with a cookie cutter. These were baked at 175°C for about 15-20 min in a baking oven. Then cooled at room temperature for 1 h and packed in air tight container for further analysis.

2.2 Proximate analysis of cookies

The proximate composition of samples like moisture content, ash content, crude protein, crude fat, was analyzed according to AOAC (2000).

2.3 Statistical analysis

Statistical analysis of the data obtained in the investigation was done using ANOVA technique according to the method described by Snedecor and Cochran (1968) [6] on a completely randomized block design (CRD). Each treatment was replicated 4 times, SEm (\pm) (standard error of mean) was calculated and all the inferences were drawn at 5 percent level of significance.

3. Results and Discussion

3.1 Effect of WPC on proximate composition of cookies

Table 1: Effect of whey incorporation on proximate composition of cookies

| Various proportions of whey-water (%) in cookies | Characteristics | | | | | |
|--|-----------------|-------------|---------|---------|-----------------|------------------|
| | Moisture (%) | Protein (%) | Fat (%) | Ash (%) | Total solid (%) | Carbohydrate (%) |
| 0:100 (T ₀) | 6.11 | 9.07 | 22.23 | 0.48 | 93.89 | 62.11 |
| 25:75 (T ₁) | 7.12 | 9.10 | 22.52 | 0.68 | 92.88 | 60.59 |
| 50:50 (T ₂) | 8.12 | 9.11 | 22.83 | 0.86 | 91.88 | 59.07 |
| 75:25 (T ₃) | 9.92 | 9.19 | 23.06 | 1.04 | 90.08 | 56.64 |
| 100:0 (T ₄) | 11.32 | 9.92 | 24.53 | 1.09 | 88.68 | 53.15 |
| SEm | 0.88 | 0.45 | 0.41 | 0.74 | 0.48 | 0.70 |
| CD at 5% | 0.57 | 0.54 | 1.23 | 0.52 | 1.46 | 0.51 |

As shown in Table 1, the moisture content of cookies increased from 6.11 to 11.32%. Highest moisture content (11.32%) was observed in T₄ (100% Whey incorporated cookies), while the lowest moisture content of 6.11% was found for T₀ (control sample). Significant difference ($p \leq 0.05$) in moisture content was found for all samples. Increase in moisture content with increasing whey incorporation level may be due to more bound water in the system. These results are in accordance with He formulated noodles by incorporation of whey gave a sticky dough with hard to dry noodles. Protein content in cookies also increased from 9.07 to 9.92% with an increase in the whey incorporation level. The highest value for protein content (9.92%) was observed in T₄ (100% whey incorporated cookies) while lowest value of 9.07% was reported in T₀ (control sample). Results revealed that the protein content in all samples differed significantly. The result were similar to the result of Visalakshi, and Mohansundari, P (2001) [8] who prepared ghee biscuits, cheese biscuits, pizza by incorporating whey at 10%, and 20% level and found that the protein content increased in the whey incorporated samples as

compared to control sample. They also reported that amount of protein content increase on increasing the amount of whey incorporated. Fat content of cookies increased slightly from 22.25 to 23.08%. The highest value of fat (24.53%) was observed in T₄ (100% whey incorporated cookies) while lowest value (22.23%) was observed in T₀ (control sample). Results showed that fat content of T₀, T₁ and T₂ (0, 25 & 50% whey incorporated cookies respectively) does not differ significantly, while as sample T₃ and T₄ (75 & 100% whey incorporated level cookies respectively) differed significantly. Mahmood, Butt, Anjum, and Nawaz (2008) [4] also reported same variations in fat content of soy fortified cookies. Ash content of cookies increased from 0.48 to 1.09%. The highest value of ash content (1.09%) was reported in T₄ (100% whey incorporated cookies) followed by T₃ (1.04%), T₂ (0.86%) and T₁ (0.68%), while lowest value for ash content (0.48%) was observed in T₀ (control samples). The result was matched with that of who prepared snacks like biscuits, cheese biscuits, pizza and whey incorporated at 10% and 20% level and reported that the mineral matter content was found to be low in the control sample and more in whey incorporated the

mineral matter increases in the same proportion. Carbohydrate content of all cookies decreased from 62.11 to 53.15%. It was observed that increase in moisture, protein, ash and fat content results decrease in total carbohydrate. Results also showed that with an increase in the whey incorporation level, there was increase in moisture, protein, ash and fat content, and total carbohydrate decreases. Similarly, Singh and Mohamed (2007) ^[5] also reported decrease in carbohydrate content in soy protein supplemented cookies.

4. Conclusion

Cookies samples of high nutrition were formulated from wheat flour and whey. The composition and nutritive value of cookies samples represent balanced quantity of carbohydrate, protein, fat, and ash. Moisture, fat, ash and protein content of the experimental cookies samples increased with the level of incorporation of whey while carbohydrate content of cookies sample decreased slightly. The study showed that whey incorporated cookies may be a suitable source of proteins as cookies 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. Whey is the most valuable ingredients and contributes to a great extent in the development of new food products as they are capable of fulfilling the diverse functional properties.

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