



**Physical ,Chemical, And Characteristics Sensuality Of
Functional Properties For Wheat –Doum And Germ Flour
Composite Balady Bread**

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Abstract: In this study three balady bread recipes were prepared using equal quantity 1: 1(a) ,2:2(b) and 3:3(c) % as a replacement levels of wheat flour (82%) by doum powder (DP) and Wheat Germ(WG). The chemical compositions of both raw materials and final products as well as, organoleptic characteristics and biological quality of the prepared balady bread were studied. Results indicated that there was a gradual enhancement increasing for supplementation of wheat flour WF)with (WG),(DP) from 0,1:1 to3:3% in the crude protein ,fiber , ash and fat contents . The taste and general acceptability of balady bread containing (WG),(DP) from 1:1 to 3:3% were significantly lower than control balady bread . Balady bread were fed to rats alone and plus (WG),(DP) for 28 days, growth and blood total protein , Cholesterol , triglycerides , Hemoglobin and Glucose were evaluated. The data also showed an increase in final body weight and gradually decrease in fed efficiency ratio for rats fed on balady bread supplemented with (WG),(DP) than the control one group.

Blood total cholesterol , Glucose , and Triglycerides for rats groups which were fed on balady bread with (WG),(DP), were significantly lower than in control group($p \leq 0.05$) from (140.88, 104.10 ,79.10) for control sample to(140.0 ,102.0 and 78.8) down to the (c) sample gradually and respectively, meanwhile showed a highest blood protein and Hemoglobin as compared with control group from(20.0 and 14.6) for control sample down to(22.0 and 14.9) for (c) sample gradually and respectively. Therefore, doum Powder with Wheat Germ can be added to wheat flour until 3:3% without any observed detrimental effect on bread sensory properties, this could be used to improve the nutritional quality of balady bread especially in

developing countries to avoid the malnutrition prevalent. Also, useful for those which suffering from high Glucose, Triglycerides and Total Cholesterol diseases.

Introduction

Bread is one of the most widely consumed food product in the world. According to Selomulyo and Zhou,(2007)bread making technology is probably one of the oldest technology known, It is an important staple food for many countries. As a result of considered convenient foods Kansas (2006) . The product is basically made of hard wheat flour, yeast, fat, sugar, salt and water (Badifu *et al.*, 2005). It is considered as convenient food (Kansas ,2006).Balady bread one of bread kinds characterized by acceptable and convenient produced from milled whole grains which recognized as important nutritionally, moreover this

grains contain photochemical whose promoted human health(Jones,2008 and Gupta,2013).Furthermore, contain a high fiber which prevent and reduced risk in type (2) diabetes ,obesity and cardiovascular diseases (Mckevith,2004,Wang et al 2007., Dalton et al .,2012and Alvah et al 2013). This encourage the fortified whole wheat flour with antioxidant materials from plant sources to produce nutritional and healthy baked product such as bread (-Hussein et al,2011 and Okafor et al, 2012) .

Doum one of this plants represented by the genus *Hyphaene thebaica*.,the fruit as a good source of potent antioxidants (Hsu and Coupar,2006) characterized by a shimmy orange –brown to deep chestnut skin (Dosumu,et al .,2006), also contain a high quality protein varied between (2.86-5.01%),relatively high proportion of lysin, cystine varied between(4.09-4.16 %and 0.2-1.62% of crude protein respectively), the limited amino acid threonine ,crude fat varied between(1.2-8.4%), crude fiber varied between(52.26-66.5%), the most important carbohydrates component was mannose varied between(13-75.9%), also there is a presence of calcium , magnesium , potassium ,iron sodium and negligible amount of nickel ,cobalt and molybdenum ,finally the nutritional value varied between(46-60) (Yidiz et al,2006 and Hussain et al ,2011).Moreover, its present this phytochemicals(tannins,saponin,steriods ,glycosides ,flavonoid ,terpene s and terpinoids in low and moderate concentrate of doum palm(Auwal,2013), its phenols content about (64.9 mg /g) dry wet, Mohamed et al(2010).Thus ,it's a good source of potent antioxidant with wheat germ Fisher (1985) reported that about wheat germ contains 30% protein ,10% fat 45% carbohydrates , high content in minerals ,traces elements and vitamins complemented well together with wheat flour to produce nutritionally balanced high quality bread (Velioglu et al,1998-Nienan and Facsn,2006). This ingredients not only nutrients but also

therapeutic source useful in preventing and reduces diabetes ,cardiovascular risks and inhibit LDL cholesterol(Liyana and Shahidi,2006- Cho et al ,2013 ,Finks et al,2012 and Hughes et al ,1994).Flavonoids, coumarins, hydroxycinamates and lignin components which act to prevent or reduce oxidative stress by scavenging free radicals [Bravo, 1998; Shariff, 2001, Sohal et al., 2002; Kamis et al., 2003; Eldahshan et al., 2008;and Jeong, et al 2009).

Therefore main objectives of the current study were to assess the chemical composition of Egyptian marketable balady breads, to evaluate the effect of fortification wheat flour with wheat germ flour and doum flour.

Materials and Methods

Materials

- 1- Wheat flour extraction rate 82% and wheat germ were obtained from South Cairo Mills Co., Cairo, Egypt.
- 2- Activated compressed yeast was supplied by Starch and Yeast Co. Alexandria, Egypt.
- 3- Other baking ingredients Margarine , table salt granulated sugar were purchased from local markets of 6 october City, Giza governorate.
- 4- Dry doum fruits were obtained from hyper market (6 october city , Egypt) in a form of small pieces.

Balady bread blends:

Balady bread was prepared as formula presented in Table (1) by mixing the formula components with other ingredients which are 1% dry yeast, 2% sodium chloride, Sugar , fat and water as needed. The mixture was mixed in mixer (250 rpm) for 20 min. The dough was left for fermentation at 30- 23°C and 85-90% relative humidity for 60min. After fermentation, the dough was divided into 130 g pieces. Each piece was molded on a wooden board previously covered with a fine layer of bran and left to ferment about 15 min at the same mentioned temperature and relative humidity. The fermented dough pieces were flattened to about 20 cm diameter. After flatting, the dough was left to final fermentation about 15 min until suitable properties. The flat dough was baked in oven at 380-400°C for 3-4.5 min. The loaves were allowed to cool at room temperature before sensory evaluation (Yaseen, 1985).

Table(1): Baking formula* and conditions of wheat flour(wheat germ: doum flour) bread

Wheat flour (%)	100 **	98	96	94
wheat germ flour : doum powder(1:1)%	-	1:1	-	-
wheat germ flour : doum powder(2:2)%	-	-	2:2	-
wheat germ flour : doum powder(3:3)%	-	-	-	3:3
Dry yeast (%)	1	1	1	1
sodium chloride (%)	2	2	2	2
Sugar (%)	6	6	6	6
Fat (%)	1	1	1	1
Water	variable	Variable	variable	variable
fermentation	1½ hrs at 30°- 32°C	1½ hrs at 30°- 32°C	1½ hrs at 30°- 32°C	1½ hrs at 30°- 32°C
Backing	380- 400°C for 3- 4.5 min	380- 400°C for 3- 4.5 min	380- 400°C for 3-4.5 min	380- 400°C for 3- 4.5 min
RH	85-90%	85-90%	85-90%	85-90%

Ingredients listed as percent of flour in control sample **

The Wheat flour was replaced by 1:1,2:2 and 3:3 % (wheat germ flour : doum powder)

3- Chemical analysis

Ingredients analysis:

The wheat flour (82% extraction), doum fruit flour and wheat germ, analyzed for crude protein ,ether extract ,ash and ,crude fibers were determined according to AOAC (2000). Total carbohydrates were calculated by difference according to the following equation differences as follows: % carbohydrates = 100 – (% moisture + % protein + % actual ash + % Fiber). According to Sara *et al.*, 2008 carbohydrate content was estimated by difference.

Minerals analysis:

Magnesium, manganese, calcium, Iron and zinc, were determined using a Pye Unicam SP 19000 Atomic Absorption Spectroscopy in Food Technology Research Institute, Agriculture Research Center, Giza, Egypt as described by AOAC (2000).

Carotene Analysis

The procedure followed to determine beta carotene in materials was the same as described by (Rogers et al 1993).

Dietary fiber analysis

The raw materials and finished products samples were analyzed by Prosky et al method (1985) and (AOAC, 1995).

Tocopherol analysis

The individual tocopherol were quantitatively determined by method based on a gas-liquid chromatographic separation of their trimethyl silyl ether derivatives (Slover et al, 1969).

4-Feeding experiments:

Animals and treatment

Twenty Male albino rats weighing (140-160g) of Sprague Dawley strain were obtained from Research Institute of Ophthalmology, Medical Analysis Department, Giza, Egypt. All biological experimental were done at the Research Institute of Ophthalmology, Medical Analysis Department, Giza, Egypt. Rats (n = 20 rats); they were housed in wire cages in a room maintained at 25±2 C and kept under normal healthy conditions. All rats (20 rats) were fed on basal diet for one week before starting the experiment for acclimatization. After one-week period, the rats were divided into 4 groups (4 rats each), all groups were fed for 28 days. The group(1) was fed on the basal diet only as a control negative (0 % healthy rats). The other groups (2,3,4) were fed on the diet: 1:1 % , 2:2 % and 3:3% balady bread recipe with (wheat germ flour : doum powder) respectively . They were fed thrice daily, morning, afternoon and evening for a period of 7 days before they were sacrificed.

Basal diet :-

The composition of basal diet and vitamin mixtures used according to method described by Hegsted et al., (1941).

Collection of serum

The rats were anaesthetized with chloroform and then sacrificed. The blood was carefully collected into a test tube after sacrifice. The blood was allowed to clot for a period of about 15-20 mins. The specimen was centrifuged at 3000rpm's for 10mins. The serum was separated from the red cells to avoid interference.

Determination of total protein

The total protein was determined using Tietz method (1995).

Determination of glucose

Glucose were determined using Barham and Trinder method (1972).

Determination of cholesterol

Cholesterol was determined using. Allain Photovoltaic method (1974) .

Determination of triacyglycerol

Triglyceride was determined using enzymatic test glycerol-phosphate oxide method of Jacob *et al.*, (1960).

Determination of Hemoglobin

Fresh blood was diluted 1:200 with 0.4% ammonium hydroxide and the hemoglobin absorbance was measured at 450 nm According to Caster and Marie (1967).

Statistical analysis:

Statistical analysis Analysis of variance for a completely randomized design was done according to Gomez and Gomez (1984) by using SPSS software program.

Sensory evaluation:

Types of Balady bread were evaluated for their sensory characteristics by ten panelists from the staff of quality control Dept., Bakery product company, 6 October city , Giza, Egypt, according to Hegazy & Faheid [1990] .

Results And Discussion

Table (2): Chemical composition of raw material on dry weight basis.

* Composition \ samples	Wheat flour (82% ex)	Wheat germ flour	Doum fruit powder
Moisture	13.8	12.3	11.7
Protein	10.5	25.9	5.68
Fat	1.5	10.4	6.8
Ash	1.1	4.2	5.1
Fiber	1.2	3.2	24.3
Total carbohydrate@	71.88	44	46.2

@: Available carbohydrate by differences

Data in Table (2) reveal the difference of the raw materials in their contents of protein, fat, ash, crude fiber, total carbohydrates on dry basis and moisture content. Wheat flour , wheat germ flour ,and doum fruit flour were found to contain 10.5% ,25.9 % and 5.68% for protein and

1.5 ,10.4 and 6.8% % for fat and 1.1 % ,4.2 and 5.1% for ash, 1.2% ,3.2% and 24.3% for fiber and 71.88% ,44% and46.2% for carbohydrates and 13.8% ,12.3% and 11.7% for moisture, for wheat flour (82% ext.), wheat germ flour and doum fruit powder respectively.

These results as are in agreement with those reported by Fisher (1985) who reported that wheat germ flour analysis contained protein (30%),and fat(10%).While Hussain et al (2011) they noticed that analysis of doum fruit powder contained (52.26%- 66.5%) of crude fiber . From the results, it could be noticed that Wheat germ flour contained the highest value in protein (25.9) and fat (10.4).While doum fruit powder contained the highest value in crude fiber (24.3) and ash (5.1%).

Table(3): Mineral content of raw materials as(mg / 100g) on dry weight bas.

Composition \ samples	Wheat flour (82% ex)	Wheat germ flour	Doum fruit powder
Mg	17.1	12.1	14.3
Mn	2.2	4.1	3.8
Zn	4.9	2.8	5.1
Fe	2.1	3.5	4.6
Ca	16.7	20.5	23.1

Data in Table (3) represent the minerals contents of the raw materials. From the data, it can be concluded that doum fruit powder was superior in, calcium, iron, zinc and followed by wheat germ flour while Wheat germ flour was superior in , magnesium, in the same trend Wheat flour (82% ex) was superior in, manganese . These results for wheat flour (82%) extraction are in agreement with those reported by Cara *et al.*, (1992) and Auwal et al; (2013). Therefore, it could be mentioned that fortification of wheat flour (82%ex) with Wheat germ flour and doum fruit powder give a rise to high levels of minerals.

Table (4): Beta carotene , Tocopherols and total dietary fiber (T.D.F) in raw material .

Composition \ samples	B. carotene Mg / 100g	Tocopherols Mg / 100g	Total dietary fiber (T.D.F) %
Wheat germ flour	Traces	21.5	8.6
Doum fruit powder	11.3	0.5	29.9

Data in Table(4) indicate that Wheat germ flour and doum fruit powder contain All phytochemical whose promote human health Gupta(2013) wich presented in wheat flour produced from whole grains In small proportions where the doum fruit powder has high

percentage from B. carotene and Total dietary fiber (11.3 Mg / 100g and 29.9%), same results obtained by Mohamed et al ,(2010) ,while Wheat germ flour Was higher in the tocopherols (21.5 Mg / 100g), the same results obtained from Hae and Hong,(1995) . So, the addition Wheat germ flour and doum fruit powder to wheat flour improve produced balady bread potent antioxidants (Nienen and Facsn 2006) .

Table(5): Chemical composition of produced balady bread.

Composition \ samples	1	2	3	4
Protein%	10.5	14.1	14.5	15.3
Fat%	1.5	1.6	1.8	2.01
Ash%	1.1	1.19	1.27	1.38
Fiber%	1.2	1.46	1.7	2.01
Total carbohydrate%	84.5	81.65	80.73	79.3

- 1- Balady bread control
- 2- Balady bread supplemented with equal level 1% wheat germ flour : 1% doum powder.
- 3- Balady bread supplemented with equal level 2% wheat germ flour : 2 % doum powder.
- 4- Balady bread supplemented with equal level 3% wheat germ flour : 3 % doum powder.

Data in Table (5) Highlighted the chemical composition of bread supplemented with different wheat germ flour and doum fruit powder levels, there were difference between the 100% wheat flour bread and those fortified with disparate wheat germ flour and doum fruit powder levels boosted with accretion the levels . The bread samples in crude protein content supplemented with (4) equal level 3% wheat germ flour : 3 % doum powder inclusion was observed to have the highest crude protein content (15.3%) , this was followed by supplemented with (3) equal level 2% wheat germ flour : 2 % doum powder (14.5%) this also was followed by supplemented with (2) equal level 1% wheat germ flour : 1% doum powder. while the balady bread control (1) had the lowest crude protein content (10.5%). The fat content of the bread samples ranged between (1.5, 1.6, 1.8 and 2.01%) for (1,2,3 and 4) bread samples respectively , there were differences among the balady bread carbohydrate content . Bread without supplementation had the highest content of carbohydrate (84.5%) followed by (1 ,2 and 3) scored (81.65 , 80.73 and 79.3%) respectively . While the balady bread supplemented with equal level 3% wheat germ flour : 3 % doum powder also had the highest ash and crude fiber levels (1.38 and 2.01%)

followed by (2%: 2%) then (1%: 1%) levels recorded (1.27 and 1.7%) ,(1.19 and 1.46%), respectively the lowest Values was in control sample listed (1.1 and 1.2%). The increase in protein, fat, ash, and fibers of supplemented balady bread can be attributed to the high content of those ingredients in doum powder and wheat germ flour table(1) . This clearly indicates that can be produced nutritionally balanced high quality balady bread (Finks et al ,2012), and an alternative source of dietary fiber in balady bread making (Yidiz et al ,2006). On the other hand, carbohydrate content was reduced as a result of increase supplemented ingredients levels . These results were in agreement with that obtained by Lokuruke,(2007).

Table(6) :Main values of Organoleptic characteristics of balady supplemented equal level mixture of wheat germ and doum powder.

Treatment	Appearance (20)	Taste (20)	Crust color (10)	Separation of layers (15)	Rounder (10)	Distribution of crumb(10)	Odor (20)
Control balady bread	19.5 ±(0.5)	19.5 ±(0.266)	9.5 ±(0.369)	14.5 ±(0.386)	9.5 ±(0.346)	9.5 ±(0.389)	19.5 ±(0.386)
1	19.4 ±(.585)	19.3 ±(0.280)	9.4 ±(0.370)	14.3 ±(0.388)	9.4 ±(0.389)	9.4 ±(0.398)	19.5 ±(0.356)
2	19.1 ±(0.580)	19.3 ±(0.287)	9.3 ±(0.377)	14.2 ±(0.390)	9.3 ±(0.386)	9.3 ±(0.411)	19.3 ±(0.361)
3	18.7 ±(0.578)	19.1 ±(0.284)	8.9 ±(0.379)	14.2 ±(0.411)	9.2 ±(0.391)	9.2 ±(0.3421)	19.2 ±(0.381)
L.S.D (p≤0.05)	(0.5220)	(0.2802)	(0.3732)	(0.3871)	(0.3892)	(0.4302)	(0.3862)

- 1- Balady bread supplemented with equal level 1% wheat germ flour : 1% doum powder.
- 2- Balady bread supplemented with equal level 2% wheat germ flour : 2 % doum powder.
- 3- Balady bread supplemented with equal level 3% wheat germ flour : 3 % doum powder.

Data in table table (6) shows the sensory evaluation of balady bread produced from different blends containing wheat flour 82% extraction, supplemented with equal level mixture of wheat germ and doum powder at ratio(1:1) ,(2:2) and (3:3) The sensory evaluation included the general appearance, taste, crust color, separation of layers, roundness, distribution of crumb and odor . The obtained data are presented that additional of all supplemented levels resulted in significant differences (P≤0.05) compared with those of control. The score of sensory evaluation was decreased with increasing the levels of supplemented materials. The tested bread samples proved to be inferior in average values of organoleptic properties as compared with control

samples. It was also proved that The tested bread samples proved to be inferior in average values of organoleptic properties as compared with control samples. It was also proved that the higher of the level (3:3) had the lower values scored for the resulting bread with insignificant ($P>0.05$), quality reduction at (2:2) and (1:1) levels and with significant ($P<0.05$) reduction at higher levels. Thus results can be concluded that replacement of wheat germ and doum powder could be added to wheat flour to produce acceptable loaf to some extent and the level of addition can be reached to (2:2) of wheat germ and doum powder to wheat flour to produce balady bread, as an economical level with the acceptable properties.

Table (7): Body weight gain ,feed intake and feed efficiency ratio of rat feed on balady bread fortification with wheat germ and doum powder .

Animal group	Initial body weight (gm)	Final body weight (gm)	Body weight gain (gm)	Feed intake (gm)	Feed efficiency ratio
Control balady bread	27.3 ± (2.7)	45.3 ± (3.1)	18	170 ±(12)	0.106
1	28 ± (2.3)	45.5 ± (4.5)	17.5	169 ±(11)	0.103
2	28.3 ±(2.2)	45.6 ±(4.2)	17.3	170 ±(13)	0.101
3	28.4 ± (2.1)	45.6 ± (3.1)	17.2	170 ±(13)	0.101
L.S.D ($p \leq 0.05$),	2.987	0.2873	0.2800	19.165	14.253

1- Balady bread supplemented with equal level 1% wheat germ flour : 1% doum powder.

2- Balady bread supplemented with equal level 2% wheat germ flour : 2 % doum powder.

3- Balady bread supplemented with equal level 3% wheat germ flour : 3 % doum powder.

Data in table (7) presents the mean changes in body weight, feed intake and feed efficiency ratio (FER). Significantly higher ($p \leq 0.05$) mean food intake was obtained among rats groups consuming the balady bread fortification with wheat germ and doum powder containing (1:1),(2:2) and (3:3) levels as compared to control balady bread containing 0% supplementation. This finding suggests that supplemented balady bread levels were more palatable to the rats than the control one. The mean gain in body weight per six weeks averaged , 18,17.5,17.3 and 17.2 g upon the consumption of balady bread

containing 0%, (1:1) %, (2:2) %, and (3:3)%, respectively. The lowest mean value was found among rats groups consuming diets containing (3:3) % wheat germ and doum powder ($p \leq 0.05$). These changes in body weight could be as a result of a decrease in their blood level during the administration of the tested feed which could also lead to sluggishness in movement Aloh Godwin Sunday, et al., (2014). Also, weight gain decrease could be attributable to a reduced metabolizable energy of the diets containing wheat germ flour and doum powder, due to its high fiber content (24.3g/100 g and 3.23g/100g) for doum powder and wheat germ flour respectively resulting in lower mean values of FER [Lechel & Hermann, 1978]. Also, the water holding capacity (WHC) of dietary fiber is thought to be an important determinant of faecal bulking and intestinal transit times with influence on gastrointestinal disease (Masoodi & Chauhan, 1998) and Ahmed et al., (2010).

Table(8): The effect of adding a mixture of wheat germ powder and Doum on the contents of the blood level of glucose, Hemoglobin, Total protein, triglycerides and total cholesterol.

Animal group	Glucose (mg/100ml)	Hemoglobin (mg/100ml)	Total protein (mg/100ml)	Triglycerides (mg/100ml)	Total Cholesterol (mg/100ml)
Control balady bread	104.1 ± (8.1)	14.6 ±(0.3)	20 ±(0.66)	79.1 ± (19.52)	140.88 ±(8.01)
1	103 ± (9.1)	14.6 ±(0.6)	20.1 ±(0.68)	79.0 ±(49.31)	140.80 ±(23.1)
2	102 ± (9.5)	14.8 ±(0.6)	21.6 ±(0.75)	78.6 ±(49.63)	140.1 ±(30.9)
3	102 ± (9.6)	14.9 ±(0.5)	22 ±(0.77)	78.7 ±(50.81)	140 ±(22.3)
L.S.D ($p \leq 0.05$),	3.845	0.2804	0.2744	19.165	11.343

- 1- Balady bread supplemented with equal level 1% wheat germ flour : 1% doum powder.
- 2- Balady bread supplemented with equal level 2% wheat germ flour : 2% doum powder.
- 3- Balady bread supplemented with equal level 3% wheat germ flour : 3% doum powder.

Data in table (8) reveals that serum concentrations of hemoglobin and total protein in the test groups were significantly higher ($P \leq 0.05$) than the control. The exact reason for this increase in level of total protein and hemoglobin is obscure but could indicate the high presence of iron and protein contents (Tables 2,3) in the replacement ingredients. According to Dosumu, et al. (2006), analyze the tested doum fruit had high quality contain from protein varied between (2.86-5.01%), .While Mohamed et al.,

(2010) found wheat germ contains 30% protein and high content in minerals.

The result shows that the level of both protein and hemoglobin are higher in bread supplemented by 3:3 wheat germ flour: doum flour than other kinds. This result suggests that the level of protein increases with an increase in the concentration of the replacement .

Also a significant decreased ($P \leq 0.05$) in triglyceride , glucose and total cholesterol obtained from balady bread diet supplemented with wheat germ and doum flour of 2:2 and 3:3% when compared with the control group. Dietary fibres((Table8) in 2:2% and 3:3% replacements have gained immense importance because of their constructive role in releasing sugars and the absorption of these sugars slowly in the intestinal tract; consequently, they reduce the severity of diabetes mellitus and are helpful in reducing blood glucose from (104.1 to 102g / 100ml)and cholesterol from (140.88 to 140 g / 100ml), respectively this result were in the same trend with (Masoodi & Chauhan, 1998) ,Heber, (2004)and Hanee (2012).While the significant decreased ($P \leq 0.05$) in triglyceride and cholesterol may be attributed to effects of high fiber content Chen,. & Anderson,. (1979) and also to high-dose beta-carotene and tocopherols in both wheat germ and doum flour Table(4) which persistent changes in serum lipids and cholesterol ,the obtained results are in the same trend with Hughes et al(1994) and Hsu and Coupar (2006).

Conclusion

Baldy bread is one of the most widely consumed food product in the Middle East. Wheat germ and doum flour could be useful for preparation this product. The investigation shows that there was a significant improvement in the bread protein content, nutritional quality and Therapeutic properties on addition of this mixers powder. The significant increase include crude protein , ash and crude fiber content was achieved acceptable bread that compared favorably well with whole wheat bread were produced with 2:2% wheat germ : doum flour supplementation However, the acceptability decreased with increase in inclusion of conglomeration. The findings of this trial highlight the beneficial effect of doum fruit on human health.

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الخصائص الحسية والكيميائية والوظيفية للخبز البلدى الناتج من تصنيع دقيق القمح مع خليط دقيق الدوم وجنين القمح

الملخص العربى

فى هذه الدراسة تم عمل تدعيم لثلاث خلطات من مكونات الخبز البلدى بإستبدال دقيق القمح استخلاص 82% بخلطات من مطحون الدوم و دقيق جنين القمح بنسب استبدال 1:1 - 2:2 و 3:3% لتصنيع الخبز البلدى كنتاج نهائى .
تم دراسة التركيب الكيميائى لكل الخامات المستخدمة فى التصنيع (بروتين - دهن - اليف - رماد - مواد كربوهيدراتية) وكذلك تمت دراسة خصائص الجودة الحسية والبيولوجية للخبز البلدى الناتج.
أشارت نتائج التحليل الكيميائى للخبز البلدى المدعم بمسحوق الدوم و مطحون جنين القمح زيادة نسب البروتين الدهن - الألياف و الرماد بينما أشارت النتائج الحسية إلى قبول لمظاهر الجودة الحسية لجميع نسب الاستبدال ولكن أقل من العينة المقارنة وتزداد الاختلافات عن العينة المقارنة بزيادة نسب الإستبدال مقارنة بالكنترول .
كذلك أظهرت نتائج التحليل البيولوجى لحيوانات التجارب زيادة فى وزن الجسم المكتسب ونسبة كفاءة الإستفادة من الغذاء المقدم للفئران التى تغذت على الخبز البلدى المستبدل بدقيق جنين القمح مع الدوم .
كما تبين أيضا من نتائج تحليل دم حيوانات التجارب التى تغذت على الخبز المدعم بمطحون جنين القمح ودقيق الدوم زيادة فى نسب الهيموجلوبين والبروتين الكلى مع انخفاض ملحوظ فى نسب الكولسترول - الجلوكوز و الدهون الثلاثية مقارنة بالمجموعة الضابطة.
لذلك يمكن التوصية بإمكانية تدعيم الخبز البلدى بإضافة هذه البدائل بهدف تقابل الكولسترول ، الدهون الثلاثية ،الجلوكوز بنسبة أستبدال حتى 3:3% من دقيق القمح دون تأثير ملحوظ على الخصائص الحسية و كناعية إقتصادية مقبولة ولتحسين الخصائص الصحية لبعض المتداولين الذين يعانون من أمراض السكر وارتفاع نسب الدهون والكولسترول بالدم.