

привода его отдельных рабочих органов. Протравливатель ПСШ-5 – 4 электродвигателя. Выпущенный в 2011 г. ПСС-20 – 6 электродвигателей, запитываемых от трехфазной электросети 380 В.

На современных сеялках типа АПП-6Д вал высевующих аппаратов имеет электрический привод от аккумуляторной батареи трактора, что, согласно рекламе, улучшает качество высева.

В этой связи наши разработки, направленные на внедрение в сельхозмашиностроение автономной электрифицированной системы, весьма актуальны.

Внедрение электрифицированной машины [7] для полосного подсева семян трав в дернину в производство позволит значительно улучшить качество выполняемой операции и поднять сельхозмашиностроение на более высокий уровень.

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ENZYMATIC ACTIVITY AFTER THE HARVEST OF IRAQI WHEAT VARIETIES

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(Поступила в редакцию 21.07.2014 г.)

Summary. It is carried out a laboratory experiment for the purpose of evaluating the enzymatic activity and some physical and chemical properties of three varieties of wheat to Iraq after harvest 2012-2013 season. The results showed that wheat varieties may differ significantly in most of the traits where parents cultivar EBAA 99 recipes in test weight and thousand kernel weight and protein content by

giving it the highest rate was 81 hectoliters and 44 grams and 12.93%, respectively. And found significant differences in the varieties of wheat flour studied where parents cultivar EBAA 99 recipes in the proportion of protein and wet and dry gluten giving it the highest rate of 11.93, 27 and 9.3%, respectively. The record class EBAA 99 lower level of activity enzymatic Flour giving it the highest rate reached 499 second. Also the results showed that wheat varieties for recipes rheological cultivar EBAA 99, Abu Ghraib and the parents of EBAA 99 per prescription absorption dough of water and showed class Rashid superior in dough development time and stability and extensibility, and conclude from this study that the class parents 99 was however, in the preferred enzymatic activity and the good qualities of the bread flour.

Introduction. Wheat (*Triticum aestivum*) is the most important crop for making bread and staple food for the people of all over the world, due to its absolute baking performance in comparison to all other cereals(1). The varietal trials are common to develop new wheat varieties and maintaining the vigor of the old ones. Wheat kernel structure consists broadly of three essential constituents; Bran, endosperm and germ. Endosperm, the major constituent, contains mainly starch granules embedded in a proteinaceous matrix and accounts for 81-84% of the grain. Germ contains the embryo and the scutellum and amounts to 2-3% of the grain. Bran, which forms 14-16% of the grain, consists of all outer layers including the aleurone layer, which is usually removed along with the other bran layers during milling, although botanically the aleurone layer is the outer layer of the endosperm. The main chemical compounds of the wheat are carbohydrates, protein and lipids. These components are non-uniformly distributed within the wheat kernel (1).

Wheat quality depends upon the genetic factors but environmental conditions, growth locations; agronomic practices prevailing during different wheat growth stages greatly alter the wheat quality attributes. Generally wheat quality refers to its suitability for a particular end-use based on physical, chemical and nutritional properties of wheat grain. Protein content is a key quality factor that determines the suitability of wheat for a particular type of product as it affects other factors including mixing tolerance, loaf volume, water absorption capacity amylase activity and etc(2). The distribution of α -amylase within the wheat kernel and ultimately the distribution within mill fractions will be influenced by environmental factors such as degree of severity of sprouting at harvest time. Thus, early germination of cereals results in the liberation of gibberellic acid from the embryo into the aleurone with resulting de novo synthesis of α -amylase in this layer(3).

Amylases are of considerable importance in the cereals industry because of their overall effect upon the bread making quality of a wheat. Thus excess levels of α -amylase in a wheat flour may lead to bread having a coarse, sticky crumb. Falling Number value is critical for final product be-

cause there is direct relationship between α - amylase activity and finished product attributes e.g. bread crumb quality and loaf volume (4).

Therefore, the present study aimed to assess the chemical and physical characteristics and amylase activity of different wheat cultivars in Iraq.

Materials and Methods. Three Iraqi bread wheat, Rasheed, Abu greab and Ebaa 99 harvested in 2013 were selected in the present study. These samples were provided from the Ministry of Agriculture, the General Commission for Scientific Agricultural Research, Wassit Research Station, which is located in the east of Iraqi. The samples were cleaned and done Kg grains of each cultivar were tempered to 15.5% moisture and milled in a Buhler Laboratory Mill (Model MLV-202, Switzerland) to obtain 80% extraction rate.

Physical Analyses Test Weight. Test weight was determined using the approved method of the American Association of Cereal Chemists 55-10 (5) and the results were reported in kg/hL. Damaged kernels were separated from the sound kernels for all the samples for the thousand kernel weight test, thousand grains were counted and weighed (6).

Chemical Analyses. Water content of the kernels and the flour was determined by the approved AACC method 44-15 (AACC 2000). Protein content was conducted using the Kjeldahl method and expressed using the conversion factor $N \times 5.7$ (AACC 2000). Falling number was determined using the approved AACC method 56-81 (AACC 2000). Ash content was determined on a 5-g sample in a silica dish incinerated overnight at 585°C. After cooling, the dish and ash are weighed, the ash brushed out, the dish reweighed, and the weight of ash determined by differences using the approved method 08-01 (AACC 2000). Results were expressed at a 14% water content basis and each sample was tested in triplicate and reported as percent.

Falling Number: The falling number, an index of alpha amylase activity, was determined according to AACC (2000). Briefly 7.0 \pm 0.05 g ground samples, based on moisture percentage were taken for the falling number test and transferred into Viscometer tubes. 25 \pm 0.2 ml of distilled water was added to each sample in viscometer test tubes, after shaking and stirring the values was noted directly from apparatus.

Gluten Content: The gluten content was estimated by using Perten's Glutomatic System. The Glutomatic System measured the gluten quantity and quality in wheat. Gluten is the visco elastic substance formed through the interaction between the wheat proteins glutenin and gliadin, wheat lipids and water under the influence of energy. Gluten is critical for the technological quality of common wheat and durum wheat. The Glutomatic test can be

performed on both wheat flour and wheat whole meal. If a test is performed on whole grains a hammer type Laboratory Mill is used to grind the grains.

Rheological Characteristics

Rheological characteristics of wheat flour were determined in duplicate, using both a Brabender Farinograph (54–21) and an Extensograph (54–10) according to standard. Approved methods of the A A C C (2000) procedures tested in Farinograph and specific indications were determined, include: the percent of absorbed water, the dough development time, the dough resistance time and calorimetric value. Mentioned flours also were tested in Extensograph specific parameters of the dough; dough resistance to extension, the dough extensibility and energy.

Statistical Analyses

One way analyses of variance (ANOVA) was used for analysis of data by applying Duncan's Multiple Range Test at $P < 0.05$ using ASSISTAT Version 7.7 beta program (7).

Results and discussion

Table 1 represents mean values of physical characteristics of wheat varieties. The results indicated that the thousand kernel weight differed significantly among the wheat cultivars it was found to be the highest in E-baa99 followed by Rasheed while it was the lowest in Abu greab. Also, the results indicated that the test weight was found to be the highest in Ebaa99 and value was 81 kg/hl, while non significant between Rasheed and Abu greab wheat cultivars and ranged from 78 to 79.00 Kg/hl (Table 1). These results are in close agreement with the results reported by (8) who reported that the test weight varied in different Iraqi wheat cultivars. In the present studies, differences in the thousand kernel weight are attributed to the differences in the genetic make up of the wheat varieties/Lines. Thousand kernel weight differed significantly among the wheat cultivars.

Chemical characteristics

Mean values for chemical analysis of the different wheat varieties are shown in

Table 1. The maximum moisture content was observed in Abu greap that was 8% followed by Rasheed as 7.43% and Ebaa 99 as 7.2%. It indicated low moisture wheat samples which is relatively low, which may be due to High air temperature during the harvest period . Its suitable for storage and would be less prone to microbial attack. Moisture content is dependent on genetic makeup of wheat varieties and is largely influenced by agronomic and climatic conditions (8). The maximum ash content was observed in Rasheed that was 1.54% while the lowest content was found in Abu greap as 1.49%. The ash content of flour is related to the amount of bran in the flour and therefore to flour yield. The average protein content in all

wheat varieties ranged from 12.93 to 12.63% for the variety Ebaa 99 and Rasheed respectively. The protein content is an important criterion while considering the wheat quality. It is a key factor in determining the suitability of wheat for different products. In many areas of the world it is fundamental criterion for establishing the economic value of wheat. Protein content is an inherent characteristic but the quantity of protein depends on the growing conditions (9). Variation in protein content among wheat varieties is due to differences in their genetic makeup as well as differences in environmental and production conditions prevailed during growth stages (10).

Table 1 – Physicals and chemicals characteristics of wheat cultivars

Wheat cultivars	Ash	Moisture	Protein	T. weight	TKW
Rasheed	1.54 a	7.43 b	12.63 b	79b	44 a
Abu graep	1.49 c	8.00 a	12.86 ab	78 b	42 b
Ebaa 99	1.51 b	7.20 c	12.93 a	81a	40 c

Means with the same letter are not significantly different.

Chemical/general characteristics: It is evident from the data on chemical characteristics of the 80% extraction wheat flour are given in Table 2. The chemical components such as moisture, crude protein and total ash differed significantly in wheat flour as well as in wheat cultivars. Highest moisture content was found in Abu graep followed by Ebaa 99 and lowest was found in Rasheed and was ranged from 13.90 to 13.13 %. Ash content in wheat flour (1.17 %) of Abu graep was found to be higher followed by Rasheed and lowest was found in Ebaa 99. Highest protein content was found in Ebaa 99 followed by Abu graep and lowest was found in Rasheed and was ranged from 11.93 to 11.43 %.

Gluten contents: The comparison of dry gluten and wet gluten content of different wheat varieties is presented in Table 2. The highest wet gluten content 27.5% was observed for wheat variety Ebaa 99 while the lowest value 26% for wet gluten was observed in wheat variety Abu graep and the highest value 10.84% for dry gluten was observed for wheat variety Ebaa 99 while the lowest dry gluten value 8.40% was observed for wheat variety Abu graep. The differences in gluten content among different samples may be ascribed to the variation in genetic makeup of wheat varieties, climatic conditions and differences in cultural practices and growth locations (10). Highest protein content of flour is not necessarily indicative of its strongest gluten strength i.e. quantity as well as quality of protein both are important for the evaluation of their end product suitability. Both wet and dry gluten content are associated with the ability of protein within the wheat varieties. Wheat protein made a great contribution to the rheological properties of wheat flour dough. Any change in the protein content or chem-

ical structure of wheat protein significantly alters rheological and bread making characteristics of the wheat flour dough (11).

Table 2 – Physicals and chemicals characteristics of wheat flour

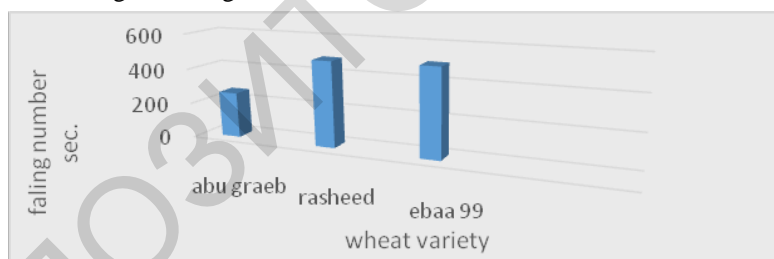
Wheat cultivars	Characteristics				
	Protein	Moisture	Wet gluten	Dry gluten	Ash
Rasheed	11.33 b	13.13 b	26.00 b	8 b	1.15 a
Abu graep	11.43 b	13.90 a	27.46 a	9.4 a	1.17 a
Ebaa 99	11.93 a	13.20 b	27.00 a	9.3 a	0.98 b

Means with the same letter are not significantly different.

Falling number: Iraqi wheat varieties were studied for falling number values. Graphical presentation (Fig 1) shows the comparison of falling number values for different wheat varieties. Falling number values were ranging from 259-499 seconds. The highest value 499 seconds was obtained for wheat variety Ebaa 99 while the lowest value of 259 seconds was obtained for wheat variety Abu graep. The results revealed that Iraqi wheat varieties are low in amylase activity.

In case of falling number, Ebaa 99 had the highest mean falling number and conversely lower alpha amylase activity while Abu graep had lowest mean falling number and therefore higher amylase activity. Alpha amylase activity depends on weather conditions, especially precipitation and mineral fertilizer (12).

Fig. – Falling number of wheat flour 80% extraction rate



3.2. Farinograph characteristics

Table 3 shows mean values of farinographic characteristics. Water absorption is considered to be an important characteristic of wheat and composite flour (13). It ranged from 61.5 to 59.4% for wheat Abu graep and variety Ebaa 99. In the present study, the results of water absorption are very close to the results of earlier researcher (14) in which water absorption ranged from 53 to 60%. The dough development time also varied among all the wheat varieties and the results were in line with the previous findings (15). It ranged from 3.8 to 7 minutes for Abu graep and variety Ebaa 99 respectively. There exists a range of dough development time for hexaploid wheats from <90 seconds to 240 seconds (16). The results of the present

study were also close to those findings. Developed doughs have higher complex moduli than the undeveloped doughs. Higher dough development time reflects strong flour while its lower value is an indication of weak flour.

Maximum dough stability (8.8 minutes) was observed in case of variety Ebaa 99 and minimum (2.5 minutes) for Abu greap and Rasheed. The dough stabilities in the present study were approximately in range with that finding. Dough stability beyond 10 min may be more suitable to the baker as it can withstand mixing for longer period (17).

3.3. Extensograph characteristics

Extensograph characteristics of 80% extraction rate flours in (Table 3) showed that the extensibility and resistance to extension ranged from 124 to 148 mm and 96 to 414 BU, respectively, whereas the R/E ratio ranged from 0.8 to 2.8. The wheat flour (Ebaa 99) showed extensibility values of 148 mm and resistance to extension of 414 BU, compared to other wheat flour, indicating that the dough from whole wheat flour behaved as a stiff dough.

Table 3 – Comparison of means for rheological characteristics of flour 80% extraction rate of wheat varieties.

Wheat Cultivars	Farinograph characteristics			Extensograph characteristics		
	R/E	Resistance to extension R (BU)	Extensibility E (min)	DS ^b (min)	DDT ^a (min)	Water absorption (%)
Rasheed	2,8	414	148	8,8	7	59,4
Abu graip	1,2	166	136	2,5	3,8	61,5
Ebaa 99	0,8	96	124	2,5	3,9	61,0

a DDT – dough development time.

b DS – dough stability.

Conclusion:

It was concluded that physico-chemical and rheological characteristics of wheat varieties was good and comparable to International standards. The wheat variety Ebaa 99 possessing highest protein contents, good rheology characteristics and low amylase activity is better than other varieties tested in the present study.

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