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THE BAKING QUALITY OF WHEAT FLOUR STREAMS AS RELATED TO ASH, PROTEIN CONTENT AND GRANULARITY

Basha, Amal, H, A.
Middle And West Delta Mills

ABSTRACT

18 different flour streams from milling of (mixture of 70% semi hard American wheat grain and 30% American soft wheat grain). Were studied these streams represent the break flour (B_1, B_2, B_3, B_4, B_5) and reduction flours (C_1A, C_2A, C_1B, C_2B, C_3, C_4, C_5, C_6, C_7, C_8, C_9, C_{10}) and C_{11}, as compared with, the (Control) flour extraction 72% rate it was produced commercial with the (Control) all products. The ash content of break flour streams recorded from 0.48% to 0.95% reduction flour streams from 0.39% to 1.59% the protein content of break flour streams from 8.35 to 12.52%, while reduction flour streams from 9.21% to 12.33% while the granularity of break flour streams from B_1 to B_4 (118 micron) , B_5 (112 micron), flour stream C_1A, C_1B, C_4, (132 Micron), C_2A, C_2B, C_3, C_9, (118 micron), C_5, C_6, C_7, C_8, (112 micron and streams C_{10}, C_{11} (140 micron). The (Control) flour recorded 0.60% ash 9.64% protein content and passes through a 260 micron sieve according to the Egyptian low. The chosen streams (B_3 + C_5) in the ratio of 1:1 according to their ash, protein content and granularity showed the best of baking quality, external and internal appearance of pan bread comparing with the pan bread made from flour 72% extraction rate (Control).

INTRODUCTION

The ash, protein content of different flour streams increased as the order of the streams increased (Sayed 1996). The quality of protein as well as it's quality beside soil and the environmental conditions (Pomeranz, 1978) the quality of flour for each use can be determined by it's content of protein and ash.

All wheat grain may be either hard or soft in texture. Hard wheat are commonly called "bread" wheat, the soft textured varieties are used for pastry, crackers, sweet goods and many other baked products. The commonwealth of independent states,. The people's republic of China and USA are the leading wheat producers (Eliasson and Larsson, 2002).

The effect of sieve fractionation of Canadian strong flour on bread baking properties was studied by (Faheid 1992), the results indicated that Canadian wheat flour and its high protein fractions (> 125, 125 – 90 and 90 – 36) were more suitable for bread production, the chemical analysis showed that contents of protein, ash and fiber increased in the coarser fractions of the French and American flours and decreased in the fine fractions.

- Protein content of French flour was increased from 8.47% in the original flour to 12.5% and (0.85% in the fractions with particle size of more than 0.125 mm and of 0.125 – 0.090 mm, respectively, the data also showed that there was a linear relation between protein content and both of ash and fiber contents of each flour fractions. (Beauchemin and Gelinas (2004).
- Studied the effect of wheat flour extraction and the effect of particle size on the values of farinograph and extensograph. Farinograph data

indicated that the water absorption and dough weakening increased with increasing flour extraction. However dough stability and development time decreased with increasing flour extraction. Physical dough test data indicated that, the water absorption however, increased not only with protein content, but also with decreasing particle size. The extensograph results showed the resistance to extension and extensibility decreased with increasing particle size. (Tarek 1999).

- The functional properties could be divided into two groups based on dependence on protein composition. Properties such as dough extensibility and bake test loaf volume correlated highly with percentage of protein in the flour. (Cuniberti etal,. 2003)

MATERIALS AND METHODS

1) Materials:

A. American wheat:

American wheat **(Triticum Aestivum)** were obtained from 23rd July mill. The wheat were cleaned, conditioned mixed 70% semi hard wheat + 30% soft wheat.

B. Eighteen flour stream are obtained during the milling (a mixture of 70% semi hard American wheat grain and 30% American soft wheat grain) in the 23rd July mill, middle west Delta flour company, Egypt.

These streams represent the break flour (B_1, B_2, B_3, B_4, B_5) and reduction flours (C_1A, C_2A, C_1B, C_2B, C_3, C_4, C_5, C_6, C_7, C_8, C_9, C_{10}, and C_{11}) for American mixed wheat.

The (Control) represent the percentage of these streams which comprise flour 72% extraction rate produced from milling the mixture of American wheat.

C. The (B_3 + C_5) flour streams of American wheat was taken depending on the ash, protein content and granularity. (B_3 + C_5) in the ratio of 1:1 are suggested to be for pan bread. Comparing the flour 72% extraction rate which is called (Control) for the mixture streams coming from the different breaks and different reductions was used for pan bread.

2) Methods:

A. Physical tests:

1- Test weight:

Test weight was determined as described in the A.A.C.C methods (1983).

2- Thousand kernel weight:

To determine the thousand kernel weight a 1000 unbroken kernels were count at random manually and weighed in grams.

3- Granulation:

Granulation of flour streams depend on the screen number according to the milling diagram

B. Chemical analysis:

Moisture, ash and protein contents of the studied wheat flour (Control) and streams were determined according to the methods described in A.A.C.C (1983).

C. Technological characteristic:

C-1 Rheological properties of flour:

The rheological properties of flours sample mixing sample (B_3 + C_5) in the percentage of 1:1 and the flour 72% extraction from 23rd July mill (Control) and using the Barabender farinograph according to A.A.C.C (2002).

C-1-1 farinograph test:

Two flours sample were tested according to its moisture content using the Barabender farionograph in the Egyptian Baking and Technology Center, Giza, Egypt to determine water absorption, dough stability and dough weakening according to the methods described in A.A.C.C (2002)

C-1-1-1 Water absorption is defined as:

The amount of water required for the flour to have consistency of 500 Barabender unit line.

C-1-1-2 Dough stability:

The time in minutes elapsing when the top of the mixing curve interacts first the 500 unit it leaves that line.

C-1-1-3 Dough weakening:

It is considered by Barabender units from leaving 500 B.U line to the middle of the curve after 12 minutes.

C-1-2 Extensograph test:

Extensograph test was carried out according to the method described in the A.A.C.C 2002.

C-1-2-1 Dough extensibility (mm):

The (Control) length of base of the extensograph measured in millimeters.

C-1-2-2 Dough resistance to extension (B.U):

The height of the extensograph curve measured in Barabender units (B.U) after 5 min from the start.

C-1-2-3 Dough energy (cm):

It is represented by the area in cm^2 out line.

C-1-2-4 Maximum resistance to extension:

The height of the extensogram by B.U

C-2 Baking test:

Baking test was done on the flours from samples (B_3 + C_5) and (Control).

C-2-1 Pan bread:

C-2-1-1 Method of processing:

Pan bread was manufactured at the Egyptian Baking technology Center, Giza.

The formula used for the prepartion of pan bread was as follows:

Flour 1000 gm, active dry yeast 15.0 gm, salt 15.0gm, sugar 15gm and water (variable) 550 – 600ml the dough was mixed by using the straight dough method by mixing all the ingredients in (Cymix) mixer for 4 minutes at slow speed (30 r.p.m) and for additional 6 minutes at fast speed (60 r.p.m).

The resulted dough was let to rest for 20 min at 28 – 30 C and 80 – 85 R.H (first proofing) then divided, rolled and molded automatically in a molding machine. Each piece was placed in metal pan and let to ferment for 60 min at 36 C and 80 – 85 R.H (final proofing) then baked in an electrically heated oven at 210 – 220 C for 15 – 20 min. After baking, loaves were separated from the metal pan and allowed cool at room temperature.

C-2-1-2 Baking quality of pan bread:

Pan bread from each samples were baking quality evaluated (loaf volume (cc), loaf weight (gm) and specific volume (cc/gm).

C-2-1-3 Organoleptic evaluation of pan bread:

The produced bread was organoleptically evaluated for their sensory characteristics (Symmetry of shape, crust color, break and shred, crumb texture, crumb color, aroma, taste and mouth feel from using 5 experienced panelists from Egyptian Baking Technology Center, Giza , Egypt.

Table (1) organoleptic evaluation score sheet of pan bread:

Properties	Score
External appearance	35
Symmetry of shape	5
Crust color	10
Break and shred	10
Crumb texture	10
Internal appearance	65
Crumb color	15
Aroma	20
Taste	20
Mouth feel	10
Overall acceptability	100

(according to Faridi and Rubenthaler 1985)

RESULTS AND DISCUSSION

1- chemical analysis and physical properties of wheat:

- Results in table (2) showed that the mixed American wheat's gave a high test weight of 80.3kg/Hec **(steven et. al., 1995)**, the 1000 kernel weight recorded that 39.3 gm/1000 kernel. On the other hand the moisture content of wheat was 12.6%, ash 1.74% and protein 11.62%

Table (2) physical properties and chemical composition of American wheat as calculated on 14% moisture basis

Sample	Properties				
	Test weight kg/hec	1000 kernel weight (gm)	Moisture %	* Ash%	* Protein content %
American wheat 70% semi hard + 30% soft)	80.3	39.3	12.6	1.74	11.62

*** 14% moisture basis**

2- The chemical composition of the flour 72% extraction (Control):

Results represented in Table (3) Showed that the moisture content in sample (Control) 13.75%, ash content 0.60% protein 10.64% and the granulation of that flour passes through the sieves (260 micron).

Table (3) The chemical composition of (Control) flour extraction rate as calculated on 14% moisture basis

Sample	Analysis			
	Moisture %	Ash %	Protein %	Screen number (micron)
Flour 72% extraction (Control)	13.75	0.60	10.64	260

3- the moisture content of different flour streams of American wheat.

- Results in table (5,6,7) Showed that the moisture content of break flour streams B_1 B_2 B_3 B_4 and B_5 contained 14.9 , 14.7 , 14.5 , 14.2 and 13.9%.
- While the moisture content of reduction flour streams C_1A, C_2A, C_1B, C_2B, C_3, C_4, C_5, C_6, C_7, C_8, C_9, C_{10} and C_{11} were 13.7 . 13.3 , 13.6 , 13.3 , 13.2 , 13.0 , 13.0 , 12.9 , 12.75, 12.7 , 12.4 , 12.3 , and 11.9% respectively. On the other hand the choose stream (B_3 + C_5) recorded 13.75% as compared with the (Control) form the same results it could also revealed that moisture content of break and reduction flour streams decreased as the order of the streams increased. This was due to heat developing from the fraction of the rolles and wheat through the several break and reduction process.

4- the ash content of the different flour streams:

- Results in Table (4) showed the ash content in the streams B_1, B_2, B_3, B_4 and B_5 were 0.48 , 0.59 , 0.60 , 0.88 and 0.95% respectively while there reduction flour streams (C_1A, C_2A, C_1B, C_2B, C_3, C_4, C_5, C_6, C_7, C_8, C_9, C_{10}) and C_{11}, were 0.49 , 0.45 , 0.43 , 0.48 , 0.44 , 0.49 , 0.60 , 0.71 , 0.75 , 0.80 , 1.0 , 1.38 , and 1.59% respectively.
- The shoosen stream (B_3 + C_5) recorded 0.60% compared with the (Control) flour recorded 0.60%

Table (4) The moisture, ash and protein contents of break flour streams on 14% moisture basis

Analysis	Stream				
	B_1	B_2	B_3	B_4	B_5
Moisture % content	14.9	14.7	14.5	14.2	13.9
Ash content %	0.48	0.59	0.60	0.88	0.95
Protein content %	8.35	8.92	10.18	11.53	12.52

Table (5) The moisture, ash and protein contents of the reduction flour streams

Analysis	Stream												
	C_1A	C_2A	C_1B	C_2B	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}
Moisture%	13.7	13.3	13.6	13.3	13.2	13.0	13.0	12.9	12.75	12.7	12.4	12.3	11.9
Ash content%	0.49	0.45	0.43	0.48	0.44	0.49	0.60	0.71	0.75	0.80	1.0	1.38	1.59
Protein content%	9.21	9.23	9.32	9.39	9.47	9.73	10.07	10.75	10.8	10.92	11.12	11.61	12.33

Table (6) comparison between the moisture, ash and protein contents of the choosen flour streams (B_3 + C_5)

Sample	Analysis		
	Moisture content %	Ash content %	Protein %
$B_3 + C_5$	13.75	0.60	10.12
(Control)	13.75	0.60	10.64

5- the protein content of the different flour streams:

- Results in Table (4, 5) showed that the protein content of break flour streams B_1, B_2, B_3, B_4, and B_5 were 8.35 , 8.92 , 10.18 , 11.53 and 12.52% while the reduction flour streams C_1A, C_2A, C_1B, C_2B, C_3, C_4, C_5, C_6, C_7, C_8, C_9, C_{10} and C_{11} indicated 9.21 , 9.23, 9.32 , 9.39 , 9.47 , 9.73 , 10.07 , 10.75, 10.80 , 10.92 , 11.12 , 11.61 and 12.33% protein content respectively.
- The protein content of the choosen stream ($B_3 + C_5$) recorded 10.12. As compared the (Control) showed 10.64 in table (6)

6- Granulation of the different flour streams was affected by passing the milled wheat through different types of sieves:

- Results presented in table (8,9) according to the milling diagram showed that the granulation of break flour streams B_1, B_2, B_3, B_4 and reduction flour stream C_2A, C_2B, C_3, C_9, that passes through the sieves (118 micrion) while the break flour stream B_5 and reduction flour stream C_5 , C_6 , C_7 , C_8 that passes through the sieves (112 Micron) the granulation of reduction flour stream C_1A, C_1B, C_4 that passes through the sieves (132 micron), while the reduction flour stream C_{10}, C_{11} that passes through the sieves (140 micron).
- The granulation of the choosen flour stream B3 + C5 passes through the sieve (118 , 112 micron) compared with the flour (Control) passes through a 260 micron sieve according to the Egyptian low.

Table (7) Granulation of the different flour streams were affected by passing the milled wheat through different types of sieves

BREAK FLOUR						REDUCTION FLOUR												
Streams	B_1	B_2	B_3	B_4	B_5	C_1A	C_2A	C_1B	C_2B	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}
Sieve number (micron)	118	118	118	118	112	132	118	132	118	118	132	112	112	112	112	118	140	140

Table (8) comparison between the granulation of the choosen flour stream ($B_3 + C_5$) and (Control)

Sample	Sieve number (micron)
$B_3 + C_5$	118 , 112
(Control)	260

7- the farinograms of the flour 72% extraction (Control) as compared the choosen flour stream ($B_3 + C_5$):

- Results given in table (9) and fig (1) showed that the water absorption %, dough stability (min), mixing time (min), and dough weakening (B.U) for the flour extraction 72% (Control) recorded 63.5%, 2.5 min, 1.3 min and 100 B.U comparing these results with the choosen flour stream ($B_3 + C_5$)

showed a water absorption of 60.5%, dough stability 3.5 min, mixing time 2.5 min and dough weakening 80 B.U

- From these results explained that the water absorption increased as the protein content and ash content of streams increased while the dough weakening decreased as the protein of streams increased. Theses results were confirmed by Pratt, J.R (1978), Hoseney (1984), Mohamed (1992) and Sayed (1996).

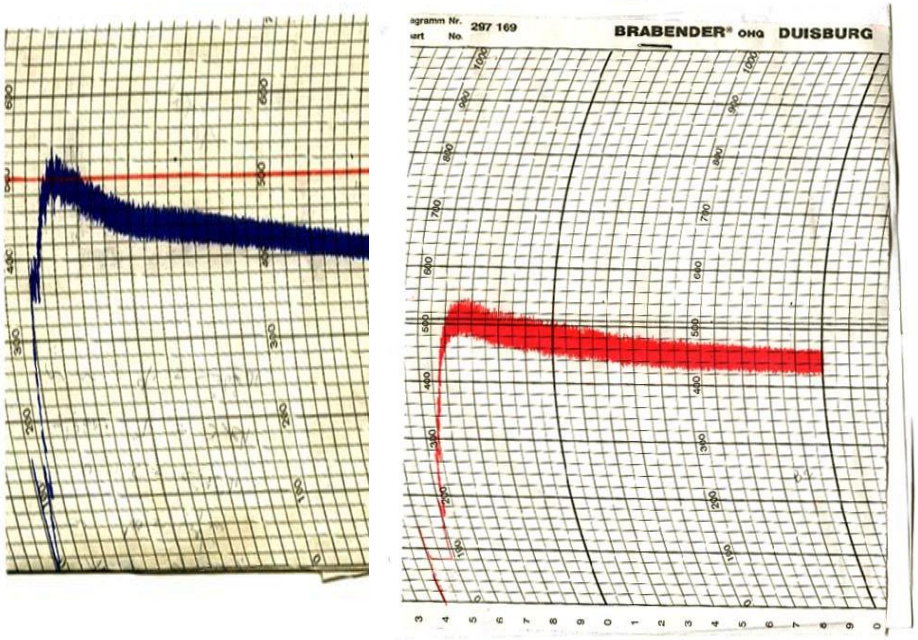

Fig (1) comparison between the farinograms of the flour 72% extraction (Control) and flour stream (B_3 + C_5)

Table (9) comparison between the farinograms of the flour 72% extraction (Control), The choosen flour stream (B_3 + C_5)

Sample	Analysis			
	Water absorption %	Dough stability (min)	Mixing time (min)	Dough weakening B.U
(Control)	63.5	2.5	1.3	100
B_3 + C_5	60.5	3.5	2.5	80

8- The extensograms of the flour 72% extraction (Control) as compared the choosen flour stream (B_3 + C_5):

- Results given in table (10) and fig (2) showed that the extensibility (mm), resistance to extension B.U, Maximum resistance B.U, and energy cm^2 of the flour 72% extraction (Control) recorded 135 (mm) 290 B.U, 310 B.U and 65 cm^2, while the choosen flour stream B_3 + C_5 showed the extensibility 160 (mm), resistance to extension 340 B.U, maximum resistance 470 B.U and energy 94 cm^2.

- From these results the choosen flour stream (B_3 + C_5) given the perfect results of extensograph it was due to the protein content and quality protein. These results indicated with **Sayed (1996) and Othman (2007)**.

Table (10) comparison between the extensograms of the flour flour 72% extraction (Control) and the choosen flour stream (B_3 + C_5)

Sample	Analysis			
	Extensibility (mm)	Resistance to extension B.U	Maximum resistance B.U	Energy cm^2
(Control)	135	290	310	65
B_3 + C_5	160	340	470	94

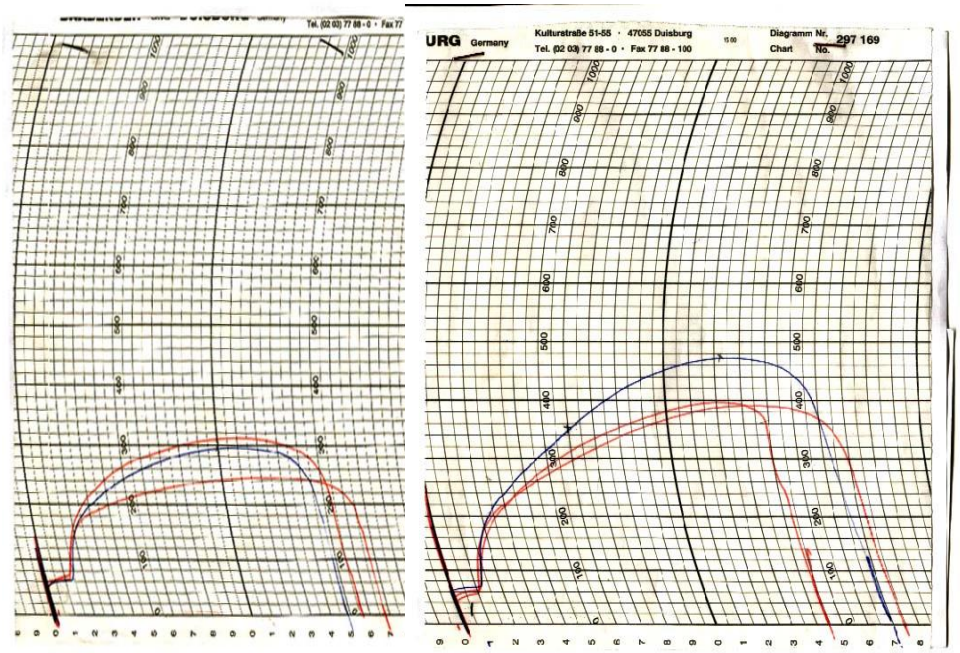

Fig (2) comparison between the extensograms of the flour 72% extraction (Control) and flour stream (B_3 + C_5)

9- Baking test:

9-1 the baking quality of pan bread made from the flour stream (B_3 + C_5) as compared with the flour 72% extraction rate (Control):

results obtained were presented in table (11) and fig (3). The loaf volume of pan bread produced from the flour stream (B_3 + C_5) showed to be 1350 , 1500 , 1625 and 1725 (cc) according to the fermentation periods 60 , 90 , 120 and 150 mins respectively, loaf weight (gm) of 264.6 , 260 , 255.8 and 245 gram at the same times, and specific volume of 5.10, 5.76, 6.35 and 7.04 cc/gm respectively. In comparison the loaf volume of the flour sample coming from the governmental mill (Control) showed a loaf volume of 1275, 1350, 1425 and 1650 (cc) respectively, from the same periods of fermentation and a loaf weight of 275, 270.2, 265,7 and 259,3 gram respectively, showing a

specific volume of 4.63, 4.99, 5.36 and 6.36 (cc/gm). These results were in harmony with obtained by Othman (2007).

- Generally the pan bread produced from mixed stream (B_3 + C_5) showed to be of high and good quality than the sample (Control), a results of the perfect protein and ash content as well as the correct degree of the granulation (112 , 118 micron) these results are in line with Hoseney (1984) , Hoseney (1985) and Othman (2007).

Table (11) the baking quality of pan bread made from the flour stream (B_3 + C_5) as compared with the flour 72% extraction rate (Control)

Characteristics units	Units	Fermentation of periods							
		B_3 + C_5				Control			
		60 min	90 min	120 min	150 min	60 min	90 min	120 min	150 min
Loaf volume	Cc	1350	1500	1625	1725	1275	1350	1425	1650
Loaf weight	Gm	264.6	260	255.8	245	275	270.2	265.7	259.3
Specific volume	Cc/gm	5.10	5.76	6.35	7.04	4.63	4.99	5.36	6.36

Fig (3) the baking quality of pan bread for sample (Control) and flour stream (B_3 + C_5).

9-2 The external and internal appearance of pan bread made from flour stream (B_3 + C_5) as compared with the flour sample taken from the governmental mill (Control)

Results are presented in table (13) and fig (4).

9-2-A- External appearance:

- The obtained results were expressed in degrees. The symmetry of shape for bread made from flour stream (B_3 + C_5) fermented for 60 – 90 – 120 and 150 mins were given 4.0 , 4.5 , 5.0 and 5.0 out of 5.0
- Crust color fermented for 60 – 90 – 120 and 150 mins were given 9.0, 9.5 , 9.8 and 10.0 out of 10.0 respectively.
- Break and shred recorded 9.3 , 9.5 , 10.0 and 10.0 out of 10.0. Crumb texture recorded 9.0 , 9.3 , 9.6 and 9.9 out of 10.0 for the same fermentation periods respectively. In comparison the symmetry of shape for the bread sample made from the governmental mill (Control) recorded 3.0, 3.2, 4.0 and 4.5 out of 5.0 at the same fermentation periods, while the crust color was given 8.0 , 8.5 , 8.7 and 9.0 out of 10.0, break and shred given 8.0 , 8.2 , 8.5 and 9.0 out of 10.0. Crumb texture were given 8.0 , 8.0 , 8.5 and 9.2 out of 10.0 respectively. These results were in good agreement with date reported by **Tarek (1999) and Othman (2007)**.

9-2-B- Internal appearance:

- Results given in table (12) and fig (4) indicated that crumb color for stream (B_3 + C_5) was 13.8 , 14.2 , 14.6 and 15.0 out of 15.0 for the fermentation periods 60 – 90 – 120 and 150 minutes. The aroma recorded 18.8 , 19.0 , 20.0 and 20.0 out of 20.0, taste was 18.8 , 19.2 , 19.6 and 20.0 out of 20.0 and mouth feel recorded 8.8 , 9.3 , 9.5 and 10.0 out of 10.0 respectively. In comparison, the crumb color of the flour sample (Control) recorded 13.0, 13.2, 13.5 and 14.0 out of 15.0, while the aroma was given 17.0 , 17.5 , 17.9 and 18.3 out of 20.0 the taste was given 17.5 , 17.8 , 18.2 and 18.5 out of 20.0 and mouth feel was given 8.0 , 8.9 , 9.2 and 9.5 out of 10.0 respectively. These results were harmony with those obtained by Othman (2007).
- From these results one can conclude that sample (B_3 + C_5) showed the best quality in external and internal appearance which explained.
- The important of the protein quality, ash content and granulation of the flour as related to the baking quality of pan bread these results were supported by pratt, J.R (1978) sayed (1996) Hoseney (1984, 1985) and Othman (2007).

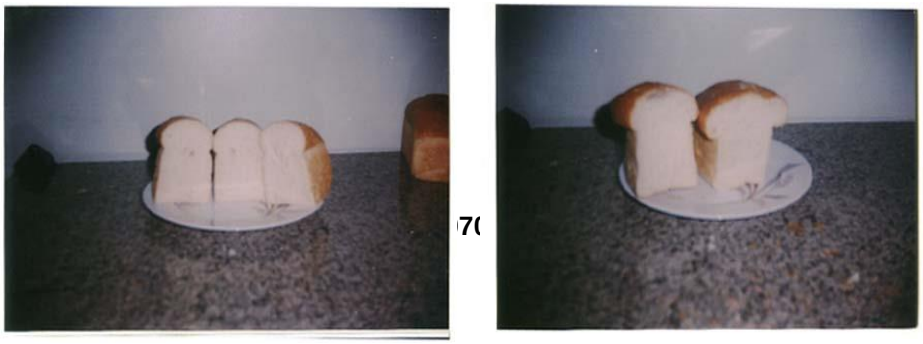

Fig (4) External and internal appearance of pan bread for sample (Control) and flour stream ($B_3 + C_5$).

Table (12) the external and internal appearance of pan bread made from flour stream ($B_3 + C_5$) as compared with the flour 72% extraction rate (Control).

Sample	Fermentation of periods	External appearance				Internal appearance				Overall acceptability 100
		Symmetry of shape 5	Crust Color 10	Break and Shred 10	Crumb texture 10	Crumb color 15	Aroma 20	Taste 20	Mouth feel 10	
($B_3 + C_5$)	60 min	4.0	9.0	9.3	9.0	13.8	18.8	18.8	8.8	91.5
	90 min	4.5	9.5	9.5	9.3	14.2	19.0	19.2	9.3	94.5
	120 min	5.0	9.8	10.0	9.6	14.6	20.0	19.6	9.5	98.1
	150 min	5.0	10.0	10.0	9.9	15.0	20.0	20.0	10.0	99.9
(Control)	60 min	3.0	8.0	8.0	8.0	13.0	17.0	17.5	8.0	82.5
	90 min	3.2	8.5	8.2	8.0	13.2	17.5	17.8	8.9	85.5
	120 min	4.5	8.7	8.5	8.5	13.5	17.9	18.2	9.2	89.0
	150 min	4.0	9.0	9.0	9.2	14.0	18.3	18.5	9.5	91.5

CONCLUSION

- The moisture content of break four stream for American wheat decreased as the order of the streams increased, and the moisture content lowest the reduction flour streams. This was due to that developing from the fraction of the rolls and wheat through the several break and reduction.
- The ash content increased in the subsequent streams and the different reduction flour stream in were due to the subsequent increase in protein and branny materials in flour streams.
- The granulation of the choosen flour stream ($B_3 + C_5$) suitable the baking quality, external and internal appearance of pan bread the water absorption increased as (the protein quantity and quality) and their ash contents, while the dough weakening decreased as the protein increased.
- The extensograph test showed to be high results in the choosen flours stream ($B_3 + C_5$) comparing the (Control). This explained the importance of the protein quality and ash in this streams.
- The external and internal appearance of pan bread made from flour stream ($B_3 + C_5$) having high quality although their protein quality, granularity lesser then (Control)
- Generally from results explained the importance of the suitable protein quality, ash content, granularity as related the Rheological properties, baking quality of pan bread comparing these results with (Control) flour extraction produced by 23rd July mill it were due to the increase in offal's.

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THE BAKING QUALITY OF WHEAT FLOUR STREAMS AS RELATED TO ASH, PROTEIN CONTENT AND GRANULARITY

علاقة نسبة البروتين والرماد ودرجة التحبب للدقيق الناتج من مخارج دقيق القمح بجوده الخبيز

أمال حامد عفيفي باشا
شركة مطاحن وسط وغرب الدلتا

- **تم** دراسة 18 مخرج من نواتج طحن (القمح الأمريكي النصف صلب70% + 30% قمح أمريكي طرى) من خلال مرحلتي الدش والتنعيم.
- مرحلة الدش تتضمن المخرج B1 , B2 , B3 , B4 , B5.
- مرحلة التنعيم وتشمل المخارج C1A, C2A, C1B, C2B, C3, C4, C5, C6, C7, C8, C9, C10 , C11.
- تم تقدير نسبة الرماد والبروتين بتلك المخارج المختلفة ومعرفة درجة التحبب لها من خلال معرفة سعة ثقوب المناخل التي مرت منها طبقا لتصميم المطحن والقوانين المنصوص عليها. ومقارنتها بالدقيق النهائي استخراج 72% الناتج من جميع تلك المخارج.
- تراوحت نسبة الرماد بالمخارج الناتجة من مرحلة الدش ما بين 0.48 - 0.95% , وسجلت في مرحلة التنعيم من المرحلة C11 إلى C1A نسبة رماد 0.39 - 1.59%.
- بينما تراوحت نسبة البروتين في مرحلة الدش 8.35 - 12.52%.
- وتراوحت نسبة البروتين في مرحلة التنعيم 9.21% - 12.33%.
- وكانت درجة التحبب بالدقيق الناتج من مخارج الدش B1 , B2 , B3 , B4 118 ميكرون ، 112 ميكرون للمخرج B5.
- وبالدقيق الناتج من مخارج التنعيم 132 ميكرون للمخرج C_4 , C_1B , C_1A C ، 118 ميكرون لـ C_9 , C_3 , C_2B , C_2A C ، 112 ميكرون لـ C_8 , C_7 , C_6 , C_5 ، 140 ميكرون لـ C_{10} , C_{11}.
- بينما كانت نسبة الرماد بالدقيق استخراج 72% (الكونترول) 0.6% ونسبة البروتين 9.64%، ويتم نفاذ ذلك الدقيق من منخل قطر ثقوبه 260 ميكرون طبقا لما تنص عليه المواصفات المصرية.
- تم اختيار المخرجين B_5 , B_3 بنسبة خلط 1 : 1 طبقا لنسبة الرماد والبروتين ودرجة التحبب.
- أعطى هذا المخلوط أفضل صفات جودة للخبز القالب (التوست) من حيث وزن الرغيف وحجمه وكذلك الصفات الداخلية والخارجية للخبز المنتج مثل لون القصرة ومظهرها ولون اللبابة واسفنجيتها والطعم والرائحة ... الخ وذلك مقارنة بالخبز المنتج من الدقيق استخراج 72%.