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IMPROVEMENT OF MERAHRAH BREAD BY USING FENUGREEK AND WHEAT GERM FLOURS

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ABSTRACT

Corn flour whole mill was supplemented with fenugreek flour or wheat flour 72% extraction at levels 2.5, 5.0, 7.5 and 10%, respectively. Also, wheat germ was added as a basis in all blends at levels 2.5% to produce merahrah bread, high quality and good nutrition value. Chemical composition of the all blends were achieved. Results of this study revealed that total protein content were increased in all blends and ranged between 10.41 to 12.01%. Moreover, the minerals were increased in the blends made from wheat germ, corn and wheat flour at level 10%. Concerning the amino acids fractions, glutamic acid was the highest in the best blends. Meanwhile, Cystine recorded the lowest value in all best blends.

The sensory evaluation of merahrah bread showed that the using 7.5 and 10% wheat flour 72% extraction or 2.5 and 5% fenugreek plus corn flour and 2.5% wheat germ gave the highest score.

The study concluded a recommendation to use fenugreek till 5.0% and wheat flour to 10% as healthy food and improvement the nutrition value for merahah bread.

INTRODUCTION

Cereal grains constitute the major energy and protein in developing countries. Wheat is the most widely used cereal in making bread and other baked products. Production of wheat in Egypt is most enough to cover the population's consumption. That is why utilization of maize and fenugreek flour as partial or whole substitute instead of wheat flour in bread making has been suggested by El-Kady *et.al.* (1991). Moreover, the Egyptian are used fenugreek as a supplement to wheat and maize flour for bread making. The sprouts of fenugreek are also consumed fresh and known as "Hulba" (El-Mahdy and El-Sebaily, 1982).

Fenugreek seeds are improvement sources of protein, lipids and carbohydrates and other components (Morrow, 1991). Fenugreek was among the top ten plants indicated for diabetes which are the most commonly recommended herbal medicines (Haddad *et.al*., 2003).

Protein content of baked products made from maize and fenugreek flour mixtures was higher as fenugreek ratio increased. Baking resulted in considerable loss percentages in most essential amino acids especially tryptophan, methionine, cystine, pherylalanine and tyrosine, while, glutamic acid, threonine, valine and aspartic acid were the most thermostable amino acids (El-Kady, *et.al.*, 1991).

On the other hand**,** cereals like wheat and oat contain 10-18% protein, wheat protein are seriously deficient lysine as well as theronine other wise nutritional problems with wheat based diets would be quite severe reported by Khalil (1996). Moreover, the nutritional value of wheat germ is outline and included, even distribution of essential and non-essential amino acids, large amounts of fatty acids particularly linoleic acid, good source of dietary fiber, good source of vitamin E and important source of minerals. Functional

properties are outline and include, the presence of protein which improve rheological and sensory properties of wheat germ, lipids which improve sensory properties, vitamin E provides antioxidative function and carbohydrates have a high water-binding capacity are rapidly fermented and contribute to sensory properties of good (Amado and Arrigoni, 1992).

This investigation is aimed to study the effect of substitution a suitable part of maize flour with wheat germ, fenugreek and wheat flour to reduce the production cost of new nutrition's bakery products. Also, chemical and nutrition evaluation were carried out for blends and these blends were used to make merahrah bread.

MATERIALS AND METHODS

Materials:

Seeds of corn, wheat and fenugreek varieties: Giza 2, Giza 164 and Giza2were obtained from Field Crops Research Institute, Agricultural Research Center, Giza, Egypt. Wheat germ was obtained from South Cairo Mill Company, Ministry of Supply and Trade, Egypt.

Methods:

Corn, fenugreek and wheat seeds and wheat germ were milled in a Laboratory Mill Junior to a fine whole powder. Wheat flour whole mill was passed on sieved to gave wheat flour 72% extraction.

Preparation of blends:

Preparation of blends were made from wheat germ 2.5% and corn flour whole mill which substitution using wheat flour 72% extraction and fenugreek flour. The blends are reported in Table (1).

Table 1. Incloude the blends for baking merahrah bread.

Blends	Corn flour	Wheat germ flour	Wheat flour 72% extraction	Fenugreek flour
Control	97.5	2.5	--	--
1	95.0	2.5	2.5	--
2	92.5	2.5	5.0	--
3	90.0	2.5	7.5	--
4	87.5	2.5	10.0	--
5	95.0	2.5	--	2.5
6	92.5	2.5	--	5.0
7	90.0	2.5	--	7.5
8	87.5	2.5	--	10.0

Chemical analysis of blends:

Moisture, protein, fat, ash, fiber and total carbohydrates contents were determined in all blends using the methods outlined in the **(A.O.A.C. 1990).** Also, amino acids were determined in the best blends and compared with control made from corn flour 97.5% plus wheat germ 2.5%., according to the procedure described by Olison *et.al.* (1978).

Chemical score of essential amino acids (EAA) as relatively determined according to FAO/WHO (1985) Scoring Pattern. The lowest percentage was taken as the chemical score and the corresponding amino acids were taken as the limiting amino acids.

Chemical score was calculated using the following equation:

$$\% \text{ Chemical score} = \frac{\text{EAA in crude protein}}{\text{EAA of FAO/WHO}} \times 100$$

According to FAO/WHO Scoring pattern (1985).

Moreover, Phosphorus, Calcium, Magnesium, Iron, Zinc, Copper and Manganese were determined in all blends using a Pye Unicon SP 1900 Atomic Absorption Spectroscopy technique as described by A.O.A.C. (1990).

Baking of merahrah bread:

Merahrah bread was prepared using 200 gm separately from all blends as shown in Table (1). Two grams of salt in 150 ml water was added. The ingredients were thoroughly mixed by hand, then the dough was allowed to stand for 20 minutes. After that, the dough was cut into two pieces of each 100 gm. The pieces were thinly flattened to 30 cm diameter and finely baked in balady oven. Merahrah breads were allowed to cool on racks for about one hour before evaluation.

Sensory evaluation for merahrah bread:

Merahrah bread was evaluated for sensory characteristics by ten panelists from the staff bread and pastry, Food Techn. Inst., Agric. Res. Center, Giza- Egypt. The scoring scheme was established as mentioned, appearance (20), taste (20), odor (20), color (20) and hardness (20).

Statistical analysis:

The data from sensory evaluation were statistically analyzed using the analysis variances as outlined by Snedecor and Cochran (1967). Differences between means of treatments were tested for significance against the Least Significant Differences (LSD) at 0.5 probability level according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

chemical composition of the blends:

Table (2) showed that the chemical composition of all blends which contained wheat germ 2.5% as a basis and substitution of corn flour with wheat flour or fenugreek flour. The data demonstrated that the blend no. 8 was higher in protein, fat and crude fiber being 12.01, 5.24 and 3.39%, respectively followed by blends no. 7 and 6, respectively. Whereas, the blend no. 4 was higher in total carbohydrates (69.70%) and lower in fat, ash and crude fiber of 4.76, 1.27 and 1.93%, respectively.

From these results, it could be noticed that the blends no. 8, 7 and 6 are higher in protein, ash and crude fiber. It may be that the fenugreek flour is rich in protein and dietary fiber (Pollard *et.al.* 2002).

Results reported in Table (3) revealed that minerals increased by increasing wheat flour 72% extraction to corn flour and wheat germ especially in blend no. 4 and followed by blends no. 3 and 2, respectively. Whereas, the blends supplemented with fenugreek flour were increased in some minerals.

Sidhu *et. al.* (2001) Reported that mineral compositions of milling wheat germ and wheat flour were rich in Ca, Mg, K, P, Mn, Zn and Fe but contained low concentration of Na and Cu.

Table 2. Chemical composition of all blends gm/100gm on dry weight basis.

Blends	Moisture %	Protein %	Fat %	Ash %	Crude fiber %	Total carbohydrate
Control	10.04	10.36	5.13	1.57	2.09	69.03
1	10.09	10.41	5.04	1.52	2.05	69.39
2	10.14	10.46	4.95	1.44	2.01	69.43
3	10.19	10.51	4.85	1.35	1.97	69.56
4	10.56	10.56	4.76	1.27	1.93	69.70
5	10.02	10.74	5.16	1.57	2.41	68.57
6	9.99	11.12	5.19	1.53	2.74	67.79
7	9.97	11.50	5.21	1.50	3.06	67.12
8	10.01	12.01	5.24	1.46	3.39	66.45

Table 3. Minerals content in all blends (mg/L.).

Blends	Ca	Mg	Fe	Zn	Cu	K	Mn
Control	28.66	117.98	3.03	0.004	0.528	330.59	0.695
1	28.83	118.88	3.55	0.126	0.535	333.40	0.766
2	29.38	119.78	3.59	0.251	0.540	336.25	0.847
3	29.93	120.68	3.62	0.376	0.545	339.100	0.931
4	30.48	121.58	3.66	0.501	0.550	341.95	1.110
5	28.43	119.88	3.75	0.126	0.893	352.28	0.761
6	28.58	121.78	3.99	0.251	1.255	374.00	0.838
7	28.73	123.68	4.22	0.376	0.618	395.73	0.911
8	28.88	125.58	4.46	0.501	1.980	417.45	1.091

Sensory evaluation of merahrah bread:

Table (4) illustrated the sensory evaluation of merahrah bread made from wheat germ 2.5% and corn flour whole mill and supplemented with wheat flour 72% extraction or fenugreek at different levels 2.5, 5.0, 7.5 and 10%, respectively.

Table 4. Sensory evaluation of merahrah bread for each blends

Blends	Appearance 20	Color 20	Odor 20	Taste 20	Hardness 20	Total score 100
Control	13.34	12.50	12.68	12.15	12.14	62.81
1	14.66	13.37	14.66	14.72	12.66	70.07
2	15.34	14.70	15.77	15.02	14.00	74.83
3	16.50	14.98	16.35	16.90	14.64	79.37
4	17.35	15.84	17.14	17.68	15.46	83.47
5	16.53	15.71	16.92	17.42	15.21	81.79
6	15.70	14.85	16.14	16.71	14.30	77.70
7	14.86	13.24	15.11	14.50	13.64	71.35
8	13.97	12.86	13.67	12.30	12.56	65.36
LSD at 5%	0.835	0.863	0.782	0.775	0.913	

The results reported that the addition of 10% wheat flour and 2.5% fenugreek flour had the highest total score (83.47 and 81.79) followed by 7.5% wheat flour and 5% fenugreek flour to corn flour whole mill for the sensory evaluation parameter. Also, these blends exhibited the highest acceptability (appearance, color, odor, taste and hardness) compared with control and other treatments.

Amino acids composition the best blends:

Amino acids contents and chemical score pattern in the best blends and compared with control are reported in Tables (5 and 6). The results showed that the glutamic acid was the highest in all blends and control (21.06- 22.62

g/100g protein), Whereas, cystine and methionine acids were the lowest compared with the all amino acids.

Table (6) show the chemical score pattern in the best blends. Lysine acid was found to be the first limiting amino acid in the control and blends no. 3 and 4, respectively, Also, valine acid was found the limiting amino acid in the blends no. 5 and 6, respectively.

Table 5. Amino acids content of the best blends compared with control g/100g protein

Amino acids	Control	* Blends			
		3	4	5	6
Essential amino acids					
Lysine	2.24	3.16	3.34	4.45	4.93
Theronine	3.31	3.35	3.38	3.51	3.56
Cystine	1.59	1.91	1.93	1.96	1.97
Methionine	2.93	2.73	2.79	2.94	2.96
Valine	3.12	3.12	3.15	3.23	3.52
Leucine	5.94	6.49	6.61	6.11	6.12
Isolucine	4.09	4.45	4.67	4.73	4.88
Tyrosine	5.65	5.45	5.52	5.68	5.64
Phenylalanine	5.16	5.23	5.25	5.38	5.48
Non essential amino acids					
Amino acids					
Glycine	4.77	4.62	4.70	4.95	5.09
Alanine	6.24	6.04	6.14	6.30	6.35
Aspatic	5.85	5.86	5.91	6.13	6.20
Glutamic	21.06	22.32	22.62	21.15	21.30
Serine	4.09	4.18	4.20	4.24	4.29
Proline	8.09	8.17	8.23	7.85	8.02
Histidine	2.34	2.45	2.48	2.40	2.42
Arginine	7.99	7.81	7.93	8.29	8.30

Blend no. 3 made from wheat germ 2.5%, corn 90%, wheat flour 7.5%
Blend no. 4 made from wheat germ 2.5%, corn 87.5%, wheat flour 10%
Blend no. 5 made from wheat germ 2.5%, corn 95%, fenugreek flour 2.5%
Blend no. 6 made from wheat germ 2.5%, corn 92.5%, fenugreek flour 5%

Table 6. Chemical score as a percent of the best blends compared with control.

EAA	FAO/WHO Proffional Pattern (1985)	Control	Blends			
			3	4	5	6
Lysine	5.5	40.72	57.45	60.73	80.91	89.64
Theranine	4.0	82.75	83.75	84.50	87.75	89.0
Cystine t Methionine	3.5	129.14	132.57	134.85	139.14	140.86
Valine	5.0	62.4	62.4	63.0	64.60	70.4
Isolucine	4.0	102.25	111.25	116.75	105.75	107.0
Lucine	7.0	58.43	63.57	66.71	67.57	69.71
Tyrosine t phenylalanine	7.0	154.43	152.57	153.57	158.0	158.86

EAA = Essential amino acids

Corn and wheat flour protein were lower in lysine, whereas, fenugreek flour was high amount of lysine (Ibrahim *et. al.* 1990 and El-Kady *et. al.* 1991).

Finally, sensory evaluation of all blends, the results showed that, the blends no. 5 and 6 were the best blends followed by blends no. 3 and 4, respectively.

It can be suggested that the addition of wheat flour at 7.5 and 10% levels to 90% and 87.5% corn flour. Also, fenugreek was added at 2.5 and 5% levels to 95 and 92.5% corn flour and wheat germ 2.5% was added for each blends. These blends had significant acceptability and better sensory evaluation than other treatment.

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تحسين الخبز المرحرح باستخدام دقيق الحلبة وجنين القمح

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تم تدعيم دقيق الذرة بدقيق الحلبة أو دقيق القمح بنسب ٢,٥ ، ٥، ٧,٥، ١٠% كل على حدة مع إضافة ٢,٥% جنين القمح كنسبة ثابتة الى كل الخلطات السابقة لإنتاج الخبز المرحرح العالى الجودة والقيمة الغذائية. تم تقدير التركيب الكيماوى فى كل الخلطات فوجد أن نسبة البروتين الكلى تزداد في كل الخلطات وتتراوح ما بين ١٠,٤١ – ١٢,٠ % . وجد أيضاً أن إرتفاع نسبة المعادن كان فى خلطة دقيق القمح بنسبة ١٠% بينما بإضافة دقيق الحلبة كانت نسبة المعادن مرتفعة في بعض الخلطات. تم تفريد الأحماض الأمينية فى أفضل الخلطات التى أعطت أفضل نسبة فى التقييم الحسى فوجد ان الحامض الأمينى الجلوتاميك أعطى أعلى نسبة فى جميع الخلطات والحامض الأمينى سيستين كان أقلهم.

تم تقييم حسى للخبز المرحرح المصنع من جميع الخلطات فوجد أن أفضل الخلطات كانت بإضافة ٧,٥ ، ١٠% من دقيق القمح على الذرة وجنين القمح وكذلك نسبة ٢,٥ ، ٥ % من دقيق الحلبة.

يمكن من هذه الدراسة أن توصى بإضافة دقيق القمح الى كل من دقيق الذرة وجنين القمح حتى نسبة ١٠% ودقيق الحلبة حتى ٥ % وذلك لإنتاج خبز مرحرح ذات جودة عالية وقيمة غذائية مرتفعة.