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Studies on Physico-Chemical properties and Sensory Attributes during Storage of Pomace Powder Incorporated Nutria-Enriched Bread

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ABSTRACT: The present study aims to check the proximate composition and sensory scores during storage of pineapple pomace incorporated bread in the ratio of (5%, 10%, 15% and 20%). Proximate content of bread control and pineapple pomace incorporated bread multigrain *viz.* carbohydrate, protein, fat, energy, fiber, ash analyzed. Minerals content, calcium and iron were analyzed. Decrease were found in sensory score significantly ($p<0.05$) during storage. The prepared bread was packed in heat-sealed and vacuum packaging method their effect on the quality of products were analyzed during storage and changes were noted at the 5th day interval throughout the entire storage period in control and treated samples up to 15 days. Among the treatments, the bread prepared with (10%) pineapple pomace powder had the highest sensory score, having an overall acceptability score of 8.67±0.55 on 9 points hedonic scale. The shelf life evaluation showed that the bread could be stored for 15 days without any preservative, at the ambient condition of average temperature at 30±1°C and RH 75-80 with acceptable quality. The developed product is rich in protein, fiber which is act as functional food minerals such as calcium and iron, as compare to refined flour bread.

Keywords: Pineapple Pomace, Bread, Proximate, Sensory Score, Shelf life.

INTRODUCTION

Pineapple is an important fruit, cultivated in an area of 89 thousand hectares and total production is 1,415.00 thousand tons in India. Pineapple (*Ananas comosus*) processing generates major by products in the peel that represents the largest portion including core, stem and crown. These by products account for 50 percent of total pineapple weight and are a potential source of important compounds such as sucrose, glucose, fructose, cellulose, fibre, bromelain and phenolics. Bromelain compounds extracted from pineapple in the form of nano-crystals (Dorta and Sogi 2017). The utilization of wastes from fruit processing plants mentioned (Shah *et al.,* 1994). White bread is the most commonly consumed bread worldwide. Therefore, to meet the fiber needs, fortifying bread with high fiber content is the best way to increase daily fiber intake. (Wang *et al.,* 2002). Pineapple pomace powder is one of the best sources of dietary fiber. However, the addition of these fibers has a neglected effect on the quality of the final bread. Excessive fiber can result in poor quality bread in terms of texture, bread quantity, and appearance (Gomez *et al.,* 2003; Wang *et al.,* 2002). High levels of fiber-diluted gluten reduce gas retention and thus reduce the amount of bread. In this experiment, various amounts of pineapple squeezed powder were incorporated to study the physicochemical quality of bread containing nutrients as a functional ingredient. As the blend of pineapple pomace powder increases, the texture and fiber content. The high fiber content of the incorporated high fiber powder increases the texture of the raw fiber content (Gopalan *et al.,* 2004). In comparison to substituted powder, refined wheat flour is a poor source of fiber (Peter and John 2012). The pineapple pomace powder enriched bread had higher hardness and gumminess that resulted from the competition of water absorption between pineapple pomace powder from the rigid nature of the fiber. Pineapple pomace contains roughage and lowers cohesiveness, springiness, and specific volume of the bread PCF-enriched steamed bread (Yin and Shiau 2015).

MATERIAL AND METHOD

Standardization of bread. For the development of value-added bread, all materials such as flour, salt,

yeast, water and other ingredients were taken according to ratio required for bread making. Bread (control and PPP incorporated) were developed by incorporating pineapple pomace in four concentrations *i.e.* 5%, 10%, 15% and 20%.

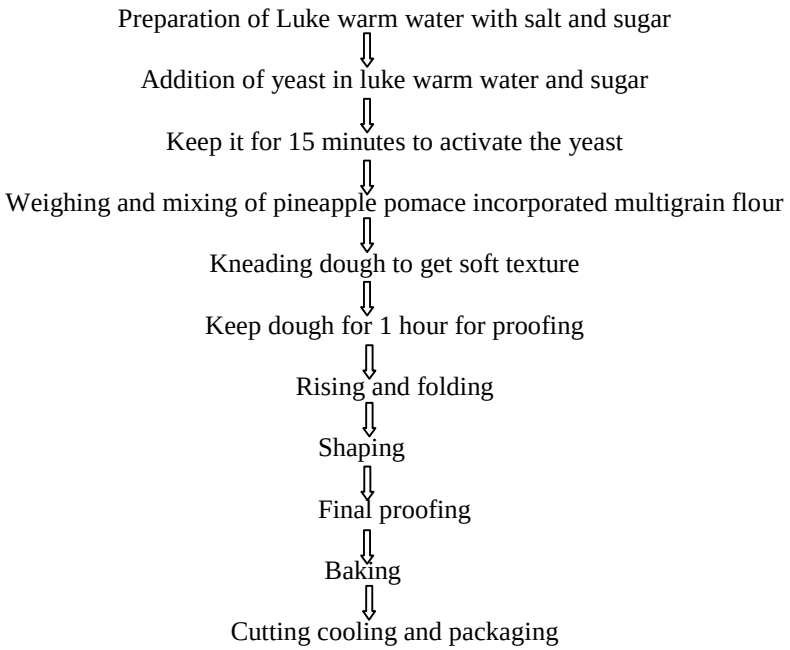

Fig. 1. Flow diagram of bread preparation.

Moisture: Moisture content was estimated using the method of NIN (2003).

Protein: Protein content was estimated by determining the nitrogen present in the sample using microkjeldhal method NIN, (2003).

Fat: The fat content of all the samples were estimated by using the method of NIN (2003).

Fibre: The fibre content was estimated by acid alkali digestion method.

Ash: Ash content of the samples was determined by the method suggested by NIN (2003).

Carbohydrate: The Carbohydrate content of sample was calculated by difference method.

Carbohydrate content (g/100g) = 100 – (moisture + protein + crude fibre + fat + ash)

Energy: The energy value of sample was calculated by using physiological fuel value per gram of protein, fat and carbohydrate.

Energy content (kcal/100g) = (% protein × 4) + (% carbohydrate × 4) + (% fat ×9)

Determination of calcium: It was estimated by titrimetric method.

Iron: Iron was analyzed using atomic absorption spectrophotometer.

Sensory evaluation: Effect of storage on sensory qualities of bread packed samples were tested at regular interval *i.e.*, 0^{th}, 5^{th}, 10^{th}, and 15^{th} day for their sensory characteristics by the panel of ten judges using nine point hedonic scales. Scores for products were taken by stored bread test the sensory qualities.

Statistical analysis. Data were analyzed using three-way ANOVA and the SPSS software version 20.0. The t-test was used to compare differences in proximate composition between plain cake and multigrain cake.

RESULT AND DISCUSSION

Mean score for sensory evaluation of bread prepared from pineapple pomace powder during storage. Table 1 shows that the overall acceptability of bread prepared by incorporating PPP packed by heat sealing method ranged between 8.87 to 7.27 indicating that bread were liked very much to liked moderately by the panelists during entire storage period. Initially it was observed that both control and PPP incorporated bread differed slightly for the sensory attributes. Sensory scores of bread prepared by using powder packed in heat sealing method decreased at higher rate during storage than the bread prepared by using powder packed in vacuum packaging. Though control sample (heat sealed and vacuum) were observed to score slightly higher than PPP incorporated sample during storage period. Significant decrease was found in samples (control and PPP incorporated bread) packed by vacuum and heat sealed method. On 5^{th} days to 15^{th} days *i.e.*, heat sealed control sample exhibited the scores of 8.37 to 7.12 for appearance, 8.02 to 7.13 for colour, 8.63 to 7.43 for flavour, 7.63 to 7.50 for texture, 7.87 to 7.13 for taste and 7.32 to 7.12 for overall acceptability. Whereas vacuum packed control sample scored 8.13 to 7.27 for appearance, 8.67to 7.15 for colour, 8.67 to 7.33 for flavour, 7.63 to 7.50 for texture, 8.67 to 7.50 for taste and 7.65 to 7.14 for overall acceptability. The combined effects of individual sensory attributes of bread made by using multigrain

flour (control and PPP incorporated) were reflected in the overall acceptability and found that the scores of bread decreased on storage but bread were not in acceptable limit.

For appearance, colour flavour, texture, taste and overall one factor (days) was found to show significant difference, whole packaging of treatment was having no significant effect on the basis of vacuum an heat sealed method.

Table 1: Mean score for sensory evaluation of bread prepared from pineapple pomace powder during storage.

Attributes	Packaging	Treatments	Storage period			
			0 days	5th day	10th day	15th day
Appearance	P1	0	8.53	8.37	7.27	7.12
		1	8.70	8.60	7.50	7.43
	P2	0	8.13	8.13	7.67	7.27
		1	8.73	8.40	7.67	7.17
			Result	S. Ed. (±)	C.D. at 5%	
Due to packaging			NS	0.15	0.31	
Due to days			S	0.31	0.62	
Due to treatments			NS	0.20	0.40	
Colour	P1	0	8.07	8.02	7.63	7.13
		1	8.40	8.23	7.73	7.23
	P2	0	8.73	8.07	7.02	7.15
		1	8.50	8.03	7.77	7.70
			Result	S. Ed. (±)	C.D. at 5%	
Due to packaging			NS	0.13	0.27	
Due to days			S	0.27	0.54	
Due to treatments			NS	0.17	0.35	
Flavour	P1	0	8.67	8.63	7.57	7.43
		1	8.87	8.27	7.17	7.12
	P2	0	8.67	8.67	7.43	7.33
		1	8.87	8.40	7.73	7.13
			Result	S. Ed. (±)	C.D. at 5%	
Due to packaging			NS	0.19	0.38	
Due to days			S	0.37	0.75	
Due to treatments			NS	0.24	0.49	
Texture	P1	0	8.47	7.63	7.13	7.50
		1	8.83	8.33	7.43	7.70
	P2	0	8.47	8.57	7.60	7.50
		1	8.83	8.47	7.61	7.77
			Result	S. Ed. (±)	C.D. at 5%	
Due to packaging			NS	0.18	0.37	
Due to days			S	0.36	0.74	
Due to treatments			NS	0.24	0.48	
Taste	P1	0	8.57	7.07	7.53	7.13
		1	8.83	7.70	7.63	7.55
	P2	0	8.57	8.07	7.53	7.50
		1	8.83	7.73	7.70	7.37
			Result	S. Ed. (±)	C.D. at 5%	
Due to packaging			NS	0.12	0.24	
Due to days			S	0.24	0.48	
Due to treatments			NS	0.15	0.31	
Overall	P1	0	8.47	7.32	7.15	7.12
		1	8.87	7.73	7.43	7.27
	P2	0	8.47	7.65	7.57	7.14
		1	8.87	7.63	7.57	7.37
			Result	S. Ed. (±)	C.D. at 5%	
Due to packaging			NS	0.10	0.21	
Due to days			S	0.21	0.42	
Due to treatments			NS	0.13	0.27	

*-Significant at 5 percent significance level, P1-heat sealed, P2- vacuum packed, 0- control, 1- treatment

Scores for overall acceptability in heat seal and vacuum packed PPP incorporated sample reduced from 8.87 to 7.12 and 8.47 to 7.14 respectively. Significant differences ($p \leq 0.05$) were noted between both packaging due to days on 30th day to through the entire storage period in control and treatment sample.

Proximate composition of PPP incorporated multigrain bread. The nutrient composition of control bread was found to be contain 11.08 percent moisture, 9.86 percent protein, 7.54 percent Fat, 68.59 percent carbohydrate content in bread, 2.19 percent fiber 1.37 percent ash, and 335.54 kcal energy. Mineral content calcium content was found to be 11.28 percent and Iron content was found to be 2.18 percent. Whereas PPP incorporated bread was 23.68 percent moisture (Table 2). 11.09 percent protein. 17.03 percent fat, 32.8 percent carbohydrates, and 7.22 percent fibers content were found to be 2.2 percent ash, 339.4 kcal energy. Mineral content calcium content was found to be 31.36 percent and Iron content was found to be 0.76 percent. Significant difference ($p \leq 0.05$) was noted for Moisture, Fiber, Protein, fat carbohydrates and Calcium, content parameters when compared with the control. Rest of the parameters like ash, energy and iron content were found to show no significant difference at 5% level of significance. According to finding (Bolarinwa *et al.*, 2019) the protein content of the bread made from malted sorghum-soy samples ranged from 7.28 percent to 11.74 percent. Similar study reported (Adebowale *et al.*, 2012) that the protein content of sorghum-wheat composite flour biscuits ranged 7.06 percent to 11.84 percent. Another study (Adebayo and Okoli 2017) reported that protein content in similar product to be 11.22 percent, ash content mentioned (Okoye *et al.*, 2008) in similar product to be was 1.42 percent, fat content mentioned (Bolarinwa *et al.*, 2019) in similar product was 2.28 percent. Protein content reported (Adebayo and Okoli 2017) in similar product was 11.22 percent, fiber content mentioned (Kaur *et al.*, 2017) in similar product was 3.54 percent, and (Hama *et al.*, 2018) Carbohydrate content in similar product was 75.22 percent.

Table 2: Proximate composition of PPP incorporated bread multigrain.

Nutrient Constituents (Per 100g)	Bread Control Mean±SD	PPP incorporated Bread Mean±SD	CD 5%
Moisture(g)	11.08±0.58	23.86±1.13	0.0046*
Protein(g)	9.862±0.47	11.09±0.78	0.0019*
Fat(g)	7.54±0.53	17.03±1.75	0.0031*
Carbohydrate (g)	68.59±1.15	32.8±3.96	0.0019
Fiber(g)	2.19±0.14	7.22±0.08	0.0002
Ash(g)	1.37±0.33	2.2±0.15	0.0007
Energy(kcal)	335.54±14.95	339.4±54.09	0.0883
Minerals	00	00	
Calcium (mg)	11.28±0.73	31.51±0.95	0.0045
Iron (mg)	2.18±0.23	1.03±0.21	0.0006

CONCLUSION

Pineapple pomace incorporated multigrain bread can be a better way for enriching the quality of breads. PPP incorporated bread are full of flavour bread, it can add the natural flovour to bread. The result revealed that 5 percent pineapple pomace powder incorporated bread had the highest overall quality during the storage compared to other treatment combinations. Therefore 5 percent pineapple pomace powder incorporated bread stored for 15 days at the ambient temperature of 30±1^{o}C and 75-80 percent RH, without adding any preservative. Pineapple pomace incorporated bread relatively more nutrient dense than plain bread, high in fiber, protein and calcium etc.

FUTURE SCOPE

Incorporation of Pineapple Pomace powder into bakery and confectionary products at the industrial level may be a cost effective strategy to improve sensory acceptability of the developed products but also in nutritional parameters like fiber, calcium and iron. Along this, it can be recommended that its use in bakery products may help In reduction of negative aspects of refined flour in bakery products.

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Conflict of Interest. None.

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