Response of some growth traits and yield of barley genotypes *Hordeum vulgare* L. to planting dates

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Abstract

The experiment was held at the Warka Extension Farm in Al-Muthanna Governorate / Al-Warka District, during the season (2021-2022) to know the response of growth traits and yield of genotypes G1, G2, G3, G4, G5, G6, G7, G8, G9 of barley crop, in addition to Cultivar Aba 265 (G10) for planting dates (1, 10, 20, 30) November, the experiment was applied using randomized complete block design (RCBD)according to the Split- plot method and with three replications, the results of the experiment showed**:** The two genotypes G4 and G9 were superior in the number of days from planting to 75% of flowering, with the highest averages of (113.75) days, while the two genotypes G6 and G3 were superior in the number of days from 75% flowering to physiological maturity, with their averages reaching (36.58 and 35.08). One day, the genotypes G1, G6, G10, G7 and G8 were recorded without significant difference between them the highest average plant height reached (80.08, 79.98, 79.92, 79.80 and 76.78) cm, respectively. In contrast, genotype G5 recorded the highest average of the leaf area of the flag reached (14.28) cm^2. For grain yield, the genotype G7 recorded the highest grain yield with an average of (8.427) ton ha^{-1}, and the cultivar Aba 265 (G10) recorded the highest biological yield with an average of (16.75) ton ha^{-1}**.** The first date (1/11) outperformed in many of the studied traits, as it achieved the highest averages in both plant height and number of days from 75% flowering to physiological maturity, the flag leaf area and vital yield amounted to (84.26) cm, (35.67) days and (14.96)) cm^2 and (16.42) ton ha^{-1} respectively, and the third date (20/11) was superior in grain yield with an average of (8.014) ton ha^{-1}**.**

Keywords: Barley, yield, genetic structures, agricultural dates**.**

Introduction

The importance of the barley crop is due to the nutritional value that lies in its grain because it contains proteins, fibers, amino acids and vitamins [1]. In addition to its many uses, including food, fodder, industrial and medical. The barley crop *Hordeum vulgare L.* ranks second after wheat locally and ranks fourth globally after Wheat, rice and corn in terms of productivity and cultivated area, barley is grown in the cen-

tral and southern regions of Iraq. Obtaining the best yield is achieved by using exotic germplasm in crossbreeding by 50% [2], and the increase in yield per unit area depends on the suitability of the environmental conditions of these varieties, which vary in the degree of their response from one variety to another, and this matter is linked in some aspects to the climatic conditions Especially temperature and light, which are the two determining factors affecting each stage of the crop's growth and development, and for the success of any crop cultivation is done by choosing the appropriate planting dates, thus leading to an increase in the yield in the unit area, as the appropriate time for each installation with good management is important in increasing Crop production, and determining the ideal planting date for the specific area, which makes it easier for researchers to study other agricultural methods (sewing rates, planting distances, types of fertilization, etc. ..)

Materials and Methods

Experience the experiment

A field experiment was carried out at the Warka extension farm affiliated to the Agricultural Extension Department / Ministry of Agriculture, in Muthanna Governorate / Warka District during the season (2021-2022) for the purpose of knowing the response of growth traits and yield of genotypes (G1, G2, G3, G4, G5, G6, G7, G8, G9) of the barley crop in addition to the variety Aba 265 (G10) for planting dates (1, 10, 20 and 30 November) as the dates occupied the main plots, while the genotypes of the secondary plots being the second factor, according to Randomized Complete Block Design (RCBD) according to the Split-plot method.

Field preparation and agricultural operations

All agricultural operations related to the experimental land were carried out, such as plowing, smoothing and leveling the land, after which the land was divided into 120 planks, the area of which is (1×2) m^2 each. 1 m, the main panels contained ten secondary panels each. Each experimental unit included 10 lines, 1 m long, and the distance between them was 20 cm.

The planting was carried out according to the mentioned dates and with a seed quantity of (100) kg ha^{-1} [3], and fertilizers were added as follows: phosphate fertilizer at a rate of (80) kg P ha^{-1} of triple superphosphate fertilizer, nitrogen fertilizer (200) kg N ha^{-1} in the form of Urea (46% N), potassium fertilizer in the form of potassium sulfate (42)% K at a rate of (60) kg K ha^{-1} Added as per the recommendation [4].

Attributes and measurements studied during the experiment

Number of days from planting to 75% of flowering, Number of days from 75% of flowering to physiological maturity, Plant height (cm), Flag leaf area (cm^2) was measured using a ruler using the formula leaf length x maximum width x correction factor 0.95 (5), Grain yield (ton ha^{-1}) and biological yield (ton ha^{-1})

Results and Discussion

Number of days from planting to 75% flowering

The results of the statistical analysis showed a significant effect of genotypes in the trait of number of days from planting up to 75% of flowering, while there was no effect of planting dates in this trait.

The results in Table No. (1) showed the difference in genotypes in the number of days from cultivation to 75% of flowering, where the two genotypes G4 and G9 exceeded them by recording the highest average of (113.75)day for shorter flowering duration (103.75) days, while the length of flowering took (103.80) days, these results agreed with the results [6,7], where they indicated the existence of differences between the genotypes of this trait, and the reason may be attributed to the genetic differences between the structures as well as a difference in the period needed to reach the stage of growth. It needs the heat necessary to reach this stage [8].

Number of days from 75% flowering to physiological maturity

The results of the statistical analysis showed a significant effect of genotypes and planting dates on the number of days from 75% flowering to physiological maturity.

Table (1): The effect of genotypes and planting dates and the interaction between them on the character of the number of days from planting up to 75% flowering

genetics	Appointments				average
	D1	D2	D3	D4	
G1	116.00	118.00	110.67	108.67	113.33
G2	115.00	107.67	109.00	105.67	109.33
G3	107.67	108.33	105.00	102.67	105.92
G4	118.00	114.67	109.00	113.33	113.75
G5	115.00	113.67	106.00	111.00	111.42
G6	105.33	106.33	101.00	102.67	103.83
G7	114.67	114.33	113.33	110.67	113.25
G8	117.00	115.00	110.67	106.33	112.25
G9	115.33	116.00	109.33	114.33	113.75
G10	110.33	115.00	113.33	108.67	111.83
Average	113.43	112.90	108.73	108.40	
L.S.D values (0.05)	Appointments N.S	Compositions 2.66		Overlap N.S	

Table (2): The effect of genotypes and planting dates and the interaction between them on the characteristic of the number of days from 75% flowering to physiological maturity

Genetics	Appointments				Average
	D1	D2	D3	D4	
G1	36.00	31.67	31.33	29.67	32.17
G2	35.00	37.67	32.33	32.67	34.42
G3	39.67	33.00	32.67	35.00	35.08
G4	36.00	32.33	33.00	29.33	32.67
G5	33.67	35.00	33.33	30.33	33.08
G6	35.67	41.67	37.33	31.67	36.58
G7	37.33	31.00	32.33	29.00	32.42
G8	33.67	30.33	31.33	31.67	31.75
G9	32.00	34.00	31.00	23.00	30.00
G10	37.67	30.33	30.33	34.67	33.25
Average	35.67	33.70	32.50	30.70	
L.S.D values (0.05)	Appointments 2.63	compositions 1.98		overlap 4.35	

The results in Table No.(2) showed the superiority of the two genotypes G6 and G3 by recording averages of (36.58 and 35.08) days, while the two genotypes G8 and G9 were faster to reach physiological maturity with averages of (31.75 and 30.00 days) sequentially. The results are with the results of [9], and the reason may be due to genetic differences, the nature of growth and the time required to reach this stage, which varies from one structure to another this result agreed with the results of [10]. As for the effect of planting dates, the results showed in Table (2) that the date (1/11).

Table (3): Effect of genotypes, planting dates and the interaction between them on plant height (cm)

Genetics	Appointments				Average
	D1	D2	D3	D4	
G1	84.47	72.88	81.30	81.68	80.08
G2	77.72	79.68	81.62	46.00	71.26
G3	81.08	79.11	81.14	49.64	72.74
G4	81.22	69.79	69.16	42.86	65.76
G5	86.08	75.16	78.49	59.58	74.83
G6	84.75	74.11	77.57	83.50	79.98
G7	85.40	75.57	71.85	74.38	76.80
G8	85.60	81.83	82.17	57.54	76.78
G9	84.96	73.86	72.30	72.70	75.96
G10	91.33	78.87	74.50	74.99	79.92
Average	84.26	76.09	77.01	64.29	
L.S.D values (0.05)	Appointments 5.69	Compositions 3.51		Overlap 8.22	

took a longer period to reach 75% of physiological maturity, with an average number of days that reached (35.67) days and without a significant difference from the date (10/11) which averaged. The number of days is (33.70) days, significantly superior to the dates (20/11 and 30/11) which recorded the lowest averages of (32.50 and 30.70) days, respectively. The period of physiological maturation and this result agreed with the results of [9].

Plant height (cm)

The results of the statistical analysis showed a significant effect of genotypes and planting dates on plant heigh. The results showed in Table (3) the difference of genotypes in plant height trait, as the genotypes G1, G6, G10, G7 and G8 recorded without significant difference the highest averages of plant height amounted to (80.08, 79.98, 79.92, 79.80 and 76.78) cm sequentially and outperformed Significantly over the other genotypes, while the lowest average for this trait was recorded by the genotype G4 which amounted to (65.76) cm, thus recording a significant decrease on all genotypes. Which represents about half of the height, this result agreed with what was mentioned before [11,12] they found the different genotypes of barley have differences in the characteristic of the height of the plant. As for the effect of planting dates, the results showed in Table (3) that most of the cultivars recorded the highest average plant height when planted on the date (1/11), which amounted to (84.26) cm, while the plant height decreased significantly at the time (30/11), recording less Average reached (64.29 cm). This result agreed with the results of [13] that showed that planting dates differ according to different environmental conditions, and the reason

may be due to the appropriate environmental conditions represented by temperature the intensity of lighting, length of day for growth and development.

Area of the flag leaf (cm^2)

The results of the statistical analysis showed a significant effect of genotypes and planting dates on the trait of the area of the flag leaf. The results in Table (4) showed the difference of genotypes in the area of the flag leaf, as the genotype G5 recorded the highest average area of the flag leaf amounting to (14.28) cm^2, while the genotype G7 recorded a significant decrease from all genotypes in the area of the flag leaf, which amounted to (7.93) cm2, and the reason for the different genotypes in the character of the area of the flag leaf may be due to the genetic nature of each composition in addition to the nature of the growth of the genotype and the extent of its tolerance to the surrounding environmental conditions This result agreed with the results of [14,15,16]. As for the effect of planting dates, the results of Table (4) showed that the date (1/11) was superior to the characteristic of the area of the flag leaf with an average of (14.96) cm^2, while the date (30/11) recorded the lowest average for this trait amounted to (10.25) cm^2. The reason for the difference in the area of the flag leaf within the planting dates is that the early date may give more time to build and elongate the cells, and thus an increase in the leaf area [17].

Grain yield (tons ha^{-1})

The results of the statistical analysis showed a significant effect of genotypes and planting dates on the trait of grain yield.The results in Table (5) showed that there is a difference between the genotypes in the trait of grain yield, where the genotype G7 recorded the highest grain yield with an average of (8.427) tons ha^{-1}, while the lowest average for this trait was recorded by the genotype G5, which amounted to (5.878)

Table (4): Effect of genotypes, planting dates and the interaction between them on the characteristic of the area of the flag leaf (cm^2)

Genetics	Appointments				Average
	D1	D2	D3	D4	
G1	11.44	16.07	11.62	10.95	12.52
G2	15.53	15.21	16.48	8.48	13.93
G3	10.66	16.80	12.65	7.32	11.86
G4	18.09	12.06	11.88	8.79	12.71
G5	16.39	11.79	16.77	12.18	14.28
G6	15.81	10.86	10.48	10.38	11.88
G7	8.77	6.90	7.37	8.66	7.93
G8	20.38	14.39	11.59	10.48	14.21
G9	14.70	11.44	10.79	12.00	12.23
G10	17.82	11.87	11.80	13.29	13.69
Average	14.96	12.74	12.14	10.25	
L.S.D values (0.05)	Appointments 1.00	Compositions 1.09		Overlap 2.23	

tons. ha^{-1}, this result agreed with (18), (19), and (20) they found significant differences between barley cultivars in the trait of grain yield. As for the effect of planting dates, the results of Table (5) showed the moral superiority of the dates (20/11 and 1/11) over the dates (10/11 and 30/11) which recorded a significant decrease in the grain yield, as their averages reached (8.014, 7.794 and 6.935). and 6.895 tons ha^{-1} respectively, this result was in agreement with (21).

Biological yield (ton ha^{-1})

The results of the statistical analysis showed a significant effect of genotypes and planting dates on the trait of biological yield.The results showed in Table (6) that there is a difference between the genotypes in the character of the biological yield, where the genotype G10 recorded the highest yield with an average of (16.75) tons ha^{-1}, while the lowest average was recorded by the genotype G5, which amounted to (12.18) tons ha^{-1}, The reason for the superiority of the G10 genotype may be due to its superiority in the grain yield, and this agreed with [8,9,22] who came to the difference of varieties in the biological yield.

As for the effect of planting dates, the results of Table (6) showed that the date (1/11) exceeded the biological yield with an average of (16.42) tons ha^{-1}, while the

Table (5): Effect of genotypes and planting dates and the interaction between them on the characteristic of grain yield (ton ha^{-1})

Genetics	Appointments				Average
	D1	D2	D3	D4	
G1	5.410	7.220	6.630	7.863	6.781
G2	6.780	8.610	8.720	5.243	7.338
G3	6.410	6.513	7.917	6.850	6.922
G4	9.383	5.847	8.293	5.273	7.199
G5	8.033	6.020	6.617	2.843	5.878
G6	6.823	7.260	7.773	8.773	7.657
G7	8.610	7.093	8.953	9.053	8.427
G8	7.990	6.770	8.433	5.740	7.233
G9	9.513	6.850	7.143	9.753	8.315
G10	8.983	7.163	9.663	7.553	8.341
Average	7.794	6.935	8.014	6.895	
L.S.D values (0.05)	Appointments 0.71	Compositions 0.54		Overlap 1.19	

date (30/11) recorded the lowest average for this trait amounting to (13.89) tons ha^{-1},

This result was in agreement with [21], the reason may be due to its superiority in grain yield over the rest of the planting dates, this result agreed with [23].

Table (6): Effect of genotypes and planting dates and the interaction between them on the biological yield (ton ha^{-1})

Genetics	Appointments				Average
	D1	D2	D3	D4	
G1	14.87	11.18	17.06	15.81	14.73
G2	12.50	16.62	15.71	13.25	14.52
G3	14.31	14.93	13.18	12.75	13.79
G4	18.25	12.93	15.62	12.25	14.76
G5	16.43	12.25	13.87	6.18	12.18
G6	16.12	16.43	15.62	17.81	16.50
G7	17.62	13.93	17.93	13.81	15.82
G8	18.21	13.81	17.50	11.43	15.24
G9	16.50	14.06	15.50	19.99	16.51
G10	19.43	14.31	17.62	15.62	16.75
Average	16.42	14.05	15.96	13.89	
L.S.D values (0.05)	Appointments 1.43	Compositions 1.54		Overlap 3.15	

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