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RESEARCH ARTICLE

EVALUATION OF PROMISING DURUM AND SOFT WHEAT GENOTYPES AT TWO LOCATIONS OF SOUTHERN IRAQ

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ABSTRACT

Tow Field experiments was conducted at two locations (AL-Muthanna and Thi-Qar province). The first experiment to evaluate the performance of nine promising genotypes of durum wheat (D1, D2, D3, D4, D5, D6, D7, D8, D9) and the local genotype (Behooth 7) called (D10). The second experiment to evaluate the performance of seven promising genotypes of soft wheat (W1, W2, W3, W4, W5, W6, W7) and compare them with three local ge notypes (Abu Ghraib, Furat and IBA 99). Randomized complete block design with three replications was used in this experiments. The result of first experiment showed that D7 and D5 gave the highest plant height, in addition D7 gave the highest leaf area, spike number /m² and dry weight/ m². D10 genotype gave the highest tiller number/ plant and grain numbers/ spike. While D4 gave the highest 100 grain. D3, D4 and D6 gave highest grain yield compare to anther promising genotypes and local cultivar (Behooth 7). in AL-Muthanna location which reached 4.04, 4.05 and 4.04 ton/ h respectively, while D2, D3, D4, D5, D6 and D8 gave highest grain yield compare to anther promising genotypes and local cultivar (Behooth 7) in Thi-Qar location which reached 4.03, 4.05, 4.03, 4.06, 4.03 and 4.00 ton/ h respectively. The result of second experiment showed that W4 genotype recorded highest grain yield compare to anther promising genotypes and local cultivars (Abu Ghraib, Furat and Ipa 99) for both Al-Muthanna and Thi-Qar locations in which reached (7.39 and 7.55 ton/ h) for two locations respectively, while the results showed that the superiority of Furat cultivar giving the highest height plant, spike length and number of spikes / m². Thi-Qar location gave the highest averages for plant height, number of spikes/ m², weight of 100 tablets and dry weight/ m². Moreover, genotypes in Thi-Qar location gave the highest averages for trails than AL-Muthanna location for tow experiments (durum and soft wheat).

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INTRODUCTION

Durum wheat is important field crop in the world. Its variety *triticum durum* desf. Is growing on 8% of the world area and producing 5% of world production. Asia is number one in the world producing durum wheat. Durum wheat is also growing in Europe, North America and North Africa. More than 85% of world durum wheat production is in the Mediterranean sea region (Amin *et al.*, 1992). Durum wheat is growing in the north of Iraq specially at Musel province. Iraqi people use it in their meal after grinded or removing the outside seed layers, and make macaroni and other uses (Mike and Davis, 1997). Iraq harvested durum wheat in 1999 from 1.2 Million hectares. The average production was 0.55 ton/ h but Iraq harvested 2.5 million metric tons durum wheat in 2003 from 1.8 million hectares and the average was 1.38 ton/h. This result revealed that durum wheat production was increased from 1999 to 2003 but still the average production of Iraq is less than the word average which is 2.6 – 2.7 ton/h. Therefore, plant breeder in Iraq must test good varieties from countries that have weather

like Iraqi weather or have to improve the local varieties (Al-Rawi and, Kalafallah, 1980). Plant breeders in the world produced good hybrid of durum wheat that is short and resist to plant logging (Al-Musawi, 2005) and (Fowzy, 2001). Saleem, (2003) found that difference of durum wheat genotypes in plant height and tillers number/ plant. AL-Kenany, (2004) observed difference to weight of 1000 grains and number grain per spike between genotypes of durum wheat. Plant height and grain yield differed with difference of durum wheat genotypes.

Soft wheat *Triticum aestivum* L. is considered the most important strategic grain crops relied on to reduce the food gap, which has become the world's problem, and the wheat are grown in most parts of the world and constitute the basic material for the manufacture of bread. Recent statistical projections indicate that global production will reach 689.8 million tons in 2015 (F.A.O, 2000), and the reason for importance of this crop is being the main food of more than 40 countries in the world (nearly 35% of the world population), Due to its high content of protein and carbohydrates (Curtis, 1982) as it is gave more than 25% needs of calories and protein in addition to contain the amounts of fat and vitamins (B1 and B2) and some mineral salts (Bushuk, 1998).

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The rectification a new genotypes and election the superior of them in yield and other traits consider important to creating new varieties that can be an alternative to the local varieties that currently cultivated or in the provision of genotypes can be used to transfer genes of higher yield and resistance to diseases and high protein to local varieties cultivated through the hybridization program (Long, 2003). The coefficient of the path is the best way to identify those relationships because it determines the effects of direct and indirect of the yield traits based on genetic relationships (Gupta *et al.*, 1979). Hucl and Baker, (1988) found that difference of wheat bread genotypes in most vegetative growth traits, grain yield and its components, due to the nature of growth, capability of tillering and total dry matter production, also the good crop and soil preparation practices have a role in increasing the yield, but this increasing did not reach the optimum level. it seems that the ideal solution to this problem is to develop new varieties more suitable for the environmental conditions, so to achieve the aim of increasing a grain yield the plant breeders needs to identify the most important characteristics of growth and the components of yield associated morphologically and genetically directly or indirectly with grain yield for use it as elected evidence. The genotype Affects in the plant behavior in terms of vegetative growth, Leaf area chlorophyll content, grain yield and its components, as both Mohammed, (2000) and so as a simple correlation measures the connectivity relationships. Amer, (2004) observed difference between breed wheat genotypes to flag leaf area, number of tillers per meter square grain per spike, weight of 1000 grains and grain yield. AL-Hassin, (2007) found that difference of soft wheat genotypes in number spike per meter square, grain per spike, weight of 1000 grains and grain yield.

Wheat varieties (Maxibak and Sabrbek) Still prevailed cultivated in Iraq since long period and characterized in sensitivity for lodging, the incidence of certain diseases, in addition to the lack of purity because of mechanical mixing and accumulated mutations, so now it is necessary to develop new varieties replace or grown along with these varieties ,and because of the lack of available studies on the breeding of wheat and the lack of sources of heterogeneity genetic that can be used for breeding purposes.

The aim of this research is to compare nine foreign genotypes from durum wheat with the local cultivar and compare seven foreign genotypes from soft wheat with three local cultivars to investigation of productivity and election of superior varieties under conditions of the southern region of Iraq.

Table 1. Physical and Chemical properties of the experiment soil

Characters Location	Texture	pH	Ec. des./m	Soil structure %			Minerals %		
				Sand	Loam	Clay	N	K	P
Muthanna	Salty clay	7.65	4.21	20	39	41	0.70	1.21	0.22
Thi-Qar	Loam clay	7.82	3.72	22	43	43	0.65	1.35	0.52

*Data analyzed in Muthanna University- Agriculture College/ Soil & Water Lab.

MATERIALS AND METHODS

This experiments was conducted at two locations in 2012-2013. The first location was at Al-Muthanna province, The

second location was at Thi-Qar province, Iraq. Ten of durum wheat genotypes (IR7, IR1229, IR1245, IR1105, IT1187, IR1287, IR1107, IR1289, IR65 and Behooth 7) were used in the first experiment, Behooth 7 genotype was local variety used as control the ten genotypes symbolized D1, D2, D3, D4, D5, D6, D7, D8, D9 and D10 respectively. The second experiment to evaluate the performance of ten promising genotypes of soft wheat (IR885, IR899, IR1123, IR981, IR1131, IR969, IR1069, Abu Ghraib, Furat and IBA 99). (Abu Ghraib, Furat and Ipa 99) genotypes were local varieties used as control. the ten genotypes symbolized (W1, W2, W3, W4, W5, W6, W7, W8, W9 and W10 respectively. Bohooth 7, Abu Ghraib, Behooth and IBA 99 cultivars was obtained from ministry of, Iraq and other genotypes were obtained from international center for improving corn and wheat in Mexico (CIMMYT). Randomized complete block design with three replication was used to evaluate these genotypes of durum and soft wheat. The area of each experimental unit was 2m width and 4m long. Soil test was done before sowing Table (1). The seeds were planted on lines (4m long each) and the space between lines was 20 cm. Structure fertilizer (100 kg P/ h) was used one time when soil was plowed and 200 kg N/ h of urea fertilizer (46% N) was applied at four times (first one during sowing, second when tillers were started, third during spike appeared and fourth during flowering).

The following plant growth and yield components were studied from the primary tiller of 20 consecutive plants in middle rows were randomly selected of each plot: Plant height (cm), leaf area cm² (used leaf area meter /LI-31000), dry weight (g/ m², (cm), tiller numbers per plant, spike numbers/ m², grain numbers/ spike, 100 grain weight (gm), and grain yield (ton/ h. All variables were analyzed, variation, correlation and regression coefficient using SPSS windows and means were separated by L.S.D at P < 0.05.

RESULTS AND DISCUSSION

Durum Wheat

Plant Height (cm)

The result in Table (2) showed that genotypes D5 and D7 significantly effect each one gave the highest average (99.00 cm) at plant height, while D10 genotype gave the least average of plant height (80.00 cm). This result may relate to the genetic diversity. This result agreed with the results of AL- Hassan, (2001) and Khan *et al.* (2013).

Thi-Qar location significantly gave the highest plant height average (95.00 cm), while Muthanna location gave the shortest plant height average (86.10 cm).This result may relate to the soil condition and weather effect Table (1). The interaction

between genotypes and locations showed significant effect when D5 genotype in Thi-Qar location significantly gave the highest plant height average (106.61 cm), while D10 in AL-Muthanna location gave the shortest plant height average (73.33 cm).

genotypes and locations showed significant effect., when D7 in Thi-Qar significantly gave the highest leaf area (83.67 cm²) average while D3 in Muthanna gave the least leaf area average (27.37 cm²). The reason for this result could relate to the weather effect and genetic diversity.

Table 2. Effect of Genotypes, Locations and Interaction on growth characteristics

Characteristics	Variety	Locations		Varieties Average
		AL-Muthanna	Thi-Qar	
Plant height (cm)	D1	84.00	95.00	89.50
	D2	81.61	84.61	83.17
	D3	86.33	96.33	91.33
	D4	87.61	99.33	93.50
	D5	84.00	106.61	99.00
	D6	93.66	93.61	88.83
	D7	92.61	105.33	99.00
	D8	96.61	90.61	93.67
	D9	83.33	91.61	87.50
	D10	73.33	86.61	80.00
		Location average	86.10	95.00
Flag leaf area (cm ²)	LSD (0.05)	Variety 3.73	Location = 1.67	Interaction = 5.27
	D1	32.89	38.57	35.73
	D2	33.19	38.00	35.59
	D3	27.37	38.13	32.75
	D4	40.53	54.97	47.75
	D5	38.63	42.10	40.39
	D6	31.82	41.04	36.43
	D7	48.77	83.67	66.22
	D8	43.77	52.57	48.17
	D9	38.67	41.50	40.07
	D10	48.77	61.56	55.16
	Location average	38.44	49.21	
Tillers number/ plant	LSD (0.05)	Variety =1.64	Location = 0.73	Interaction = 2.32
	D1	5.00	7.00	6.00
	D2	3.33	5.33	4.33
	D3	3.66	6.00	4.83
	D4	4.33	7.00	5.66
	D5	3.33	4.67	4.00
	D6	3.33	4.67	4.00
	D7	4.33	6.33	5.33
	D8	3.66	5.33	4.50
	D9	3.66	5.33	4.50
	D10	5.00	7.33	6.16
	Location average	3.86	5.90	
Dry matter weight (gm/ m2)	L.S.D (0.05)	Variety =0.77	Location = 0.35	Interaction = N.S
	D1	207.33	210.01	208.66
	D2	325.00	368.33	246.67
	D3	187.66	196.65	152.16
	D4	203.33	216.67	210.00
	D5	247.66	255.00	251.33
	D6	250.00	365.67	357.33
	D7	251.65	365.00	358.32
	D8	228.33	241.66	235.01
	D9	138.32	158.34	148.33
	D10	125.00	146.67	135.83
	Location average	236.43	252.40	
	LSD (0.50)	variety= 5.71	Location=2.55	Interaction=8.08

FLAG LEAF AREA (cm²)

The result in Table (2) showed that D7 gave significantly the highest flag leaf area average (66.22 cm²), while D3 gave the least leaf area (32.75 cm²). This result might relate to the genetic diversity, this finding agree with finding of Gardener *et al.* (1990). Moreover, Thi-Qar location significantly gave more leaf area average (49.21 cm²) than the average of Muthanna location (38.44cm²). This result could relate to the better adaptation of genotypes in Thi-Qar location because the soil in Thi-Qar was more fertilized than in Muthanna Table (1), in addition to the weather effect. The interaction between

TILLERS NUMBER/ PLANT

Results in Table (2) showed that D10 (local cultivar) significantly gave the highest tiller number average (6.16) while D5 and D6 gave the least tiller number (each gave 4.00 Tiller/ plant). Again this result could relate to genetic diversity. The result agreed with the results of Saleem, (2003). Thi-Qar location significantly showed that the highest tiller numbers average (5.90) and Muthanna location showed the least tiller numbers, average (3.86) The reason for this result could relate to the leaf area. The interaction effect on this trail had not significant.

DRY MATTER WEIGHT (gm/ m²)

Table (2) showed that D7 significantly produced the highest dry weight average (358.32 gm/ m²), while D10 (local cultivar) produced the least (135.83 gm/ m²). This result could relate to effect of leaf area that D7 had, this agree with the suggestion of Gardener *et al.* (1990) who revealed, to produce more dry weight it must have more leaf area index to intercept more sunlight. Also the table showed that Thi-Qar location significantly had the highest dry weight average (252.40 gm/ m²). These results might be related to plant height and leaf area (table 2), Also the interaction between D2 genotypes and Thi-Qar locations caused significantly produced dry weight average (368.33 gm/ m²) while D10 in AL-Muthanna gave the least dry weight average (125.00 gm/ m²).

SPIKE NUMBERS/ m²

Table (3) showed that D7 genotype significantly gave the highest spikes number average 736.80 spike/ m², while D10 (local cultivar) genotype gave the least spikes number average 228.00 spike/ m². These results might be related to the high leaf area and dry matter weight (Table 2). This result agree with Saadallah *et al.* (1998). Locations and interaction between genotypes and locations effect on the spike/ m² had not significant.

GRAINS NUMBER / SPIKE

Table (3) revealed that D10 (local cultivar) significantly produced the highest grain number average (74.33 seed/ spike), while D7 produced the lowest average

Table 3. Effect of Genotypes, locations and Interaction on the yield and its components

Characteristics	Variety	Locations		Varieties Average
		AL-Muthanna	Thi-Qar	
Spike numbers.(m ²)	D1	329.00	334.70	331.80
	D2	716.70	714.69	715.70
	D3	525.70	533.70	529.70
	D4	485.30	333.70	409.50
	D5	527.00	549.00	538.00
	D6	699.00	730.70	714.80
	D7	728.30	745.30	736.80
	D8	380.70	442.69	411.70
	D9	291.00	286.70	288.80
	D10	222.30	233.68	228.00
		Location average	490.50	490.5
	L.S.D (0.05)	Variety = 66.27	Location = N.S	Interaction = N.S
Grains number/ Spike	D1	60.61	62.00	61.33
	D2	32.33	38.33	35.33
	D3	60.33	61.33	60.83
	D4	46.61	49.00	47.83
	D5	50.33	52.67	51.50
	D6	48.00	53.00	50.50
	D7	26.67	29.00	27.83
	D8	61.33	63.33	62.33
	D9	60.67	63.67	62.17
	D10	72.33	76.33	74.33
		Location average	51.93	54.87
	L.S.D (0.05)	Variety = 2.14	Location = 0.96	Interaction = N.S
Weight of 1000 grain (gm)	D1	30.51	30.48	30.50
	D2	40.19	40.12	40.15
	D3	30.90	30.85	30.87
	D4	50.16	50.12	50.14
	D5	30.69	30.61	30.65
	D6	30.38	30.35	30.37
	D7	40.63	30.89	40.26
	D8	40.41	40.20	40.30
	D9	30.20	30.16	30.18
	D10	30.28	30.28	30.28
		Location average	30.93	30.81
	L.S.D (0.05)	Variety = 3.10	Location = N.S	Interaction= 5.12
Grain yield (kg/donam ⁸)	D1	2.80	2.89	2.84
	D2	3.54	4.03	3.78
	D3	4.04	4.05	4.04
	D4	4.05	4.03	4.04
	D5	3.20	4.04	3.62
	D6	4.05	4.03	4.04
	D7	3.08	3.36	3.22
	D8	3.30	4.00	3.65
	D9	2.34	2.32	2.33
	D10	2.10	2.34	2.22
		Location average	3.24	3.51
	L.S.D (0.05)	Variety 501.90	Location = NS	Interaction = 712

(27.83 grain/spike). These results might be related to dry matter weight (Table 2), the result agree with the result of AL-Hassaa and (2001) AL-Kenany, (2004). The data also showed that Thi-Qar location significantly had the higher grains/ spike average (54.87Grain/spike) and Muthanna location showed the least grains/ spike average (51.93). ith the results of. Result of interaction between genotypes and locations effect on this trail had significant.

WEIGHT OF 1000 GRAINS (gm)

Table (3) showed that D4 significantly produced the highest weight of 1000 grains average (50.14 gm) while D9 produced the least weight of 1000 grains average (30.18 gm). This result could relate to the genetic diversity and the result agree with the finding of Tesemma, (1994) and AL- Hassaa, (2001). The interaction between genotypes and locations showed significant effect when D4 genotype in Thi-Qar location significantly gave the highest plant height average (50.16 gm), while D9 in AL-Muthanna location gave the shortest plant height average (30.16 gm). The locations effect on weight 1000 grains had not significant.

GRAIN YIELD (ton/ h)

Table (3) showed that D3, D4 and D6 produced the least grain yield average (each produced 4.04 ton/ h) while, D10 (local cultivar) significantly produced the minimum grain yield average (2.22 ton/ h). This result could relate to the highest spike number and 1000 grain weight, this result agree with result of Amin *et al.* (1992) and Tesemma *et al.* (1994) and Khan *et al.* (2013). The interaction between genotypes and locations showed significant effect when D4 genotype in Thi-Qar location significantly gave grain yield average (4.05 ton/ h), while D10 in AL- Muthanna gave the shortest grain yield average (2.10 ton/ h). The locations effect on grain yield had not significant.

SOFT WHEAT

PLANT HEIGHT (cm)

The data presented in Table (4) indicated that genotypes significantly affected the plant height. Maximum plant height (105.33 cm) was observed for W10 (local cultivar), whereas minimum value (78.83 cm) was observed for W7 genotype. The reason for that may be due to the genetic nature of genotype, These findings aer in greement with the work Ahmed (2003). Also the location were differed significantly between them in this trait in which Thi-Qar location, gave the highest average was (96.40 cm), while AL-Muthanna location gave the lowest average for this trait was (86.30 cm) and the reason for this is the nature of the soil Table (1) and environmental conditions. As regards to the effect of interaction W10 genotype gave highest average for this trait was (113.33cm) in Thi-Qar location.

FLAG LEAF AREA (cm²)

The results of Table (4) showed that the significant effect of genotypes on flag leaf area where W9 (local cultivar) given

highest average of leaf area (64.61 cm²), while W6 genotype given lowest average for this trait (39.91 cm²). This result may relate to the genetic diversity, this result is in agreement with the findings of the Cardeneir *et al.* (1990) and Amer (2004), also the interaction among W9 genotype in Thi- Qar location recorded the highest average for this trait (76.63 cm 2), while D6 genotype in AL-Muthanna location gave the lowest average for this trait was (40.83 cm). The reason for this is due to the interaction effect of environmental and genetic factors. Results show that location had not significant in this trail.

NUMBER TILLERS/ PLANT

Results showed that the significant effect of genotypes on number of tellers per plant. W1 genotype gave highest number tillers per plant (5.83 tillers/ plant), while W7 genotype gave lowest average (2.16 tillers/ plant). The reason for that is the formation of tillers depend on cultivar, applied fertilizers, cultivation date and environmental conditions, this result is in agreement with the findings of Sharma and Sirvastava (1980) and AL- Anbari (2004) and AL-Hassan (2007). Also Thi-Qar location was superior to giving highest average of this trait (4.31 tiller/ plant), while AL-Muthanna location gave lowest average (3.38 tillers/ plant) (Table 4). The reason for that is the nature of the soil and minerals content (Table 1). Results show that interaction effect had not significant.

DRY MATTER WEIGHT (gm/ m²)

Results of Table (3) showed that the significant effect of Dry matter weight where W2 genotype given highest weight (335.83 gm), while W3 genotype given lowest weight for this trait (147.50 gm), also Thi-Qar location was superior to giving highest weight reached (245.70 gm) compare to AL-Muthanna which gave (223.50 gm/ m²). Results show that interaction effect had not significant.

SPIKE NUMBERS/ m²

The result of Table (5) showed that the significant effect of genotypes on number of spikes/ m² where W10 genotype (local cultivar) given maximum number of spikes (805.33 spike/m²), while W7 genotype given minimum number for this trait (447.17 spike/ m²). Our results are in conformity with the work of Acevedo *et al.* (2002) and Ahmed (2003). Also Thi-Qar location was superior in this trait giving maximum number reach (615.00 spike/m²), while AL-Muthanna location given minimum average (588.80 spike/m²). Interaction effect had not significant.

GRAIN NUMBER / SPIKE

The results of Table (5) showed that the significant effect of Number of seeds/ spike where W7 genotype given highest rate of seed (97.00 grain/ spike) while W2 genotype given lowest average for this trait (37.00 grain/ spike). This result may relate to the genetic diversity. This result is agreement with the findings of Curtis, (1982) and AL-Hassan, (2007). Results show that location and interaction effect on grain number per spike had no significant.

Table 4. Effect of Genotypes, Locations and Interaction on growth characteristics

Characteristics	Variety	Locations		Varieties Average
		AL-Muthanna	Thi-Qar	
Plant height (cm)	W1	93.33	96.00	94.67
	W2	88.32	85.00	86.66
	W3	84.00	97.67	90.83
	W4	88.67	92.33	90.50
	W5	82.33	97.32	89.83
	W6	82.33	100.66	91.50
	W7	72.33	85.31	78.83
	W8	94.00	111.67	102.83
	W9	80.31	84.66	82.50
	W10	97.32	113.33	105.33
	Location average	86.30	96.40	
	L.S.D (0.05)	variety= 2.74	location = 1.22	interaction = 3.87
Flag Leaf areas (cm ²)	W1	51.26	49.67	50.46
	W2	48.90	45.13	47.01
	W3	65.23	51.60	58.41
	W4	53.83	54.16	54.00
	W5	52.31	51.93	52.12
	W6	39.00	40.83	39.91
	W7	47.16	48.13	47.65
	W8	53.20	53.20	53.20
	W9	52.60	76.63	64.61
	W10	42.87	57.00	49.93
	Location average	50.63	52.83	
	L.S.D (0.05)	variety = 6.97	Locations= N.S	interaction = 9.86
T Tillers number/ plant	W1	5.00	6.67	5.83
	W2	3.33	4.00	3.66
	W3	4.13	4.53	4.33
	W4	4.37	4.97	4.17
	W5	2.00	4.00	3.00
	W6	4.00	4.00	4.00
	W7	2.00	2.32	2.16
	W8	2.33	3.66	2.99
	W9	4.33	5.00	4.66
	W10	2.33	4.00	3.16
	Location average	3.38	4.31	
	L.S.D (0.05)	variety = 1.27	locations = 0.57	Interactions = N.S
Dry matter weight (gm/ m ²)	W1	208.33	243.33	225.83
	W2	316.67	355.00	335.83
	W3	133.33	161.67	147.50
	W4	203.32	213.33	208.33
	W5	238.33	250.00	244.17
	W6	290.00	306.67	298.33
	W7	206.67	216.66	211.67
	W8	193.33	208.66	201.00
	W9	245.00	286.67	265.83
	W10	200.00	215.00	207.50
	Locations average	223.50	245.70	
	L.S.D (0.05)	Cultivars =16.27	Locations = 7.28	Interactions = N.S

WEIGHT of 1000 GRAIN (gm)

Results showed that the significant effect of weight of 1000 grain, where W7 genotype given highest rate (40.91 gm), while W1 genotype given lowest average for this trait (20.44 gm) may be due to the genetic nature of cultivar in which cultivars differ in genetic susceptibility. Our research has a great similarity with Ahmed, (2003) and AL- Anbari, (2004). Results of interaction between genotypes and locations show that W7 genotype in Thi-Qar location gave highest average (50.02 gm), while W1 genotype in AL-Muthanna gave lowest average (20.41 gm) (Table 4).

GRAIN YIELD (ton/ h)

The results of Table (5) showed that significant effect of grain yield. W4 genotype gave highest yield (6.47 ton/ h) while

W8 genotype (local cultivar) gave lowest yield for this trait reached (3.37 ton/ h). The imbalance between of yield components lead to increasing of grain yield for W4. Similar results were also communicated by Sharma and Smith (1987), and AL- Anbari (2004) and AL-Hassan (2007). Also the results showed the significant effect of locations which Thi-Qar location gave highest yield (4.97 ton/ h), while AL-Muthanna location gave lowest average (4.67 ton/ h). The interaction between genotypes and locations showed significant effect when W4 genotype in Thi-Qar and AL-Muthanna locations significantly gave the highest grain yield height average (6.55 and 6.39 ton/ h) respectively.

Table 5. Effect of Genotypes, locations and Interaction on the yield and its components

Characteristics	Variety	Locations		Varieties Average
		AL-Muthanna	Thi-Qar	
Spike numbers (m ²)	W1	497.00	514.66	505.83
	W2	662.66	685.33	674.00
	W3	606.67	635.33	621.00
	W4	641.65	646.00	643.83
	W5	513.33	544.67	529.00
	W6	661.66	685.67	673.67
	W7	433.33	461.00	447.17
	W8	531.00	581.66	556.33
	W9	558.33	567.33	562.83
	W10	782.32	828.33	805.33
		Location average	588.80	615.00
	L.S.D (0.05)	Variety = 21.03	location = 21.03	Interaction=N.S
Grain numbers/ Spike	W1	73.00	76.33	74.66
	W2	35.00	39.00	37.00
	W3	49.33	53.66	51.50
	W4	66.32	68.33	67.33
	W5	61.00	58.00	59.50
	W6	46.33	44.32	45.32
	W7	82.00	76.00	79.00
	W8	48.67	44.67	46.67
	W9	56.00	54.66	55.33
	W10	48.00	45.00	46.50
		Location average	56.56	56.00
	L.S.D (0.05)	Variety= 3.98	Locations N.S	Interaction N.S
Weight of 1000 grains (gm)	W1	20.41	20.48	20.44
	W2	40.43	40.45	40.45
	W3	40.03	40.07	40.05
	W4	40.34	40.28	40.31
	W5	40.41	40.08	40.25
	W6	30.20	30.27	30.23
	W7	40.81	50.02	40.91
	W8	30.18	30.34	30.26
	W9	20.76	20.82	20.79
	W10	20.95	30.41	30.18
		Location average	30.65	30.72
	L.S.D (0.05)	variety = 2.66	Location= N.S	Interactions=3.76
Grain yield (ton/ h)	W1	3.49	3.87	3.68
	W2	4.10	4.76	4.43
	W3	4.81	5.55	5.18
	W4	6.39	6.55	6.47
	W5	5.53	5.15	5.34
	W6	3.92	3.97	3.94
	W7	5.84	6.03	5.93
	W8	3.28	3.47	3.37
	W9	3.45	3.50	3.47
	W10	3.96	4.88	4.42
		Locations average	4.67	4.97
	L.S.D (0.05)	variety = 394.20	Locations = 176.28	Interactions=662.31

Conclusion

In conclusion

- 1- The promising durum wheat genotypes (D3, D4 and D6) in AL-Muthanna location and D2, D3, D4, D5, D6 and D8) genotypes in Thi-Qar location gave the highest grain yield compare to another promising genotypes and local cultivar (Behooth 7).
- 2- W4 soft wheat genotype has given the highest grain yield in Thi-Qar and AL-Muthanna locations compare to another promising genotypes and local cultivars (Abu Ghraib, Furat and Ipa 99)

Recommendation

The study recommends the followings

- 1) Agriculture extension agent should encourage farmers to use D3, D4 and D6 durum wheat genotypes in AL-

Muthanna location and D2, D3, D4, D5, D6 and D8) genotypes in Thi-Qar location because it produced high grain yield.

- 2) Agriculture extension agent should encourage farmers to use W4 soft wheat genotype in Thi-Qar and AL-Muthanna locations
- 3) This research should repeat in other locations to have good genotype stability.

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