*Pak. J. Biotechnol. Vol. 21(1), 228-231, **2024,*** http://doi.org/10.34016/pjbt.2024.21.01.878

Research Article

OPEN ACCESS

Available on http://www.pjbt.org
Pakistan Journal of Biotechnology
(PJBT)
(P-ISSN: 1812-1837 and E-ISSN: 2312-7791)

SENSORY EVALUATION OF THE POTATO STARCH PUDDING: AS AN AFFORDABLE WAY OF ESSENTIAL NUTRIENTS FOR HUMAN CONSUMPTION

Elaf Shaikh[1], Tahira Bano[2], Alayesha Farooq[1], Amer Nazir[2], Hajrah Ilyas[1], Abdul Sabeer[2], Ahmed Hassan[2], Namra Aftab[2], Syeda Alishba[1], Naimatullah Koondhar[3], Mumtaz Ali Sahito[4]

[1]Human Nutrition and Dietetics, Faculty of Eastern Medicine, Hamdard University
[2]Applied Sciences, Faculty of Engineering Sciences and Technology, Hamdard University.
[3]Department of Plant Pathology, Lasbela University of Agriculture, Water & Marine Sciences, Uthal, Baluchistan, Pakistan.
[4]Sindh Coastal Development Authority, Government of Sindh, Pakistan
Correspondence: lealafshaikh@gmail.com
Article Received 25-11-2023, Article Revised 27-01-2024, Article Accepted 10-02-2024.

ABSTRACT

The purpose of this study was to examine the nutritional value and energy content of potato pudding as an affordable way to get important nutrients such proteins, vitamins, and other energy components. Potatoes are a commonly available and reasonably priced staple item. Using them in pudding form presents an interesting way to feed people on a budget. This essay looks at the ingredients, health advantages, and possibilities as a high-energy food source of potato pudding. The objective of this work was to develop and characterize a new pudding recipe using potato flour as the main ingredient. The recipe was formulated by varying the ratios of potato flour and milk powder and by adjusting the sugar levels. The resulting puddings were evaluated for their texture, nutritional composition and sensory characteristics. The findings showed that the potato flour and milk powder- based pudding had a creamy texture with a smooth mouthfeel. The sensory assessment revealed a non- significant ($p < 0.05$) difference between potato pudding and control, suggesting that potato pudding formulations have a high potential to substitute potato starch.

Keywords: Starch, Vitamins, Nutrition, Potato flour, Sensory evaluation

INTRODUCTION:

The potato (*Solanum tuberosum*), an annual plant belonging to the nightshade family (Solanaceae), is cultivated for its starchy tubers that are edible(Senguttuvan *et al*., 2014). Originating from the Peruvian-Bolivian Andes, the potato has become a key global consumed food crop. Potatoes can be prepared in various ways, such as boiling, mashing, frying, and baking, making them a staple ingredient in numerous culinary dishes (A. Kaur *et al*., 2007). The majority of the crop (68%) is eaten for table, 7.5% is used for processing, 8.5% is used for seed, and 16% is disposed of as waste as a result of improper post-harvest handling (Marwaha *et al*., 2010). Potatoes are widely consumed globally and have a significant presence in various diets. Beyond their culinary uses, potato starch has gained recognition for its diverse industrial applications, ranging from food additives to emerging fields like nanotechnology and bioengineering. This versatile ingredient showcases its potential in multiple sectors, highlighting its importance and relevance in today's world (Jagadeesan *et al*., 2020). Similar to other plant-based foods, the nutritional makeup of potatoes is influenced by various factors both before and after harvesting. Pre-harvest elements such as environmental conditions, cultural practices, maturity at harvest, and biotic and abiotic stresses, along with post-harvest factors like processing, storage, and transport, collectively impact the nutritional composition of potatoes (M. Kaur *et al*., 2011). These include carbohydrates with starch being the primary form, as well as protein, vitamins (particularly vitamin C), minerals, dietary fiber, phenolics, and various other bioactive compounds (Xu *et al*., 2023). Additionally, potatoes contain inherent anti-nutrients like glycol alkaloids and nitrates, which when present in elevated levels, can pose health risks to humans (Elżbieta, 2012). This Plant based food, potato has earned global popularity as a widely consumed food crop due to their impressive yield per unit area, cost-effectiveness, and widespread daily consumption (Foley *et al*.,

2021). Research in both human and animal studies indicates that potatoes serve various health-related roles, functioning as antioxidants, antibacterial, anti-inflammatories, anti-obesity agents, anti-cancer elements, and anti-diabetic agents (Asar, 2024).

Anti-Inflammatory Properties: Potatoes contain compounds like flavonoids and carotenoids that possess anti-inflammatory properties. Applying slices of raw potato or potato juice to inflamed or irritated skin may help alleviate the discomfort (Kenny *et al*., 2013).

Digestive Health: Potatoes are a good source of dietary fiber, which aids in digestion and promotes a healthy digestive system. Consuming potatoes with their skin can increase fiber intake (Dupuis & Liu, 2019).

Skin Care: Potatoes can be used topically for various skin conditions. Applying raw potato slices or potato juice to the skin may help soothe sunburns, reduce dark circles or puffiness around the eyes, and treat minor skin irritations due to their anti-inflammatory and skin- lightening properties (Camire *et al*., 2009).

Nutritional Composition of Potato Pudding

Macronutrients: Analysis of the macronutrient content of potato pudding, includingcarbohydrates, proteins, and fats.

Micronutrients: Examination of the presence of vitamins (such as vitamin C, vitamin B6) and minerals (such as potassium and magnesium) in potato pudding.

Energy Density: Calculation of the energy density per serving of potato pudding.

While potatoes offer these potential benefits, it's important to note that they are most effectivewhen used as part of a balanced diet and complementary to other medicinal treatments. Always consult with a healthcare professional before using potatoes or any other food as a remedy for specific health issues (Zaheer & Akhtar, 2016).

Since the common purpose potato covers 90% of the production area of the country and the crop is venerable to losses, pudding formulation may be one of several ways of reducing postharvest losses (Zaheer & Akhtar, 2016). Therefore, the objectives of this study was to develop a novel formulation of potato flour in a potato pudding mix.

MATERIAL AND METHOD:

Two commercial potato cultivars were procured from Hamdard University Garden. Sugar, artificial color (Lemon yellow powder; International Flavors and Fragrances and flavors were purchased locally.

Potato pudding formation: A new pudding recipe using potato flour as the main ingredient. The recipe was formulated by varying the ratios of potato flour and milk powder and by adjusting the sugar levels along with addition of artificial color (0.1% w/w) and vanilla flavor (2ml/100g). The control sample prepared with cornstarch was used for quality and sensorial comparison.

Nutritional parameters:

Per 500gm or 5 servings	
Calories	255
Total fat	12.68g
Saturated fat	7.44g
Sodium	100mg
Total carbohydrate	30.55g
Dietary Fiber	0.92g
Sugars	19.71g
Protein	6.17g

Sensory Evaluation: A product or food's qualities are scrutinized through the panelists' senses (sight, smell, taste, touch, and hearing) in a sensory analysis. Various consumer and sensory surveys are also incorporated and are applied in the creation of highly diverse new items (Jaiswal *et al*., 2023).

Pudding mix (25g) was suspended in 25ml of milk in a plastic container to make a paste for sensory evaluation. After boiling, 225 ml of the left over milk were used. Then, to make hot gruel, pudding paste was gradually added to the boiling milk while the mixture was constantly stirred for 1-2 minutes. Twenty semi-trained panelists, including university personnel and students, were given warm pudding gruel samples. A nine-point hedonic scale was used to rate the samples based on appearance, colour, flavor, odor, taste, and overall acceptability. (1 = Dislike extremely, and 9 = Like extremely). The samples were served in color-coded plastic cups. Comparative Analysis.

RESULTS AND DISCUSSION

Sensory evaluation: The quality of the final product is affected by many factors, such as the conditions of preparation, the way it is packaged, as well as storage. The sensory characteristics of the formulated pudding mix are depicted in fig.1, reveals that the Potato pudding mix has high acceptability scores for appearance, flavor, color, odor and taste. The results indicated that Potato pudding from Potato

rice flour has made it feasible for use in various food systems or other industrial applications (Mulambu, 2017). The parameters of the raw materials used in production and their mutual proportions also play an important role. The water content of starch should not exceed 20%, which is related to the microbiological risk of the material and its rapid spoilage. The addition of juice to potato starch mixture caused a delay in the pasting. The addition of natural fibers to starches influences their properties. The thickening base in the present systems was potato starch (normal and waxy) and corn starch (normal and waxy). Waxy forms of starch are appreciated in the design of various types of desserts because they are characterized by the appropriate consistency and hardness of the resulting pudding (Chawla R, *et al* 2010, Kaur M, *et al* 2011). The texture starch contributes to the texture of potato pudding by absorbing moisture and forming a gel-like structure during cooking. The amount of starch used and the cooking method will determine the final texture. Too much starch can result in a gummy or overly thick pudding, while too little may make it runny or loose. Properly cooked starch gives the pudding a smooth, creamy texture that is both pleasing to the palate and visually appealing (Lewandowicz G, *et al*, 2003). Starch influences the release of flavors in potato pudding. As starch gelatinizes during cooking, it traps and suspends flavor compounds, enhancing their release upon consumption. This ensures that the flavors of the pudding are well-distributed and enjoyed with each bite (Alakali, J.S, *et al*, 2008). Starch affects the appearance of potato pudding by providing structure and stability. It helps hold the pudding together and prevents it from separating or becoming watery. Additionally, starch contributes to the pudding's smooth and glossy surface, enhancing its visual appeal (Li S *et al*, 2022)

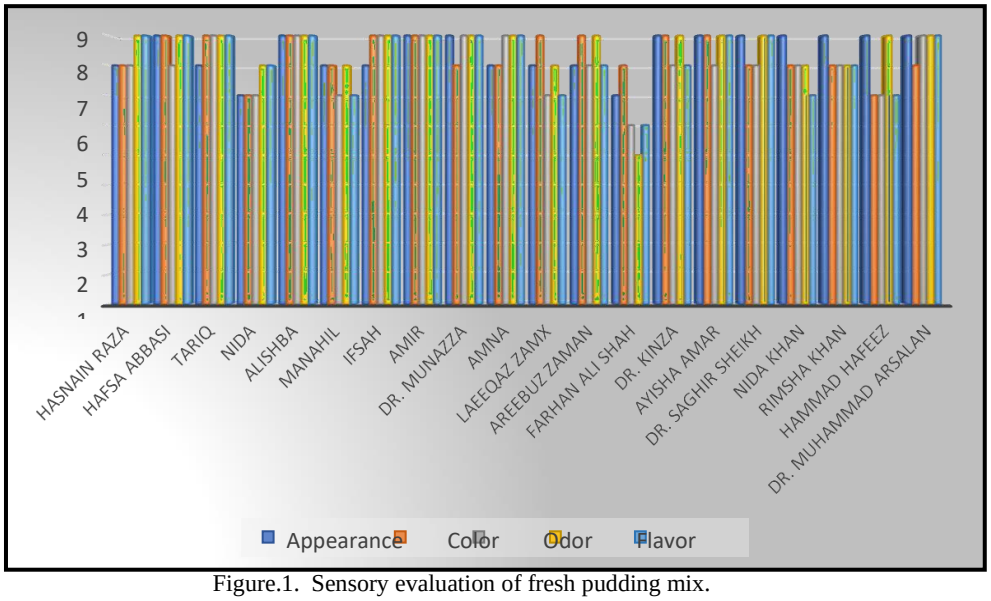

Figure.1. Sensory evaluation of fresh pudding mix.

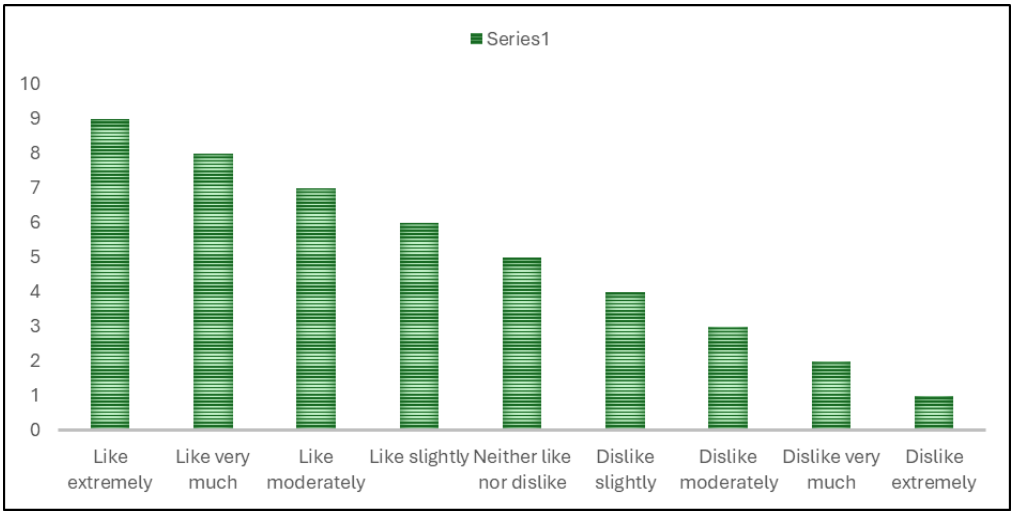

Figure 2. Sensory evaluation graph of Potato pudding mix. Each bar denotes the frequency of the overall key scores.

Like extremely	**Like very much**	**Like moderately**	**Like slightly**	**Neither likenor dislike**	**Dislike slightly**	**Dislike moderately**	**Dislike very much**	**Dislike extremely**
9	8	7	6	5	4	3	2	1

CONCLUSION

The study's findings proved that the improved recipe for potato flour pudding had a smooth, creamy mouthfeel. The sensory evaluation of the potato pudding and control showed a non- significant ($p < 0.05$) difference, indicating that potato pudding formulations have a high potential to replace potato starch. This means that obtaining essential nutrients like proteins, vitamins, and other energy components at a reasonable price can be accomplished with potato pudding

REFERENCES

Asar, A. M.-R. I. I. (2024). Microbial Functional Foods as a Magic Secret to Healthy Life Style. *Egyptian Journal of Chemistry*, **67**(2), 161–173.

Camire, M. E., Kubow, S., & Donnelly, D. J. (2009). Potatoes and human health. *Critical Reviews in Food Science and Nutrition*, **49**(10), 823–840.

Dupuis, J. H., & Liu, Q. (2019). Potato starch: a review of physicochemical, functional and nutritional properties. *American Journal of Potato Research*, **96**(2), 127–138.

Elżbieta, R. (2012). The effect of industrial potato processing on the concentrations of glycoalkaloids and nitrates in potato granules. *Food Control*, **28**(2), 380–384.

Foley, J. K., Michaux, K. D., Mudyahoto, B., Kyazike, L., Cherian, B., Kalejaiye, O., Ifeoma, O., Ilona, P., Reinberg, C., & Mavindidze, D. (2021). Scaling up delivery of biofortified staple food crops globally: paths to nourishing millions. *Food and Nutrition Bulletin*, **42**(1), 116–132.

Jaiswal, A. K., Singh, B., Mehta, A., & Lal, M. (2023). Post-harvest losses in potatoes from farm to fork. *Potato Research*, **66**(1), 51–66.

Kaur, A., Singh, N., Ezekiel, R., & Guraya, H. S. (2007). Physicochemical, thermal and pasting properties of starches separated from different potato cultivars grown at different locations. *Food Chemistry*, **101**(2), 643–651.

Kaur, M., Oberoi, D. P. S., Sogi, D. S., & Gill, B. S. (2011). Physicochemical, morphological and pasting properties of acid treated starches from different botanical sources. *Journal of Food Science and Technology*, **48**, 460–465.

Kenny, O. M., McCarthy, C. M., Brunton, N. P., Hossain, M. B., Rai, D. K., Collins, S. G., Jones, P. W., Maguire, A. R., & O'Brien, N. M. (2013). Anti-inflammatory properties of potato glycoalkaloids in stimulated Jurkat and Raw 264.7 mouse macrophages. *Life Sciences*, **92**(13), 775–782.

Marwaha, R. S., Pandey, S. K., Kumar, D., Singh, S. V, & Kumar, P. (2010). Potato processing scenario in India: industrial constraints, future projections, challenges ahead and remedies—a review. *Journal of Food Science and Technology*, **47**, 137–156.

Jagadeesan, S., Govindaraju, I., & Mazumder, N. (2020). An insight into the ultrastructural and physiochemical characterization of potato starch: a review. *American Journal of Potato Research*, **97(**5), 464-476.

Senguttuvan, J., Paulsamy, S., & Karthika, K. (2014). Phytochemical analysis and evaluation of leaf and root parts of the medicinal herb, Hypochaeris radicata L. for in vitro antioxidant activities. *Asian Pacific Journal of Tropical Biomedicine*, **4**, S359–S367.

Xu, J., Li, Y., Kaur, L., Singh, J., & Zeng, F. (2023). Functional food based on Potato. *Foods*, **12**(11), 2145.

Zaheer, K., & Akhtar, M. H. (2016). Potato production, usage, and nutrition—a review. *Critical Reviews in Food Science and Nutrition*, **56**(5), 711–721.

Mulambu, J. (2017). Iron beans in Rwanda: Crop development and delivery experience. African Journal of Food, Agriculture, Nutrition and Development, **17**(02), 12026–12050.

Chawla, R. P. G. R., & Patil, G. R. (2010). Soluble dietary fiber. Comprehensive reviews in food science and food safety, **9(**2), 178-196.

Kaur, M., Oberoi, D. P. S., Sogi, D. S., & Gill, B. S. (2011). Physicochemical, morphological and pasting properties of acid treated starches from different botanical sources. Journal of food science and technology, **48**, 460-465.

Alakali, J. S., Okonkwo, T. M., & Iordye, E. M. (2008). Effect of stabilizers on the physico-chemical and sensory attributes of thermized yoghurt. African Journal of Biotechnology, **7**(2).158–163.

Li, S., Liu, H., Zheng, Q., Hu, N., Zheng, M., & Liu, J. (2022). Effects of soluble and insoluble dietary fiber from corn bran on pasting, thermal, and structural properties of corn starch. Starch-Stärke, **74**(5-6), 2100254