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RESEARCH ARTICLE

Effect of Adding Guava Fruit Powder on the Chemical and Mineral Composition of Wheat Flour

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Abstract

This study investigated the effect of adding guava fruit powder on the chemical and mineral composition of wheat flour. The result of the chemical composition showed improvement of the nutritional value of the wheat flour due to addition of guava fruit powder. Significant increase was found in fiber and ash. The fiber content of wheat flour in control sample and standard sample containing commercial ascorbic acid improver and samples C, D and E with added guava fruit powder at 3, 4 and 5% level was 0.2504, 0.2533, 0.2607, 0.4033 and 0.4400% respectively. The ash content of the same composition flour was 0.6396, 0.6231, 0.7420, 0.7306 and 0.7523% respectively. The protein content showed higher values in control sample and sample containing A as compared with guava added flour samples (C, D and E) containing 3, 4 and 5% guava powder. The protein content was 12.10, 12.00, 11.60, 11.67 and 11.60% respectively. In conclusion, the addition of guava fruit powder to wheat flour increased the fiber and ash content but decreased the protein content.

Keywords: Guava fruit powder, flour samples, nutritional value, fiber content, protein content.

Introduction

In Sudan, wheat is the 2nd most important cereal crop after sorghum which is grown under rain but cultured under irrigation during the dry and cool season in Gezira scheme, Northern and River Nile States. Composition of the grain makes wheat palatable food of high energy value. This is especially because wheat is eaten daily by nearly everyone from their infant age in most of the world. Melville and Shatto (1980) noticed that oxidized L-ascorbic acid from old lemon juice was very effective as bread improver, which led to the discovery of dehydro-L-ascorbic acid (DHLAA) and they concluded that it was this oxidized form that was active improving agent. Although wheat is used for several purposes, the traditional staple bread is produced in many forms by different processes and flour which is suitable for bread making in one country may be unacceptable in another country for baking quality. Finney *et al*. (1982) established that loaf volume is an indicator of baking quality, varying linearly with protein content, while Ritchie (1978) found that differences in performance were due to gluten content. In Sudan, guava is widely grown where the fruits are usually consumed in fresh form. However, in production areas large amount of guavas that exceed the local consumption demand are lost due to the relatively, poor marketing in production season, low price, lack and difficulties of transportation, lack of the storage facilities, and absence of processing. Preservation methods should be adapted to extent the shelf-life of these fruits. Guava fruit is rich in ascorbic acid.

Values of ascorbic acid per 100 g of guava fruit reported for most geographical locations generally exceed recommended dietary allowances for children. Vitamin C (ascorbic acid) is only a minor constituent of fruit and vegetables, but is of major importance in human nutrition. Ascorbic acid is normally used as a safe improver in bread making. Against these backdrops, the chemical composition and mineral content of the wheat flour and wheat flour with guava powder at different ratios were studied.

Materials and methods

Materials: Mature green fruits of white and pink fleshed guava fruits were obtained from EL Kadaro village, Khartoum State. Fruits were selected for uniformity in size, color and free from blemishes. About 10 kg of the selected guava fruits were sliced into small pieces and chopped in blender, dried in vacuum oven and packed in polyethylene bags. Wheat flour (72% extraction) was obtained from local flour Mill, Khartoum North. The flour was free from flour improvers.

Determination of ascorbic acid in guava: Vitamin C was determined in guava powder using the indophenols method as described by Eromosele *et al*. (1991).

Chemical composition: The chemical composition for wheat flour (without improvers) and flour with added guava were determined as follows:

Table 1. Chemical composition of wheat flour, wheat flour with ascorbic acid and wheat flour with guava powder.

		Mean	Std. Error	P value	Comment
Moisture	A	11.0020	.56008	0.958	Not significant
	B	11.3200	.36080		
	C	11.1000	.52599		
	D	11.2300	.42112		
	E	11.5000	.52705		
	Total	11.2304	.20928		
Protein	A	12.1000	.48189	0.722	Not significant
	B	12.0000	.29814		
	C	11.6700	.39442		
	D	11.6100	.23872		
	E	11.5000	.34157		
	Total	11.7760	.15809		
Fat	A	1.4323	.09506	0.999	Not Significant
	B	1.4339	.11337		
	C	1.4233	.06719		
	D	1.4231	.09855		
	E	1.4046	.04205		
	Total	1.4234	.03734		
Ash	A	.6396	.02177	0.006	Significant difference
	B	.6231	.03835		
	C	.7427	.02307		
	D	.7306	.03280		
	E	.7523	.03023		
	Total	.6977	.01501		
Fiber	A	.2504	.01931	0.000	Significant difference
	B	.2533	.01882		
	C	.2607	.01385		
	D	.4033	.04050		
	E	.4400	.02211		
	Total	.3215	.01585		
Carbohydrates	A	75.0200	.51743	0.440	Not significant
	B	74.7000	.51747		
	C	75.4000	.40000		
	D	75.4000	.45216		
	E	74.3000	.51747		
	Total	74.9640	.21574		

Sample A: Control, wheat flour without ascorbic acid and guava powder, Sample B: Standard, wheat flour with Ascorbic Acid; Sample C: Wheat flour with 3% guava powder, Sample D: Wheat flour with 4% guava powder, Sample E: Wheat flour with 5% guava powder.

Moisture content: The method of the Association of Official Analytical Chemists (AOAC, 1990) was used to determine the moisture content.

Protein content: Protein content of the samples was determined according to AACC method (1983).

Ash content: The method of AOAC (1990) was used to determine the ash content of the samples in this study.

Mineral content: The spectrophotometer was used to determine the content of potassium, iron and phosphorus of guava powder.

Oil content: Oil content was determined for wheat flour samples using soxhlet extraction method (AOAC, 1990).

Carbohydrate content: Carbohydrate content was calculated according to Pearson (1976) by difference.

Results and discussion

Effect of addition of guava powder on proximate composition of wheat flour: Proximate composition was carried for wheat flours and blends (A, B, C, D and E).

1. *Sample A:* Wheat flour free from bread improvers (control sample).
2. *Sample B:* Wheat flour with ascorbic acid improver.
3. *Sample C, D and E:* Wheat flour with different guava powder levels i.e. 3, 4 and 5% respectively.

Moisture content (%): The moisture content of wheat flour (control), wheat flour with vitamin C and with added guava powder samples (A, B, C, D and E) was found to be 10.8, 11.3, 11.1, 11.2 and 11.5% (Table 1).

The results were lower than the value obtained by Hassan (2007) who found that the moisture content of two imported wheat flours purchased from local flour mill was 11.53 and 12.26%. However, lower values of Canadian wheat flour were obtained by Babiker (2002) who reported 9.75% for moisture content. However, due to hot and dry weather of Sudan, imported flours usually have high moisture content at Port Sudan compared to in land locations.

Ash content (%): The ash content of the control sample flour (A), ascorbic acid added flour (B) and guava added flours (C, D and E) were 0.639, 0.623, 0.742, 0.730 and 0.752% respectively. The results showed no significant difference in ash content, between the control sample and ascorbic acid added sample. The ash content of control and ascorbic acid added samples was lower than the result of Babiker (2002) who reported that the ash content of wheat flour was (0.69%). The higher value of ash content of guava added flour samples is due to high content of the ash in guava powder as compared to wheat flour. It is considered as an advantage for wheat flour with low ash content to have desirable loaf volume.

Protein content (%): The result of protein content is presented in Table 1. The protein content showed higher value in sample A (wheat flour) and sample B (with vit. C) as compared with guava added flour C, D and E. The protein content was 12.10, 12.00, 11.60, 11.67 and 11.60% respectively. This decrease in protein content is due to the low protein content of the guava fruit powder.

Fat content (%): The fat content of sample A, control sample B with added ascorbic acid and guava added flours (sample C, D and E) was found to be 1.42, 1.43, 1.43, 1.42, 1.42 and 1.40 respectively.

Fiber content (%): Fiber content of wheat flour (sample A) and wheat flour with ascorbic acid (B) and wheat flour with guava powder (sample C, D and E) were 0.250, 0.253, 0.260, 0.403 and 0.440% respectively. Sample D and E with higher content of guava powder had shown higher content of fiber as compared with samples A, B and C. The difference is significant. Pearson (1976) reported that the fiber percentage in whole meal flour ranges between 1.8-2.5% and of flour (72% extraction rate) ranges between 0.10 and 0.3%, the average fiber content of guava is 5.3% and that is why sample E, with highest guava percentage showed the highest fiber content among the five samples (0.440%). The increase in fiber gives the food product an added value.

Carbohydrates (%): Carbohydrate content of wheat flour (sample A) and wheat flour with ascorbic acid (B) and wheat flour with guava powder (sample C, D and E) was 75.02, 74.65, 75.19, 75.14 and 74.55% respectively, the results obtained were within the value of Babieker (2002) who reported that carbohydrates content of Wadi El neel, Debera and Canadian wheat flours were 75.623, 73.793 and 71.023% respectively.

Mineral content of guava: The results showed that, the guava powder consists of 25 mg, 27 mg, 0.75 mg and 3.7 mg/100 g of calcium, phosphorus, iron and potassium, respectively. Guava fruit is known to be good source of minerals but they are comparatively poor source of iron. The ash content ranges between 0.2 and 5.8% and varietal differences in mineral content of fruits have been reported by Wills *et al*. (1981).

Conclusion

The wheat flour containing guava powder had higher moisture, ash and fiber content, but lower protein content. The fat and carbohydrate content seemed to be similar in all samples. Increase in fiber and ash content gives the food product an added health value. Adequate fiber intake has been elated to a lower incidence of the colon cancer and some types of heart diseases. It is considered as an advantage for wheat flour with low ash content to have desirable loaf volume. But, nutritionally the higher mineral content, the higher the nutritive value of the food.

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