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Technological Study of Different Wheat Species in Gaza Strip

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Abstract
Bread is a major part of the diets in Palestine. The present study was carried out to investigate the physical and chemical character of wheat and flour produced from different varieties and evaluate these species and possibility of utilization in some food products such as flattened bread. Available six wheat types of 2007 season (LR5, LR6, MR7, MR19, MR22, and Emlag) were obtained from the Agricultural Research Center, Ministry of Agriculture, at Gaza City, Palestine. The chemical composition of studied wheat cultivars indicated that the Moisture content 10.40 – 12.10 %. The content of proteins, Crude ether extract, ash and crude fiber were (8.14 – 12.36 %), (1.54 – 2.20 %), (1.47 – 1.94 %), (1.46 – 2.09 %) respectively. The results indicated that the variety (LR5) obtained the highest value in resistance to Extension, while (LR6) got the highest value in extensibility, while (MR7) was the most Strength in dough than the rest of the samples and in terms of taste and flavor, the best variety was (LR6). Comparative studies were conducted on the effect of room temperature, refrigerator and freezer in bread stalling. This study showed a decrease in the moisture content and an increase in the friability of the pulp during storage. During the first day of storage, a decrease in the softness of the pulp occurs, while the friability of the pulp with storage increased significantly during the first three days of storage, while this decreased during storage in the refrigerator and was very little during storage in the freezer. It could be noted that the highest stalling values was obtained for bread in refrigerator at 4 °C, while the lowest values were observed when storage at room temperature.

Keywords: Syrian Wheat, Physical and Chemical Analysis, Gaza City, Palestine

1. Introduction
Wheat (Triticum aestivum) is considered the widest spread cereal crop used in bread making. The increase in per-capita in the Palestinian population together with consumption led the government to import large amounts of wheat from different countries. In the last two decades the production of both maize and sorghum increased significantly, while the consumption was decreased. In addition, the price of both crops is less than the wheat grains (PCBS, 2006) [20]. Moisture content of some Spp of wheat flour was 12.07 % (Bailey and Boulter, 1970) [2]. Also, (Chung *et al*., 1976) [4] showed that the hard winter wheat flour contained 13.7% moisture. The moisture content of whole wheat grain was 12.85 %, while it was 13.0% in wheat flour (Mansour *et al*., 1989; Damir, 1981) [18, 7]. (Dreese and Hoseney, 1982) [8] reported that hard red winter wheat flour had 11.4% protein. (Iryine and McMullan, 1982; Lawrence, 1971; Kasarda *et al*., 1971; Hoseney, 1979) [-, 17, 15, 13] stated that the protein content of wheat flour was of great importance in bread-making and depending on the environments of cultivation. (Tipples, 1974; Damir, 1978; El- Shimi, 1975; El-Sayed *et al*., 1978) [27, 6, 10, 9] determined the protein content of different wheat flours of various gluten strength and indicated that the percentages of protein, fat, ash, and crude fiber in hard wheat flour were higher than in soft wheat flour and the overall backing quality of wheat flour was affected by both protein quantity and quality. The ash content of ranged from 0.7 to 0.9 % for flour with 72% extraction and 1.4 – 1.6 % for flour with 95 % extraction rate (Kent and Amos, 1967) [16]. (Sidwell and Hammerle, 1970; Hellmann *et al*., 1954) [26, 12] reported that Fat was varied in wheat from 0.1 – 1.08 % (as dry weight basis), while the figure of 1.5 – 2 % was reported by (Kent and Amos, 1967) [16]. Physical and rheological properties of wheat flour depend to a great extent on its chemical composition (Pyler, 1952; Sandstedt, 1961; Meredith and Bushuk, 1962) [24, 25, 19].

2. Material and methods
2.1 Study area
The Gaza Strip (Fig 1) is the southern region of the Palestinian coastal plain on the Mediterranean Sea; Gaza has a population

of about 2.1 million. They live in 5 governorates: North Gaza, Gaza City, Deir al-Balah, Khan Yunis and Rafah. Bordered by Israel to the north and Egypt to the southwest, on the Mediterranean coast, with an area of about 365 square kilometers. It is only 41 km long. The annual harvest of wheat barely covers the demand for one week in Gaza, which consumes up to 500 tons of flour per day.

Fig 1: Selected study area

2.2 Raw materials

The materials used in this study are wheat grains obtained from Syrian wheat (soft wheat). Six wheat Spp namely (LR5, LR6, MR7, MR19, MR22, and Emlag) were obtained from the Agricultural Research Center, Ministry of Agriculture, at Gaza City, Palestine. The samples of 2007 season were packed in polyethylene bags and kept at refrigerator at 4°C for analysis and experiments.

Table 1: Annual Production of six varieties of wheat in Palestine during the years 2002-2006

Year	Production (metric tons)					
	LR 5	LR 6	MR7	MR 19	MR 22	Emlag
2002	547	533	623	383	618	917
2003	587	557	501	549	514	938
2004	450	695	1160	795	980	930
2005	1420	1489	969	1056	1336	1243
2006	1710	1420	1636	1276	1510	1426

Where: LR = Low Rain
MR = Medium Rain

2.3 Methods

samples of 5gm each of wheat flour were randomly taken and dried to a constant weight in a forced air oven at 130 ± 1 ºC to a constant weight (No.44-15 A). Protein of wheat flour was determined using micro-kjeldhal method. The samples of wheat flour (0.1gm) were digested with concentrated sulphoric acid followed by with Sodium hydroxide distillation. The formed ammonia was received in a boric acid solution and then titrated with a standard hydrochloric acid. Crude protein percentage was calculated by multiplying the total nitrogen in the wheat flour by 5.7. Ash content, Crude lipid, Crude fiber, Nitrogen free extract, Protein fractions, Rheological Tests and Extensograph tests were determined.

2.4 Technological methods

Flat bread was made according to (Dalby, 1963) [5] as follow: five hundred grams of wheat flour (82 % extraction) 10 gm salt, 10 gm baker's yeast. The required amount of water to obtain optimum dough consistency were added. The dough was mixed for 5 min and left for 30 min for resting. The ability of the bread to be stored without staling was measured quality of the resulting product. The flattened bread was stored in polyethylene bags for zero time (after baking) then 24, 48, and 72 hours at room temperature refrigerator at 4 C˚ and Freezer. Bread staling was determined according to the procedure described by (Bechtel *et al*., 1953) [3]. Multiple factors contribute to staling including moisture loss, starch retrogradation and loss of crumb cohesion.

Data were analyzed by Microsoft Office Excel and statistical package of the social science program (SPSS) and descriptive analysis were conducted for different variables.

3. Results and discussion

3.1 Chemical composition of wheat flour

The studied wheat spp. (LR5, LR6, MR7, MR19, MR22 and EMLAG) were chemically analyzed for moisture, protein, fiber, lipid, ash and nitrogen free extract shown in Table 2.

Table 2: Proximate chemical composition of different wheat flour (% dry weight basis)

Constituent	Types of Wheat					
	LR5a	LR6b	MR7c	MR19d	MR22e	EMLAGf
Crude protein	12.05	9.50	12.16	12.15	8.14	12.36
Crude Lipid	1.63	1.96	2.20	2.15	1.54	2.12
Crude fiber	1.51	2.09	1.58	1.92	1.81	1.46
Ash	1.55	1.79	1.47	1.80	1.72	1.94
Nitrogen-free extract*	83.26	84.66	82.59	81.98	86.79	82.12

Where

a) Low rains (5), moisture content: 10.4 %.
b) Low rains (6), moisture content: 11.60 %
c) Medium rains (7), moisture content: 11.30 %.
d) Medium rains (19), moisture content: 11.20 %.
e) Medium rains (22), moisture content: 11.20 %.
f) Emlag, moisture content: 12.10 %.

As seen in Table 2, the six wheat spp varied in their chemical constituents. Protein content was varied from the highest value (12.36, 12.16, 12.15, and 12.05) for (Emlag, MR7, MR19 and LR5) to the lowest values (9.50 and 8.14) for LR6 and MR22). The results of different spp. wheat flour composition are in good agreement with those reported by (Posner and Deyoe, 1986; Fellers, *et al*., 1976; Pederson and Eggum, 1983) [23, 11, 21] for soft wheat flour.

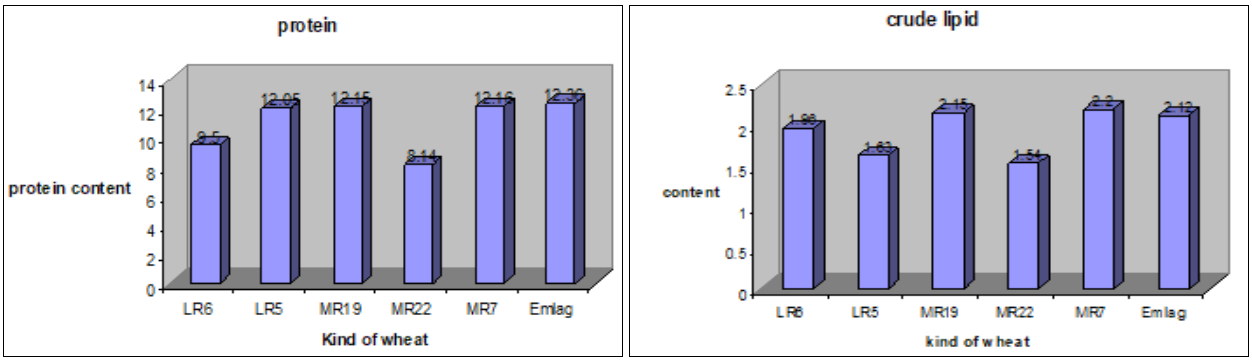

Fig 3: Average of protein and crude lipid content in different wheat spp flour

3.2 Statistical analysis of Proximate composition of different kinds of wheat

Statistically analyzed of different kinds of wheat as shown in Table 3. Meanwhile, there is no statistical difference in the Crude Fiber among the different kinds of wheat (LR6, LR11, MR19, MR22, MR25, Emlag) at significant at $\alpha = 0.05$, since the test F value equal 1.483 which is less than the critical F value which is equal ***3.11*** and the p-value equal 0.266 which is greater than 0.05.

Table 3: ANOVA test for the Chemical Composition of different wheat Spp flour

Dependent Variable	Source	Sum of Squares	Df	Mean Square	F	Sig.
Moisture content	Between Groups	4.680	5	0.936	8.023	0.002
	Within Groups	1.400	12	0.117		
	Total	6.080	17			
Crude protein	Between Groups	48.085	5	9.617	128.283	0.000
	Within Groups	0.900	12	0.075		
	Total	48.984	17			
Crude fiber	Between Groups	0.799	5	0.160	1.483	0.266
	Within Groups	1.293	12	0.108		
	Total	2.092	17			
Crude Lipid	Between Groups	252.801	5	50.560	2215.933	0.000
	Within Groups	0.274	12	0.023		
	Total	253.075	17			
Ash	Between Groups	0.452	5	0.090	3.807	0.027
	Within Groups	0.285	12	0.024		
	Total	0.737	17			
Nitrogen-free extract	Between Groups	51.731	5	10.346	10.346	0.001
	Within Groups	12.000	12	1.000		
	Total	63.731	17			

There are no significant differences were observed for albumins in water solubility. The lowest albumin value was obtained in (LR6 and MR 22). Farinograph and Extensograph Parameters showing that wheat flour spp. LR5 showed the lowest arrival time (2.0) and mixing time (3.5) with stability of 4 minuet and water absorption of 71%. It also had the lowest values of extensibility (6.3) and the highest value of elasticity (5.0). This followed by wheat spp. MR7 that had an arrival time (2.5) and mixing time (3.5) with water absorption (71.1) and stability (4.0). This MR7 had moderate extensibility and high elasticity and area (strength) wheat sp. LR6 showed high water absorption (71) large arrival, mixing time and moderate stability with low weakling value. It had high extensibility and low elasticity. MR22 wheat had the highest water absorption value (76%), moderate arrival and mixing time and stability with high degree of weakening value. It also had low extensibility, Elasticity and strength. Wheat flour spp. MR19 had moderate water absorption, long arrival and mixing time. It had low water absorption, long arrival and mixing time with lowest stability. This indicates that LR5 wheat spp. had almost the highest reheological characteristics followed by MR7, LR6, MR22, and MR19.

Generally, appearance, flavor and texture of the flattened bread samples were significantly differences among various flattened bread. Moreover, it was clear that flour wheat from LR5, LR6, MR7, MR19, Emlag and MR22 produced flattened bread of organoleptic properties quite similar to that of the control. There are no significant differences among various flattened bread were observed for the

appearance. The obtained results showed that the highest and significant score for LR5 bread appearance was observed but the MR22 bread scored the lowest points for appearance. The results in Table (13) show that the texture score was 7.70, 7.00, 6.90, 6.62, 5.86 and 5.80 for flattened bread made at LR6, MR7, LR5, Emlag, MR22 and MR19 There is not statistical difference in texture among the different kinds of flattened bread. The highest stalling value were obtained under zero time, while the lowest values of stalling was recorded under 72 hours, indicating that the fresh starch was found in zero time, after 72 hours at room temperature, it turned in to complex from.

The results showed that in control and the six flattened bread varied in their stalling increasing time of stalling, decreased the time of freshness of bread. Also, Stallings decreased by using Freezing and Refrigerator storage. These results were confirmed by (Platt and Powers, 1940; Alxford *et al*., 1986) [22, 1].

4. Conclusion

The bulk of the flour in Palestine, both locally cultivated and imported is used for bread making Palestinians consume large quantities of bread which furnishes up to 72% of the total calories and 70% of the total protein intake. The low-income people derive almost 90% of their calorie's intake from bread and cereals.

The results show that flavor score was 7.50, 7.30, 7.20, 7.00, 5.70, and 5.20 for flattened bread made at LR6, LR5, MR7, Emlag, MR22 and MR19. There is not statistical difference in flavor among the different kinds of bread. Four spp. of the six tested wheat contained the high content of protein (12.05 % -12.36 %) compared to the other two spp. (8.14-9.50). Lipid, Fiber and ash contents were varied from 1.63 % -2.2 %, 1.46 % -2.09 % and 1.47 % – 1.94 % respectively. the six wheat spp varied in their moisture content, the wheat cultivars (Emlag) contained the highest content (12.10 %), followed by (LR6) which contained (11.6 %), while (LR5), the lowest content of moisture (10.4%), meanwhile, (MR19 MR22 MR7) Contained the nearest level which is equal (11.30). The wheat cultivars (MR7) gave higher lipid content than the other kinds. The result shows that the crude fiber content in different kinds of wheat ranged between 1.46% and 2.09%, where (LR6) gave the highest. The N-free extract percentage was markedly lower in content of protein.

All Cultivars under the study don't have the capability to produce high quality bread. There is a possibility to mix these cultivars with different portions with other cultivars in order to obtain high quality bread.

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