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QUALITY TEST OF LOCAL VARIETIES AND GENOTYPES INTRODUCED WHEAT (*TRITICUM AESTIVUM* L.) DURING FOUR PLANTING DATES

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Abstract

The study was conducted during the winter season 2018-2019, at the extension station of the Agricultural Extension Service, Ministry of Agriculture, using 15 local varieties and newly introduced genotypes (Iba 99, Bohoth 22, Al-Rasheed, Tamos 2, Baghdad, Latifa, Wafiyah, Babil, Iraq, Abu Ghraib, coa, Nwewya, Nacowy potas, N1, N2), under the influence of four planting dates (November 1, November 15, December 1 and December 15), to know the effect of planting dates on the qualitative traits of the varieties**.** The split-plot system was implemented with Randomized Complete Block Design (R.C.B.D) with three replicates, main plots included planting dates, while secondary plots included wheat bread items. The date of planting, November 15, gave the highest 1000 grains weighed 40.40 g, the highest specific weight is 80.74 $hl.kg^{-1}$, while the date of planting December 15 gave the highest averages in terms of ash, protein and wet and dry gluten content, reached 1.71, 11.80, 29.26 and 10.71%, respectively. The varieties included in the study differed significantly between in the studied traits, as Wafiyah variety gave the highest The specific grains weight of 1000 grains, reached 40.12 g, Bohoth 22 Variety the highest average specific grains weight of 80.94 kg/ha^{-1}, the genotype R3 gave the highest average ash content of 1.72%, the genotype outperformed R2 and gave the highest mean protein and wet and dry protein content 12.9, 29.02 and 11.06%, respectively.

Key words: Quality test, local varieties, genotypes, wheat (*Triticum aestivum* L.), planting dates

Introduction

Cereal crops were among the most important and oldest crops known to man, the main material in his food, the source of energy, contains a high content of essential carbohydrates (Al-Anbari, 2004). Wheat (*Triticum aestivum* L.), belonging to the Poaceae evangelical family, the most important, because contains protein, the basis for making bread, staple food for the world's population (Jamali *et al.,* 2000). The grain consists of 63-71% starch, 8-17% protein, 8-17% water, 2-5.5% cellulose, 1.5-2% fat, 2-3% sugar and 1.5-2% mineral elements (Al-Shammari, 2007). The global cultivated area is 736.5 thousand hectares, expected to produce about 739.9 million tons (FAO, 2017). In Iraq, the total production for the year 2019 reached more than 4 million tons (Agricultural Statistics Directorate, 2016).

The success of growing any crop depends on optimum management in terms of service operations, the abundance of growth factors, especially varieties appropriate to the environment and planted with appropriate dates, the final result increases the quotient per unit area, due to the role of climatic conditions affecting the physiological processes that take place in the plant, impact on the rates of growth and the duration of its life cycle (Riaz *et al.,* 2010). The inter of new varieties into the region aims to increase yields per unit area, depends on the suitability of the environmental conditions of these items, especially temperature and light, rise or decrease have a significant impact on the length or shortness of any stage of growth and development, the most important were the flowering period and the duration of full seed (Al-Rifai, 2000).

Understanding crop performance under heterogeneous environmental conditions (including date of planting), known behavior and response to the variable, the genetic potential is revealed through growth and formation of different organs with appropriate thermal and photovoltaic conditions, reflects on increasing productivity and improving its qualities, leads to the selection of the appropriate genetic makeup for the most

appropriate appointment, especially the need for early or late planting. The review of some agricultural practices, as a revision of agricultural dates and adaptation to the current climate changes, which may be a smart agricultural practice to cope with climate change, therefore, this experiment aimed to assess the quality of newly introduced genotypes and local certified varieties, under the influence of different planting dates, and determine the most suitable ones to the local environment (Al-Muthanna Governorate).

Materials and methods

The study was conducted during the winter season 2018-2019, at the extension station of the Agricultural Extension Service, Ministry of Agriculture, using 15 local varieties and newly introduced genotypes (Iba 99, Bohoth 22, Al-Rasheed, Tamos 2, Baghdad, Latifa, Wafiyah, Babil, Iraq, Abu Ghraib, coa, Nwewya, Nacowy potas, N1, N2), under the influence of four planting dates (November 1, November 15, December 1 and December 15), the split-plot system was implemented with Randomized Complete Block Design (R.C.B.D) with three replicates, main plots included planting dates, while secondary plots included wheat bread items. The experimental unit area was 2x2 m, 10 lines included, with a cultivation distance of 20 cm between the lines, the total number of experimental units reached 180 experimental units, wheat seeds were planted according to study dates, the seed quantity amounted to 120 kg.ha^{-1}, soil service, irrigation and fertilization were carried out according to scientific recommendations, the nitrogen fertilization was carried out 200 kg N.ha^{-1} (Jado'a, 1995), phosphate fertilizer was added at 80 kg p. ha^{-1} of the P_2O_5 fertilizer before planting, potassium fertilizer was added in the form of potassium sulfate (42% K) with a quantity of 60 kg K. ha^{-1} (Al-Taher, 2005), traits were studied number of the weight of 1000 grains, the specific weight, grain protein ratio, grains ash ratio, wet gluten content and dry gluten content.

The data were statistically analyzed according to the design used in the statistical program (GenStat), the difference between mean was compared according to the L.S.D test under the probability level of 5% (Al-Rawi and Khalaf Allah, 2000).

Results and discussions

Weight of 1000 grains

Table 1 show that the delay in the date of planting had a negative effect on the weight of the grain, the plants of the second date (November 15) gave the highest average weight of 1000 grains amounted to 40.40 g and without significant difference with the first date, the fourth date plants (December 15) gave the lowest mean of this trait, to be 28.83 g, the average weight loss of 1000 grains started with the delay of the planting date, as the averages began to decline for this quality at the third and fourth dates, gradually, as a result of the short duration of the fullness of the grain, because it coincides with high temperatures during the duration of the grain filling, the less accumulated material and lower weight, agreed with Hashem (2011) and Alam *et al.,* (2013).

Table 1: Effect of varieties, planting dates and interaction on the weight of 1000 grains (g).

Date / Variety	November 1	November 15	December 1	December 15	Means
Tamos 2	33.13	38.70	31.07	26.70	32.40
R3	33.10	31.20	28.33	24.30	29.23
Wafiyah	45.43	44.93	37.70	32.40	40.12
R2	44.07	42.73	36.53	31.37	38.68
N1	41.20	40.73	31.90	27.87	35.43
Latifia	36.93	37.57	29.50	27.10	32.78
Baghdad	41.70	41.47	28.80	30.30	35.57
Iraq	48.07	49.23	36.57	26.20	40.02
Abu Ghraib	38.70	40.50	33.00	24.63	34.21
R1	36.23	40.57	31.53	30.00	34.58
Al-Rasheed	39.17	38.43	30.73	27.17	33.88
Bohoth 22	44.23	45.93	35.93	33.07	39.79
Iba 99	44.10	43.10	35.20	32.43	38.71
Babil	38.77	34.93	30.97	30.30	33.74
N2	38.77	35.90	31.60	28.63	33.73
Means	40.24	40.40	32.62	28.83	
L.S.D $_{0.05}$	Date		variety		Interaction
	0.72		1.62		3.19

There were significant differences between the varieties and the genotypes included in the study, Wafiyah variety gave the highest average mean weight of 1000 grains of 40.12 g, with no significant differences from the varieties Iraq, Bohoth 22 and Iba 99 and R2 genotype, R3 genotype plants gave the lowest mean for this trait was 29.23 g. The weight of the grain is an indication of the efficient transmission of metabolic materials from the source to the estuary associated with the nature of the variety, the fullness of the grain and the rate and duration of processing of the foodstuffs manufactured during the stage from flowering to physiological maturity, may be due to the superiority of the cultivar in this capacity due to the small number of grains per spike, as a result, there was more opportunity for food to accumulate in the grain, due to the lack of competition within a single spike, agreed with Al-Amiri and Al-Ubaidi (2016); Al-Hamdaoui (2017) and Al-Salem (2018), showed that wheat varieties differ in the quality of the weight of a thousand grains.

The results showed that there is a significant interaction between planting dates and varieties in this trait, as the combination (type Iraq X second date) gave the highest average weight of one thousand grain amounted to 49.23 g and without significant differences with a number of combinations, while the combination (genotype R3 X fourth date) showed the lowest mean for this trait was 24.30 g and without significant differences with a number of combinations.

The specific weight (hl.kg^{-1})

Table 2 show that delaying the date of planting has a negative effect on the specific weight of seeds compared to the appropriate date, the second date (11/15) gave the highest specific weight of 80.74 hl.kg^{-1}, which did not differ significantly with the first date (1/11), while the fourth planting date (12/15) gave the lowest average specific weight of 77.77 hl.kg^{-1}. The reason for the decrease in specific weight in the last date (the fourth date) may be due to high temperatures, led to a complete thermal assembly by the plant for its transformation from one stage to another, a lack of accumulation of representation outcomes, reduction and shortening in the growth period, especially the full period, that adversely affected the transfer and accumulation of acting products from the source to the estuary (grain), reflected negatively in the weight of grains table 1, led to a reduction in the specific grains weight, agreed with Silva *et al.,* (2014).

As for the varieties, they differed significantly among themselves in this capacity, the highest specific weight was observed in Bohoth 22 at 80.94 hl.kg^{-1}, which did not differ significant with the Wafiyah variety, as for the lowest mean specific weight, it was observed in Al-Rasheed variety, and it reached hl.kg^{-1}, did not differ significantly from the genotype R3. The reason for the variation of varieties in specific weight may be due to the different proportions of the chemical composition of the grains, it has been indicated that the high protein content in grains has a negative effect on specific weight, the reason for the superiority of the two varieties, Bohoth 22 and Wafiyah was due to their superiority in the weight of a 1000 grain, effected positively on the specific grains weight increase, agreed with Al-Dawoodi and Al-Ubaidi (2014); Muhammad *et al.,* (2018).

Table 2: Effect of varieties, planting dates and interaction on the specific weight (hl. kg^{-1}).

Date / Variety	Novem-ber 1	Novem-ber 15	Decem-ber 1	Decem-ber 15	Means
Tamos 2	80.73	80.80	81.70	78.53	80.44
R3	78.33	78.86	76.66	76.63	77.62
Wafiyah	82.26	82.60	78.76	78.26	80.47
R2	81.26	80.80	80.06	77.93	79.97
N1	78.93	80.53	81.03	78.46	79.74
Latifia	80.66	80.83	81.56	77.93	80.25
Baghdad	80.70	81.26	78.80	77.26	79.50
Iraq	82.20	81.33	77.56	77.63	79.68
Abu Ghraib	80.30	80.36	80.53	78.06	79.81
R1	81.53	81.20	79.86	77.40	80.00
Al-Rasheed	80.10	76.73	76.66	76.66	77.54
Bohoth 22	81.76	82.40	80.30	79.30	80.94
Iba 99	81.10	81.23	78.13	77.53	79.50
Babil	81.10	81.33	79.56	77.60	79.90
N2	80.73	80.80	79.16	77.33	79.50
Means	80.77	80.74	79.36	77.77	
L.S.D $_{0.05}$	Date		variety		Interaction
	0.28		0.49		0.92

Grain protein ratio (%)

Table 3 showed that delaying the date of planting led to a noticeable increase in cereal protein, whereas, the fourth plant date (12/15) gave the highest average protein ratio of 12.20%, the first date (1/11) gave the lowest average (10.60%), perhaps the reason for the increase

Table 3: Effect of varieties, planting dates and interaction on the grain protein ratio (%).

Date / Variety	Novem-ber 1	Novem-ber 15	Decem-ber 1	Decem-ber 15	Means
Tamos 2	10.46	10.46	11.13	11.93	11.00
R3	10.93	10.93	11.50	13.40	11.69
Wafiyah	10.33	10.40	10.96	11.16	10.71
R2	10.83	11.96	12.43	13.53	12.19
N1	10.86	10.86	11.36	11.60	11.17
Latifia	10.83	10.90	11.20	12.76	11.42
Baghdad	10.90	11.20	11.33	11.43	11.21
Iraq	10.26	10.53	11.16	12.06	11.00
Abu Ghraib	10.03	10.86	11.26	12.83	11.25
R1	10.53	10.83	11.46	12.23	11.26
Al-Rasheed	10.60	10.90	11.76	12.63	11.47
Bohoth 22	10.76	10.83	11.26	12.13	11.25
Iba 99	10.66	10.90	11.36	11.90	11.20
Babil	10.43	10.86	11.93	11.56	11.20
N2	10.56	10.80	11.23	11.80	11.10
Means	10.60	10.88	11.42	12.20	
L.S.D $_{0.05}$	Date		variety		Interaction
	0.09		0.17		0.34

in protein percentage for the fourth appointment is to give it the lowest weight of the grain table 1, explained on the basis that cereal protein comes from two sources, the vegetable and fruit parts, the high temperatures and low humidity with delaying the planting date lead to tension on the fruit parts (spike parts), as a result, it contributes less to food production, causes the plant to rely mainly on the materials transported from the vegetative part during the process of transferring the materials, most of which are protein substances, leads to an increased sedimentation of protein in grains, agreed with Hashem (2011); Al-Ajibi (2014) and Shakir *et al.,* (2019).

The varieties of wheat differed significantly in the percentage of cereal protein, as the genotype R2 exceeded, it gave the highest average protein ratio of 12.19%, as for the lowest protein content, it was with the Wafiyah cultivar, which amounted to 10.71%, with an insignificant difference with the cultivars, Tamos 2, Iraq, Abu Ghraib, Babil, and the genotype N2, the variation in the protein content between the varieties depends mainly on the nature of the variety and the genotype, Beninati and Bush (1992) indicated that there is a difference in the efficiency of the vegetative group of different varieties in the redistribution of plant protein within the plant, causes a variation in the protein ratio between different cultivars, also, it was found that the varieties differ in the efficiency of their roots to absorb nitrogen from the soil and their ability to reduce nitrates during the period of full grain, agreed with Kadhum (2015); Al-Hamdaoui (2017) and Al-Salem (2018).

The interaction between the factors significantly affected the grain protein , the combination (Genotype R2 X fourth date) gave the highest average protein ratio of 13.53%, while the combination (Abu Ghraib X first date) showed the lowest average for this trait, reached 10.03%, with a significant difference with a number of combinations.

Grains ash ratio (%)

Table 4 show that the planting dates significantly affected the ash content of grains, the second date (12/15) gave the highest average ash content of 1.71%, while the second date (11/15) scored the lowest average for this capacity of 1.57%, the concentration of most ash and the nutrients, such as calcium, magnesium, and sodium, are in the outer layer of the grain and fetus, the specific grains weight increase and the weight of 1000 grains table 1, resulted in reducing the grain content of ashes in the first and second dates, as Eslami *et al.,* (2014) found a negative correlation between specific grains weight and ash content in grains, also, the increased period of fullness of the grain in the two mentioned dates allowed a greater opportunity to absorb and accumulate starch in the grain, which reflected negatively on the accumulation of protein, agreed with Seleiman *et al.,* (2011) and Fergany (2014), showed that the dates of cultivation significantly affected this trait.

Table 4: Effect of varieties, planting dates and interaction on the grain ash ratio (%).

Date / Variety	November 1	November 15	December 1	December 15	Means
Tamos 2	1.53	1.60	1.63	1.70	1.61
R3	1.70	1.63	1.73	1.83	1.72
Wafiyah	1.53	1.50	1.63	1.60	1.56
R2	1.63	1.66	1.73	1.80	1.70
N1	1.60	1.56	1.60	1.70	1.61
Latifia	1.60	1.63	1.73	1.76	1.68
Baghdad	1.60	1.63	1.73	1.73	1.67
Iraq	1.53	1.43	1.56	1.63	1.54
Abu Ghraib	1.60	1.56	1.66	1.76	1.65
R1	1.56	1.50	1.60	1.60	1.56
Al-Rasheed	1.63	1.56	1.73	1.86	1.70
Bohoth 22	1.56	1.60	1.70	1.70	1.64
Iba 99	1.53	1.56	1.70	1.66	1.61
Babil	1.50	1.53	1.66	1.56	1.56
N2	1.60	1.63	1.70	1.73	1.66
Means	1.58	1.57	1.67	1.71	
$L.S.D_{0.05}$	Date		variety		Interaction
	0.02		0.04		N.S

Wheat varieties differed significantly between them in the ash content of grains, the genotype R3 gave the highest average ash content of 1.72%, as for the lowest ash content in the first season, it was in the seed of Iraq, and it gave an average of 1.54%, which did not differ significantly with the Wafiyah, Babil and R1 varieties. The variation may be due to the ash content of the grains, to the nature of the growth of genotypes, photosynthesis efficiency and dry matter accumulation, especially in the stage of full grain, which is reflected in the specific weight and average weight of the grain, agreed with Hossain *et al.,* (2010) and Ismail *et al.,* (2017).

The results showed that there was no significant interaction between the factors in the ash grain content.

Wet gluten content (%)

Table 5 shows that the wet gluten content increased significantly with the delay of sowing date, as the fourth date of cultivation (12/15) gave an average higher than wet gluten of 28.57%, whereas the first date of cultivation (11/1) showed the lowest mean for this trait of 25.33% and without significant difference from the second date of cultivation, perhaps the reason for exceeding the fourth

Table 5: Effect of varieties, planting dates and interaction on the grain wet gluten ratio (%).

Date Variety	Novem -ber 1	Novem- ber 15	Decem- ber 1	Decem- ber 15	Means
Tamos 2	25.13	24.96	26.70	28.23	26.25
R3	27.26	28.03	29.93	30.86	29.02
Wafiyah	25.20	25.00	26.63	27.50	26.08
R2	26.76	26.93	29.50	30.93	28.53
N1	24.36	24.20	26.96	28.33	25.99
Latifia	24.93	24.73	27.66	29.23	26.54
Baghdad	24.00	25.50	25.56	26.73	25.45
Iraq	26.03	25.66	25.30	27.63	26.15
Abu Ghraib	25.23	26.73	27.00	29.33	27.07
R1	26.20	26.40	27.90	29.86	27.59
Al-Rasheed	26.76	26.00	27.00	28.33	27.02
Bohoth 22	25.00	25.16	27.00	28.00	26.29
Iba 99	25.73	25.23	26.33	28.46	26.44
Babil	24.00	24.50	25.43	25.83	24.95
N2	25.66	25.00	26.66	28.13	26.61
Means	25.49	25.64	27.04	28.49	
L.S.D $_{0.05}$	Date		variety		Interaction
	0.16		0.20		0.42

date of cultivation in the content of wet gluten, to the increase in cereal protein table 3, this increase was due to the increase in temperatures, which short period of the crop growth period and the period of full seed, caused confusion in organizing the relationship between the source and the downstream, which ultimately led to less photosynthesis in the grain, allowed an opportunity to accumulate and transfer protein to the grain and increase the protein of the grain, reflected positively in the increase in the content of wet gluten, agreed with Bagulho *et al.,* (2015) and Forster *et al.,* (2017).

The wheat varieties differed significantly among themselves in this capacity, the genotype R3 was distinguished and gave the highest average percentage of wet gluten at 29.2%, the lowest mean wet gluten was in the class Tamos 2 and Bohoth 22 reached 25.54%, variation of varieties in their wet gluten content may be attributed to the difference in the composition of the genetic varieties and their difference in the percentage of total protein in grains, variation in varieties may also be due to the quality of gluten proteins and the quality of the security acids that constitute.

Found a noticeable increase in the wet gluten content of all varieties with a delay in planting, the combination (genotype R3 X forth date) gave the highest mean wet gluten content of 30.8%, whereas, the combination (Tamos 2 X first date) showed the lowest average of 22.1% and without significant difference with a number of combinations.

Dry gluten content (%)

Table 6 show that the dry gluten content correlated with the behavior of the wet gluten with a significant increase with the delay of planting date, exceeded the fourth planting date (12/15), gave the highest average dry gluten of 10.75%, while the second planting date (11/15) recorded the lowest mean dry gluten of 9.66% without significant difference with the first date, perhaps the reason for the superiority of the fourth date of cultivation in the content of dry gluten is due to its superiority in the percentage of total protein in grains table 3, resulting in wet gluten content in the dough table 5, as this reflected positively in increasing the content of dry gluten, as Saeed (2000) found that the dry gluten content most often exhibits a similar behavior to the wet gluten content, agreed with Meena *et al.,* (2016) and AL-Esayed *et al.,* (2018).

Wheat varieties differed significantly in their content of dry gluten, the genotype R3 exceeded the highest average dry gluten of 10.91%, while the genotype N2 showed the lowest mean for this trait of 9.40%, the reason for the superiority of some varieties in the proportion of dry gluten over other varieties may be due to the difference in the composition of the genetic varieties, difference in the percentage of total protein in grains and flour, as well as its variation in its content of wet gluten, which sometimes differs in its behavior from the content of dry gluten, due to the difference in the amount of moisture that gluten maintains the different varieties when

Table 6: Effect of varieties, planting dates and interaction on the grain dry gluten ratio (%).

Date Variety	Novem -ber 1	Novem- ber 15	Decem- ber 1	Decem- ber 15	Means
Tamos 2	9.10	9.13	10.10	10.23	9.64
R3	10.66	10.60	10.86	11.90	11.00
Wafiyah	9.36	9.30	10.00	10.33	9.71
R2	10.70	10.20	10.23	10.33	10.71
N1	9.90	9.80	9.10	10.06	9.71
Latifia	9.80	9.70	10.23	11.08	10.20
Baghdad	9.33	9.23	9.73	10.60	9.72
Iraq	9.13	9.63	9.60	10.30	9.66
Abu Ghraib	10.16	9.86	10.23	11.00	10.31
R1	9.20	9.53	10.60	11.66	10.25
Al-Rasheed	9.46	10.10	10.70	11.06	10.33
Bohoth 22	9.30	9.33	9.33	10.70	9.61
Iba 99	9.53	9.80	9.20	10.10	9.65
Babil	9.12	9.40	9.53	10.66	9.43
N2	9.13	9.30	9.30	10.63	9.59
Means	9.59	9.66	9.90	10.73	
L.S.D $_{0.05}$	Date		variety		Interaction
	0.29		0.14		0.29

adding water, agreed with Duric *et al.,* (2010) and Al-Zubaidi and Ayad (2016).

The cultivation of most varieties with delay in cultivation led to an increase in the content of dry gluten, the combinations (genotype R3 X fourth date) and (genotype R2 X fourth date) recorded the highest rate of dry gluten, which averaged 11.92 and 10.70%, respectively, while the combination (Tamos 2 X the second date) recorded the lowest average for this trait, reached 9.10% and without a significant difference compare with the other combinations.

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