

Development of cookies from potato flour and their quality evaluation Pragya Johry*, Samsher, G.R. Singh, B.R. Singh, Vaishali¹ and Suresh Chandra

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Abstract

Experiments were conducted at the Department of Agricultural Engineering and Food Technology S.V.B.P. University of Agricultural & Technology, Meerut to utilize the potato flour for preparation of potato chocolate cookies. The potato tubers were procured from the experimental farm of Central Potato Research Institute (CPRI), Modipuram for the present studies and other materials viz. milk powder, sugar and PET jars were procured from the local market. The tubers were thoroughly sorted, washed, peeled, sliced, blanched, dried and milled into flour. In this experiment potato flour was blended with wheat flour in ratio of 30:70%, 40:60%, 50:50%. The proximate composition of the various flour blends used for the preparation of biscuits were determined using standard methods. The physico-chemical analysis and sensory evaluation was done to know the acceptability of Potato-chocolate cookies. On the basis of nutritional and sensory evaluation, cookies containing 30% potato flour scored high score for over-all acceptability.

Keywords: Potato, Flour, Potato-chocolate cookies, Physico-chemical, Sensory evaluation.

Paper cited: Johry, P., Samsher; Singh, G.R., Singh, B.R., Vaishali and Chandra, S. (2016). Development of cookies from potato flour and quality evaluation. *South Asian Journal of Food Technology and Environment*, 2(1): 309-312

Received: 12/02/2016 Revised: 30.02.2016 Accepted: 17/03/2016

Introduction

Potato is popularly known as 'The king of vegetables'. Indian vegetable basket is incomplete without Potato. Because, the dry matter, edible energy and edible protein content of potato makes it nutritionally superior vegetable as well as staple food not only in our country but also throughout the world. Now, it becomes as an essential part of breakfast, lunch and dinner worldwide. Being a short duration crop, it produces more quantity of dry matter, edible energy and edible protein in lesser duration of time than cereals like rice and wheat. Hence, potato may prove to be a useful tool to achieve the nutritional security of the nation. Today, the potato is so common and is the world's root and tuber crop grown in the greatest quantities. Potato is consumed by more than one billion people the world over. It is a high quality vegetable cum food crop and used in preparing more than 100 types of recipes in India. The popular Indian recipes like samosas and parathas are prepared from potato.

The proteins of potato has high biological value than proteins of cereals and even better than that of milk. The biological value of mixture of egg and potato is higher than the egg alone. Hence, potato can be supplement of meat and milk products for improving their taste, lowering energy intake and reducing food cost. Nutritional point of view, potato is a wholesome food and deserves to be promoted as a potential high quality vegetable cum food crop in the country.

Potato (*Solanum tuberosum*) is a starchy, tuberous crop of the solanaccea family. Potato is a semi perishable in nature, it contains about 80% water and 20% dry matter. A major portion of dry matter is starch and sugar that constitutes 16% on fresh wet basis, crude protein content is 2% (Singh *et al.*, 2007). India stands third in potato production in the world. Potato is world's most widely grown tuber crop and fourth largest food crop in terms of fresh produce after rice. Potato is one of the most important staple crops for human consumption, together with wheat, rice and corn. Presently the global potato sector is

undergoing major changes. A daily 150-300g of potato provides 4-8% of the calories required by the human. Potatoes are considerably richer source of nutrient than of

Nutritionally potatoes are best known for their carbohydrate content. The predominant form of the carbohydrate present in it is starch. The starch provides bulk, offers protection against colon cancer, improves glucose intolerance and insulin sensitivity, lowers plasma cholesterol and triglycerides concentration, and reduces fat storage (Tamaki et at., 2003). Potato is a highly nutritive food and the crop can be produced in 90 to 100 days, it wide adaptability in planting and harvesting makes it an ideal to grow between two major crops. India's potato production has been a phenomenal increase since the 1950s, mainly due to strong demand from the processing industry and remunerative returns. According to the Central Potato Research Institute (CPRI), the area under potato rose by almost 547% since the 50s, while yield rose by 267% and overall output jumped by 146%. Potato is most widely grown vegetable crop in the country with a share of 25.7%. The area under potato cultivation is 1.89 million hectares with total production of 3.99 million tons in 2010-11.

Materials and Methods

Experiments were conducted to develop potato flour and potato-chocolate cookies from potato that flour in the Department of Agricultural Engineering and Food Technology S.V.B.P. University of Agricultural & Technology, Meerut. Studies were also carried out to evaluate the physicochemical and sensory quality of potatochocolate cookies after preparation at room temperature. Details are described in the following sections.

Biscuit development

A process of development of biscuit was accepted and given by Chandra *et al.*, (2015). The biscuits were prepared from various combinations of potato flour and wheat flour in ratio of 30:70 (T1), 40:60 (T2) and 50:50 (T3) respectively. The standardized formulations for biscuit had ingredients as 100 g flour, 45 g sugar, and 45 g hydrogenated fat, 1.25 g sodium bicarbonate, 1.25 g baking energy. They are virtually free of fat, although they are quite easily turned into fatty foods. (FAO, 2008).

powder and chocolate powder. Hot liquid hydrogenated fat and sugar were taken and creamed to a uniform consistency. The flour. required amount of water, baking powder and sodium bicarbonate were added to creamed mixture and mixed for 10 min at medium speed in dough mixer to obtain a homogeneous mixture. The dough was rolled out into thin sheet of uniform thickness and was cut into desired shape using mould. The cut pieces were placed over perforated tray and transferred into convective baking oven at 170 °C for 15–20 min till baked. The well baked biscuits were removed from the oven, cooled to room temperature, packed in PET jar and stored at room temperature for further studies.

Physico-chemical parameters of biscuits

The moisture, fibre, fat and ash content of biscuits was analytically estimated by the methods as recommended by AOAC (2000).

Evaluation of Physical parameters of developed biscuits:

The thickness, volume diameter and density was calculated by following procedures

Thickness: Thickness is measured by screw gauge in mm.

Volume: Volume of biscuit is defined as the area of biscuit multiplied by thickness.

$$volume = \frac{\pi}{4}d^2t$$

where

d = average diameter of biscuit (cm)

t = average thickness of biscuits (cm)

Diameter: Diameter of biscuit is measured by vernier caliper in mm

Density: Density is obtained by ratio of weight of volume

Density
$$\left(\frac{gm}{cm^3}\right) = \frac{Mass of sample (gm)}{Volume of sample (cm^3)}$$

Sensory analysis of developed biscuits:

The samples were evaluated on the basis of color, taste, flavour, texture and overall acceptability by a panel of judges using 9-point hedonic scale. A semi trained panel consisting of both gender more than 10 judges of different age groups having different eating habits were constituted to evaluate the quality. The judges were selected from the faculty staff and students of Department of Agricultural Engineering & Food Technology, SVPUA&T, Meerut (U.P.). Samples were served to the panellists and they were asked to rate the acceptability of the product through sense of organs. Different attributes viz. color, texture, flavor, crispiness and taste were rated on the basis of 9- point hedonic scale ranging from 1 (extremely dislike) to 9 (extremely like). A test proforma was also prepared and supplied to them at the time of evaluation.

Results and Discussion

Physical properties of Cookies: Table 2 shows that there was a decrease in the volume and thickness of different treatments (T1, T2 and T3) after increasing the levels of potato flour. There was a slight increase in the density of different treatments (T1, T2 and T3) after increasing the levels of potato flour. The result showed that increase in level of potato flour resulted in linear decrease of thickness and volume of biscuit. This is due to the higher water holding capacity of potato flour.

Physico-chemical analysis of Cookies: The moisture content, ash, fibre and fat of cookies was between the range of 1.326% to 1.349%, 2.80% to 2.85%, 1.90% to 4.01% and 8.30% to 5.50%, respectively, which was within the acceptable limits for biscuits. Table 3 shows the physico-chemical quality of potato-chocolate cookies. The moisture content of biscuits increased linearly with increase in concentration of potato. This is attributed to high water binding capacity of potato which retained higher moisture content in ultimate

products. The ash content of biscuits decreased after increasing the levels of potato flour in the Potato-chocolate cookies. The fiber content of biscuit increased significantly, due to higher fiber content of potato flour. As fiber absorbs large amount of water, it gives a sensation of fullness (having an appetite completely satisfied). The fat content of Potato-chocolate cookies decreased significantly with the increment of potato flour level in the cookies.

Sensory evaluation of cookies: Data (Table 4) indicated that the percent score of cookies containing 30% potato flour were found to be the most acceptable. At 30% level of incorporation, all the attributes scored highest level. The colour scores of cookies with 30% potato flour reached maximum than to the rest of the proportions. Thus, incorporation of potato flour at 30% level improved the sensory attributes namely texture, flavor, color and over all acceptability. The score of colour reduced significantly to 7.9, this was due to increasing level of potato flour which gave a dark brown colour to cookies which was not liked much by the panellist. Similarly, the score of taste, flavour and texture also reduced significantly. Highest score of overall acceptability of cookies was observed for the ratio of T1 (30: 70) of potato and wheat flour.

Conclusion

It was found that Potato contains a limited amount of protein and fiber content although rich in carbohydrate, so a successful combination with wheat flour for cookies production would be nutritionally advantageous. Incorporation of 40% potato flour vielded approximately similar results compared with wheat flour cookies with improved nutritional value and texture. This work showed the peculiar characteristics (moisture, protein, ash, fiber and fat) of Potato-chocolate cookies. The results obtained could be very valuable in decision making for industries that want to take nutritional advantage of potato flour as alternative or supplement to cereal flours. Potato flour could be useful in the manufacture of highly nutritious cookies.

| Sample | Diameter (cm) | Thickness (cm) | Volume (cm ³) | Density (g/cm ³) |
|--------|---------------|----------------|---------------------------|------------------------------|
| T-1 | 4.30 | 0.84 | 13.1 | 0.84 |
| T-2 | 4.38 | 0.82 | 12.9 | 0.86 |
| T-3 | 4.36 | 0.82 | 12.8 | 0.86 |

Table 2: Physical parameters of developed biscuits

Table 3: Physico-chemical analysis of Potato-chocolate cookies

| Sample | Moisture content (%) | Ash (%) | Fiber (%) | Fat (%) |
|--------|----------------------|---------|-----------|---------|
| T-1 | 1.326 | 2.80 | 1.90 | 8.30 |
| T-2 | 1.340 | 2.79 | 2.69 | 6.02 |
| Т-3 | 1.349 | 2.85 | 4.01 | 5.50 |

Table 4: Sensory evaluation of potato-chocolate cookies

| Sample | Colour | Flavour | Taste | Texture | Overall acceptability |
|--------|--------|---------|-------|---------|-----------------------|
| T-1 | 8.2 | 8.4 | 7.8 | 8.5 | 8.8 |
| T-2 | 8.1 | 8.2 | 7.2 | 8.2 | 8.1 |
| T-3 | 7.9 | 8.0 | 6.9 | 8.1 | 8.0 |

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