International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
Volume 3, Issue 6 - 2016

Research Article

SOI: http://s-o-i.org/1.15/ijarbs-2016-3-6-30

Development of fiber enriched bakery products by incorporating fruit pulp waste powder and their acceptability evaluation

Richa Singh

Assistant Professor, Department of Dietetics & Applied Nutrition, Amity University Haryana
Corresponding author: *richasingh.karma@gmail.com*

Abstract

Wheat is consumed mostly as baked products throughout the world. India is a developing country with a large segment of population depending on wheat as staple food and 25%of wheat is used in the preparation of baked foods, the demand for which is increasing continuously (10.07% per annum). Baked products are rich in starch, fat and energy but depleted of fiber. They can be used for fortification and adding value. Fruit pulp waste/residue can serve as a valuable source for enrichment of fiber in bakery products. This study was conducted to explore the possibility of utilization of waste residues of fruits (pineapple) and using it for value addition to bakery products. Fruit pulp waste powder was prepared by drying the fruit pulp in an oven and then grinding it through a household grinder. The prepared powder was tested for proximate analysis and also for iron and vitamin C content. Out of various proportions of whole wheat flour and refined flour cakes, 50- 50 proportion was chosen for incorporation. The prepared Fruit pulp waste (FPW) powder was incorporated at 5%, 10%, 15% and 20% into the standardized cakes. Multiple comparison Test was applied to test the bitterness which is the characteristic of fruit pulp wastes. Not much difference in the taste of the cakes was observed at 5% level of incorporation while the bitterness increased at higher levels of incorporation.

Keywords: fruit pulp waste, Cakes, Pineapple *(Ananas cosmosus)*

Introduction

The market of bakery products and cereals is worth $1 billion in India and is growing day by day (Bhise et al., 2013). There is an upcoming demand for bakery products which is increasing at the rate of 10% per annum. Cereal grains have been used for centuries for food because of the ease of growing them and their storage stability. Wheat is consumed mostly as baked products throughout the world (Manay et al., 2004). Bakery products are mainly made up of wheat, which is a staple grain of the country and around 25% of wheat is used for the preparation of bakery products (Kamaljeet et al., 2010). The increased demand for consumption of processed foods may be attributed to a number of factors like increased urbanization, rising income, changing lifestyle and increase in the number of working women (Goyal and Singh, 2007). Bakery products are liked by people of all age groups and include a wide variety of products like cakes, breads, biscuits etc. Since demand and acceptability for bakery products is more, they can be used as a vehicle for fortification and enhancing the nutritional quality. Bakery products like cakes are rich in starch, fat and energy but depleted of fiber. It has been evident with various epidemiological studies that high intake of dietary fiber has been found to be associated with reduced blood pressure, LDL cholesterol and associated cardiovascular diseases (Lupton and Turner, 2003). Fruits and vegetables are a good source of fiber. India ranks second in the world in the production of vegetables and third in production of

fruits (Boer et al., 1997). Fruits are commonly consumed in India and most often consumed as fruit juice. The wastes of fruits and vegetables are inexpensive, abundantly available and are a good source of dietary fiber (Serena & Knudsen, 2007). A lot of research has been done on waste utilization of various fruits and vegetables like artichokes, apples, carrots, oranges, cherries, peaches, onions etc. (Grigemo- Miguel and Martin Belloso, 1999; Ng et al., 1999; Nawirska and Kwasnievska, 2005). Pineapple (Ananas cosmosus) is an important tropical fruit and is the edible member of the family *Bromeliaceae*. Pineapple juice is the most preferred after juice of apple and orange, worldwide (Cabrera *et al*., 2000). It can be eaten fresh or in processed form. Pineapple processing industry leads to generation of by-products or wastes amounting to 25-35% of the whole fruit. The waste mainly comprises of peel, core and crown (Siti Roha et al., 2013) Pineapple peel is rich in cellulose, hemicelluloses and other carbohydrates (Rani and Nand, 2004). Dietary fibers from fruits have a high proportion of soluble dietary fiber and bioactive associated compounds (Spiller, 1986). There is increasing interest to find new sources of dietary fiber such as (Mango, passion fruit, algae) with specific bioactive compounds that may add new healthy properties to the traditionally commercialized products (Larrauri et al., 1996). The dried fruit pulp waste powder of pineapple is highly nutritious and a good source of dietary fiber – 8.5g/100g, Vitamin C- 8.8mg/100g.

Materials and Methods

Source and Preparation of FPW Powder: Pineapple *(Ananas cosmosus)* fresh fruit was collected from local market of Gurgaon city, India. The fruit weighing 1200 grams was washed and juice was extracted using a household juicer. The waste left after juice extraction was weighed and dried in an oven at 100°C for 10-12 hours. The dried waste was powdered and passed through a household sieve to get a fine powder. The powder thus obtained was weighed and packed in an airtight container for further use. The percentage recovery for extraction was 10% in terms of residue.

Table No.1 Extraction of Fruit Pulp Waste (FPW) of Pineapple

Fruit Taken	Edible Portion	Juice Obtained	Residue	Powdered Waste
1200 gm	750 gm	375 ml	120 gm	20 gm

Composition Analysis: The dried fruit pulp waste powder of pineapple was analyzed for proximate composition of moisture, protein, ash, fat, crude fiber, iron and Vitamin C by methods described by AOAC (1995).

Recipe Formulation: The initial stage of recipe formulation was selection and standardization of bakery products (cakes). Various ratios of whole wheat flour and refined flour were used to standardize the cakes. Four variations were prepared –S (Standard 100% refined flour), A (50% whole wheat flour and 50% refined flour), B (100% whole wheat flour) and C (80% whole wheat flour and 20% refined flour).

Sensory Evaluation of Standardized Cakes: Sensory evaluation was conducted to find out the most acceptable cake amongst the standardized cakes. The most acceptable cake will serve as the standard cake to be used for incorporation.

Nutrient Analysis of Standardized Cakes: The nutrient analysis of the Variation A was done for moisture, ash, protein, fat, fiber, Iron and Vitamin C using standard procedures prescribed by AOAC (1995). After proximate analysis, the cake was found to be rich in fiber- 12.74g/100g. The higher fiber content was mainly because of the replacement of refined flour with 50% whole wheat flour. The Nutrient composition of Variation A is given in Table No. 2

Table No.2 Nutrient Composition of the Variation A (50% Refined Flour and 50% Whole wheat flour)

	Moisture	Ash	Protein	Fat	Crude Fiber	Iron	Vitamin C
FPW Powder	23.5%	1.95 gm	9.84 gm	3.12 gm	12.74 gm	1.8 mg	1.7 mg

Product Development: The standardized and selected cake i.e. Variation A (50% whole wheat flour and 50% refined flour) was used for incorporation. The prepared FPW powder of pineapple was incorporated at different levels viz. 5%, 10%, 15% and 20%.

Sensory Evaluation of FPW incorporated cakes: Since the FPW Powder has a characteristic taste of its own, therefore this might be the possibility that it may not be liked by all. Therefore, the sensory evaluation of FPW incorporated cakes was carried out using Multiple Comparison Test to find out significant difference among the acceptability attributes of different variations of FPW incorporated cakes. In this test, the judges are required to give a score from 1 to 9 in comparison to the standard product. Score 1 being extremely unacceptable, than standard and Score 9 being extremely acceptable, than standard. This test was applied to all the aspects of sensory evaluation-color, texture, flavor, taste and overall acceptability. After that data was compiled and analyzed statistically.

Statistical Analysis: Statistical Analysis was done using computer software. The analysis was done by application of ANOVA at 5% significance level.

Results and Discussion

Nutritional Composition of FPW Powder: Pineapple fruit waste after juice extraction was obtained and its moisture, ash, protein, fat, crude fiber, iron and vitamin C content was determined (AOAC, 1995). The proximate composition of FPW powder is given in Table No.3.

Table No. 3 Nutritive Value of FPW Powder of Pineapple (as per 100 grams)

	Moisture	Ash	Protein	Fat	Crude Fiber	Iron	Vitamin C
FPW Powder	5.96 %	1.4 gm	2.6 gm	0.26 gm	8.5 gm	1.2 mg	8.8 mg

Moisture: The moisture content of the FPW powder was 5.96%. A study reported moisture content of pineapple waste powder to be 8.1%. (Ackom et al., 2012)

Protein: The total protein content for FPW powder was calculated to be 2.6 g/100g while it was slightly higher i.e. 3.7 g/100g as analyzed by Ackom et al., 2012.

Ash: The mineral ash content of FPW powder as analyzed was 1.4 g/100g. While a study conducted by Ackom et al., 2012 reported mineral ash content slightly higher and around 3.16 g/100g.

Fat: Fruits do not contain much fat and hence the content of fat was very less. As per the nutritive analysis the fat content of FPW powder was 0.26% and similar content was reported by other studies.

Crude Fiber: It is the residue that remains after a food sample has been subjected to treatment by acid or alkali under standard conditions. As per analysis, the crude fiber content of the fruit pulp waste was 8.5%.

Vitamin C: Pineapple fruit is very good source of Vitamin C and this is evident from the chemical analysis as well. The Vitamin C content of the pulp waste of pineapple was 8.8mg/100g. A similar study conducted by Malaysian agricultural research and development institute indicated vitamin C content around 9.6mg/100g.

Selection and Standardization of Cakes: The sensory evaluation was carried out by semi trained panel of nine judges by using 9 point hedonic scale assigning scores 9 (like extremely) to (dislike extremely) which was marked as 1(Amerine et al., 1965). It was concluded after sensory evaluation that Variation A which was made from 50% whole wheat flour and 50% refined flour were the most acceptable amongst all the four variations. Therefore, Variation A was selected as the standard cake for incorporation. The FPW powder was incorporated at different levels in the standard cake viz., 5%, 10%, 15% and 20%.

Sensory Evaluation of FPW Incorporated Cakes: As per the sensory evaluation done on FPW incorporated cakes, the cake with 5% incorporation of FPW powder was considered to be the most acceptable out of all the other variations.

Nutrient Composition of the most acceptable product: The nutrient composition of the most acceptable product was calculated on the basis of standard procedure (AOAC, 1995). As per the result, there were slight variations in the nutrient composition of standard and the incorporated cake. The content of crude fiber showed substantial increase from 12.74g/100g to 13.16g/100g.

The increase was recorded to be 3.2%. Considerable amount of Vitamin C was also increased with incorporation. In standard the content of vitamin C was 1.7mg/100g which increased to 2.12mg/100g. No significant difference was seen in the content of moisture, ash and protein.

Table No. 4 Mean Score of FPW Incorporated cakes

Attributes	Level of incorporation			
	5%	10%	15%	20%
Color	8.7± 0.42	8.6± 0.49	8.5± 0.75	8.0± 0.82
Texture	8.8± 0.36	8.3± 0.63	8.3± 0.74	8.2± 0.88
Flavour	8.7± 0.42	8.7± 0.46	8.5± 0.51	8.1± 0.94
Taste	8.7± 0.42	8.6± 0.49	8.4± 0.75	8.0± 1.10
Appearance	8.8± 0.36	8.7± 0.46	8.6± 0.63	8.2± 1.06
Overall acceptability	8.9± 0.25	8.6± 0.46	8.3± 0.81	8.0± 1.06

Conclusion

Fruit Pulp waste are residues remaining after extraction of the juice. Pineapple juice from pineapple fruit leaves a considerable amount of residue which goes waste. It can serve as a potential source of dietary fiber and minerals. The present study was carried out with the aim to develop cakes rich in fiber by incorporating FPW powder of pineapple at various levels and study the acceptability of the same. Biochemical estimation showed 100grams of FPW powder contains 5.96% moisture, 8.5 grams of crude fiber, and 8.8 mg of vitamin C and 2.6 grams of total proteins. Cakes were standardized using various levels of whole wheat flour and refined flour. Sensory evaluation using 9-point hedonic scale was done to select the standard cake. The chosen standard i.e. 50% whole wheat flour and 50% refined flour was incorporated with FPW powder at 5%, 10%, 15% and 20% levels. Again sensory evaluation was done using Multiple Comparison Test. Though there was significant increase in bitterness, the test of acceptability showed that all the products were highly acceptable and cakes with 5% incorporation were preferred above all. Therefore FPW powder of pineapple can be incorporated and used as a source of fiber in cakes without much alteration in their basic taste.

References

1. Ackom N B and K- Tano Debrah, 2012. Processing pineapple into dietary fibre supplement, African Journal of Food, Agriculture, Nutrition and Development, 12: 6.
2. Amerine M A, Pangborn R H, Rossler E B, 1965. Principles of Sensory Evaluation of food, Academic Press, New York, 23-45.
3. AOAC, 1995. Official Methods of Analysis. 16th Edn., Association of Officical Analytical Chemists, Washington, DC., USA.
4. Bhise S. and Kaur A. 2013. Polyols to improve quality and shelf life of bakery products: A review. Int. J. Adv. Sci. and Technical Res., 3(1): 262-272.
5. Boer K, Pandey A., 1997. “India’s Sleeping Giant: Food”, The McKinsey Quarterly, New York, 83:1.
6. Cabrera H.A.P., Menezes H.C., Oliveira J.V. and Batista R.F.S., 2000. Evaluation of residual levels of benomyl, methyl parathion, diuron, and vamidothion in pineapple pulp and bagasse (Smooth cayenne).J. Agric. Food Chem. 48: 5750-5753.
7. Goyal, A. and Singh, N. P. 2007. Consumer perception about fast food in India: An exploratory study. British Food Journal, 109(2): 182-195.
8. Grigelmo-Miguel N, Martín-Belloso O, 1999. Comparison of dietary fibre from by products of processing fruits and greens and from cereals. LWT- Food Sci. Technol. 503-508.
9. Kamaljit K., S. Baljeet and K. Amarjeet, 2010. Preparation of bakery products by incorporating pea flour as a functional ingredient. Am. J. Food Technol., 5:130-135.
10. Larrauri, Ruperez P and Fulgencio SC, 1997. Pineapple shell as a source of dietary fiber with associated polyphenol. Journal of Agricultural Food chemistry; 45(10): 4028-4031

11. Lupton JR, Turner ND, 2003. Dietary fiber and coronary disease: does the evidence support the association, Curr Atheroscl Rep. 5:500–5.
12. Manay S and Shadaksharaswamy M, 2004. Food Facts and Principles. New Age International (P) Ltd. New Delhi.
13. Nawirska A, Kwasniewski M, 2005. Dietary fibre fractions from fruit and vegetable processing waste, Food Chem. 91(2):221-225.
14. Ng A, Lecain S, Parker ML, Smith AC, Waldron KW, 1999. Modification of cell wall polymers of onion waste. III. Effect of extrusion-cooking on cell wall material of outer fleshy tissue. Carbohydrate Polymers, 39:341-349.
15. Rani, D.S. and Nand K. 2004. Ensilage of pineapple processing waste for methane generation. Waste Management 24: 523-258.
16. Serena A. and Knudsen B, 2007. Chemical and physicochemical characterization of co-products from vegetable food and agro industries. Anim. Feed Sci. Technol. 139:109-124.
17. Siti Roha A.M., Zainal, S., Noriham, A. and Nadzirah, K.Z, (2013). Determination of sugar content in Pineapple waste variety N36, Int. Food Res. J. 20(4): 1941-1943.
18. Spiller GA, 1986. Handbook of Dietary fibre in Human Nutrition. CRC, Press Inc, Boca Raton, 285-286.

Access this Article in Online	
Quick Response Code	Website: www.ijarbs.com
	Subject: Food and Nutrition

How to cite this article:
Richa Singh. (2016). Development of fiber enriched bakery products by incorporating fruit pulp waste powder and their acceptability evaluation. Int. J. Adv. Res. Biol. Sci. 3(6): 222-226.