



Effect of quantities of seeds on dry matter production of parts of the plant and on yield and its components of varieties of barley *Hordeum vulgare* L

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Abstract

A field experiment was carried out at the Second Agricultural Research and Experiments Station of the College of Agriculture / University of Al-Muthanna in Al Bandar region, in the winter season (2020-2021), to study the effect of seed quantities on the production of dry matter of varieties of barley, and the experiment was applied according to the arrangement of the plates. The split was according to a randomized complete block design (RCBD) with three replications. The experiment included the main factor of five seed quantities (20, 40, 60, 80, 100 and 120 kg ha⁻¹), and the secondary factor included two of varieties barley (Aksad, Ibaa265). The results showed that the quantities of seeds were significantly superior in all yield characteristics and the dry matter of the plant parts in the barley crop, where the quantity of seeds 80 kg ha⁻¹ was superior to the dry weight of stems, the dry weight of leaves in the stage of full maturity and the number of grains in the spike, which reached their averages were (21.12 g, 15.30 g, and 50.1 grain spike⁻¹) respectively, and the 60 kg ha⁻¹ seed quantity outperformed in the dry weight of the fully ripened ears, the dry plant weight and the weight of 1000 grains, as their averages were (41.41 g and 77.08 g and 26.28 g) respectively, and the quantities of seed 120 kg ha⁻¹ outperformed in the number of spikes and grain yield, as they reached 371.11 spike m⁻² and 6.47 tons ha⁻¹). The lowest seed level of 40 kg ha⁻¹ gave the lowest averages for most of the studied traits, as it gave the lowest average dry weight of stems, leaves and ears, and the dry weight of the plant in the fully mature stage, and the weight of 1000 grains, where their averages were (15.53 g, 12.20 g, 24.21 g, 51.94 g and 24.1 gm) sequentially. As for the cultivars, there were no significant effects, but the cultivar Ibaa 265 was superior in most of the studied traits compared with the cultivar Aksad. With regard to the interaction between the quantities of seeds and varieties, there were no significant effects between them.

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Introduction

Barley, *Hordeum vulgare* L. of the Poaceae family, is an important winter cereal crop grown in large areas in most parts of the world. It ranks fourth after wheat, rice and maize in cereal production in addition to its important uses as a fodder crop (F.A.O, 2008). Barley is characterized by its high nutritional value because it contains a high percentage of protein and amino acids, its speed of growth after cutting, and its ability to withstand salinity and drought. (Al-Atabi, 2011) Its cultivation thrives in a wide climatic range between latitudes 30 south and 60 north, and this makes it adaptable to environmental conditions (Eshghi and Akhundova 2009).

Determining the appropriate amount of seeds has a positive effect on intercepting the largest percentage of the solar radiation needed to carry out the process of carbon metabolism, which is reflected on the yield of the plant, as the different seed rates affect the quality of grains through their impact on competition on the number of plants per unit area (Al-Mousawi, 2002), and that determining the

optimal seeding rate is one of the basic conditions for obtaining a high yield, because its lower than the required limits may lead to the growth of large numbers of bushes that compete with barley in its early stages of growth through the small number of plants and to an increase in the number of shavings, especially those without ears The newly formed ones have a negative impact on the grain yield as a result of consuming water and nutrients and not giving them grain (Bonachela et al., 1995).

The seeding rates and the method of distributing plants per unit area have a significant impact on the three production components in field crops, which are the number of spikes per unit area, the number of grains per spike, and the weight of 1000 grains. Al-Rawashdah and others, 2013). With the aim of knowing the quantity of the best seed in producing the largest amount of dry matter in a manner that ensures its efficient distribution among the parts of a single plant and its effect on the yield characteristics and components of two types of barley.

Materials and working methods:

A field experiment was carried out at the College of Agriculture / University of Al-Muthanna, Al-Bandar area, which is located in the southwest of Al-Muthanna Governorate (2 km from the center of Al-Samawah city) during the agricultural season 2020-2021 in a mixture of soil, the

specifications of which are shown in Table (1) In order to know the quantity of the best seed in producing the largest amount of dry matter in a manner that ensures its efficient distribution among the parts of a single plant and its effect on the yield characteristics and its components for two types of barley crop.

Table 1. Some physical and chemical properties of the experimental soil.

	Characteristics	Units	Results
Physical properties	Sand	%	30.5
	Silt	%	29
	Clay	%	40.5
	Soil texture		Clay sandy loam
	ECe	ds.m ⁻¹	9.32
Chemical properties	Ph		7.8
	OM	%	10
	N	%	0.43
	P	Ppm	8.5
	K	Ppm	12

* Data were analyzed in the Soil and Water Laboratory - Diwaniyah Agriculture Directorate

experiment parameters

The experiment included studying the factors:

Where the main panels included the first factor, which is the quantities of seeds (S) and at five levels:

1- Level 1 (S1) = 40 kg ha⁻¹

2- Level Two (S2) = 60 kg ha⁻¹

3- Third level (S3) = 80 kg ha⁻¹

4- Fourth level (S4) = 100 kg ha⁻¹

5- Level Five (S5) = 120 kg ha⁻¹

The secondary panels included the second factor, which is the varieties

1- Aksad

2- Ibaa 265

The experiment was carried out using split plate design(RCBD) with three replications, and the number of experimental units was 30 units.

The operations of preparing the land and servicing the soil before planting were carried out by cleaning and removing the remnants of the previous crop, plowing the land designated for the experiment, and conducting the process of tamping for it. 46% N) was added in batches at the stage of branching, elongation and lining, and fertilized with triple super phosphate fertilizer 46% P₂O₅ before planting with

an amount of 80 kg H-1 added at once before planting (Jadoa, 1995), and potassium fertilizer was added in the form of potassium sulfate (42% K) with a quantity of 60 kg-1 in two batches, one before planting and the second in the elongation phase. The following traits were studied:

1- The dry weight of the stem at the stage of full maturity (gm)

2- The dry weight of the leaves in the stage of full maturity (gm)

3- The dry weight of the ears in the stage of full maturity (gm)

4- Dry weight of the plant in the stage of full maturity (gm)

The above characteristics were measured by harvesting 10 marked plants in the branching stage for easy identification of the whole plant, then drying them aerobically and finally placing them in the oven device until the dry weight is established

5- Number of spikes m²

The number of spikes was calculated by harvesting the two middle lines and converting it to m².

6- The number of grains in the spike

It was calculated by neglecting 10 spikes and taking and calculating its general average.

7- The weight of 1000 grain

The weight of 1000 grains was calculated from a sample of grains.

8- Grain yield ton ha⁻¹

It was calculated by harvesting the two middle lines and getting rid of straw and impurities and then converting it to ton ha⁻¹.

- The data was analyzed statistically after collecting and classifying the data using the statistical program. Genestat

Results and discussion :

1- The dry weight of the stems at the stage of full maturity (gm)

The results showed in Table (2) that there was a significant effect of seed quantities and the absence of any significant effect of the varieties and the interaction between them on the dry weight of the stalk of the barley crop. The seed quantity 80 kg ha⁻¹ gave the highest average dry weight of the stalk, reaching 21.12 gm, which did not differ significantly from the seed quantity 60 kg ha⁻¹, which averaged 20.99 g, while the seed quantity 40 kg ha⁻¹ gave the lowest average of these. The trait reached 15.53 g, and the reason for this is that this quantity of seeds took sufficient space for branching, and thus the photosynthesis per unit area was large and gave the largest amount of dry matter for the stem.

As for the varieties, there was no significant effect for this trait, but the aksad variety gave the highest mean for this trait compared to the variety Ibaa 265, where their averages were 19.07 and 18.77 g, respectively. As for the interaction, there was no significant effect.

Table (2) Effect of seed rate and varieties their interactions on weight of dry stem at the stage of full maturity (g).

varieties	Rate of seeds (kg ha ⁻¹)					Mean of varieties
	40	60	80	100	120	
Aksad	16.16	21.22	21.43	17.56	19.01	19.07
Ibaa 265	14.90	20.77	20.82	18.43	18.93	18.77
Mean of rate of seeds	15.53	20.99	21.12	18	18.97	
L.S.D (0.05)	Seeds rate = (1.232)		varieties = (N.S)		Interaction = (N.S)	

2- The dry weight of the leaves at the stage of full maturity (g)

The results showed in Table (3) that there was a significant effect of seed quantities and the absence of any significant effect of the varieties and the interaction between them on the dry weight of the leaves of the barley crop. The seed quantity 80 kg ha⁻¹ gave the highest average dry weight of leaves, reaching 15.30 g, which did not differ significantly from the quantity of other seeds except for the quantity of seeds 40 kg ha⁻¹, which gave the lowest average for

this trait, reaching 12.20 g, and the reason is mainly due to its superiority. In the dry weight of the stem, Table (2), which is positively reflected in the increase in dry matter in the leaves.

As for the varieties, there was no significant effect for this trait, but the aksad variety gave the highest average for this trait compared to the variety ibaa 265. As for the interaction, there was no significant effect.

Table (3) Effect of seed rate and varieties their interactions on weight of dry leaves at the stage of full maturity (g).

varieties	Rate of seeds (kg ha ⁻¹)					Mean of varieties
	40	60	80	100	120	
Aksad	12.50	15.67	15.08	14.84	13.86	14.39
Ibaa 265	11.90	13.86	15.52	14.37	14.97	14.12
Mean of rate of seeds	12.20	14.76	15.30	14.60	14.42	

L.S.D (0.05)

Seeds rate = (1.372)

varieties = (N.S)

Interaction = (N.S)

3- The dry weight of dry spikes at the stage of full maturity (g).

The results in Table (4) showed a significant effect of seed quantities and no significant effect of varieties and the interaction between them on the dry weight of ears of barley. The amount of seeds 60 kg ha⁻¹ gave the highest average dry weight of the ears, which amounted to 41.21 g, which differed significantly from the amount of other seeds, while the amount of seeds 40 kg ha⁻¹ gave the lowest

average for this trait, reaching 24.21 g, and the reason is attributed to the fact that the amount of seeds The optimization led to an increase in the weight of the spikes and the lack of competition between the parts of the same plant.

As for the varieties, there was no significant effect for this trait, but the variety Ibaa 265 gave the highest average for this trait compared to the aksad variety. As for the interaction, there was no significant effect.

Table (4) Effect of seed rate and varieties their interactions on weight of dry spikes at the stage of full maturity (g).

Varieties	Rate of seeds (kg ha ⁻¹)					Mean of varieties
	40	60	80	100	120	
Aksad	23.78	39.81	31.03	31.33	32.77	31.75
Ibaa 265	24.63	42.85	30.87	32.62	33.2	32.83
Mean of rate of seeds	24.21	41.33	30.95	31.98	32.99	
L.S.D (0.05)	Seeds rate = (1.978)		varieties = (N.S)		Interaction = (N.S)	

4- The dry weight of the plant in the stage of full maturity(g)

The results in Table (5) showed that there was a significant effect of seed quantities and the absence of any significant effect of the varieties and the interaction between them on the dry weight of the plant for the barley crop. The amount of seeds 60 kg ha⁻¹ gave the highest average dry weight of the ears,

reaching 77.08 g, which differed significantly from the amount of other seeds, while the amount of seeds 40 kg ha⁻¹ gave the lowest average for this trait, reaching 51.94 g, and the reason for this is mainly due to its superiority In the dry weight of the ears, Table (4).

As for the varieties, there was no significant effect for this trait, but the cultivar Iba 265 gave the highest average

for this trait compared to the aksad variety. As for the interaction, there was no significant effect.

Table (5) Effect of seed rate and varieties their interactions on the dry weight of plant (g)

varieties	Rate of seeds (kg ha ⁻¹)					Mean of varieties
	40	60	80	100	120	
Aksad	52.44	76.69	67.53	63.73	65.64	65.21
Ibaa 265	51.43	77.48	67.21	65.42	67.1	65.73
Mean of rate of seeds	51.94	77.08	67.37	64.58	66.37	
L.S.D (0.05)	Seeds rate = (2.669)		varieties = (n.s)		Interaction = (N.S)	

5- Number of spikes m²

The results in Table (6) showed a significant effect of seed quantities and the absence of any significant effect of varieties and the interaction between them in the characteristic of the number of ears of barley crop. The amount of seed 120 kg ha⁻¹ gave the highest average number of spikes, reaching 137.11 spike m², which differed significantly from the quantity of other seeds, while the seed quantity 100 kg ha⁻¹ gave the lowest average for this trait, reaching 291.67 m² spike, and this result agreed with Al-Fraih and others (2015)

who found that the greater the number of seeds, the greater the number of spikes m², and thus the increase in the number of spikes.

As for the varieties, there was no significant effect for this trait, but the variety Ibaa 265 gave the highest average of 329.32 spikes m² for this trait compared to the aksad variety, which gave the lowest average of 296.22 spikes m². As for the interaction, there was no significant effect.

Table (6) Effect of seed rate and varieties their interactions on number of Spikes plant-1.

varieties	Rate of seeds (kg ha ⁻¹)					Mean of varieties
	40	60	80	100	120	
Aksad	272.22	278.89	278.89	298.89	352.22	296.22
Ibaa 265	321.11	330.00	323.33	284.44	390.00	329.78
Mean of rate of seeds	296.67	304.44	301.11	291.67	371.11	

L.S.D (0.05)

Seeds rate = (15.421)

varieties = (N.S)

Interaction = (N.S)

6- The number of grains in the spike

The results in Table (7) showed a significant effect of seed quantities and no significant effect of varieties and the interaction between them on the number of grains in the spike of barley crop. Where the amount of seeds 80 kg ha⁻¹ gave the highest average number of grains in the spike, which amounted to 50.1. A grain spike⁻¹, which differed significantly from the quantity of other seeds, while the quantity of seed 60 kg ha⁻¹ gave the lowest

average for this trait, as it reached 42.77 grain spike⁻¹, and the reason for this is attributed to Significant differences between seed quantities in the number of grains per spike.

As for the varieties, there was no significant effect for this trait, but the aksad variety gave the highest average of 47.47 grain spike⁻¹ for this trait compared to Ibaa 265, which gave the lowest average of 45.98 grain spike⁻¹. As for the interaction, there was no significant effect.

Table (7) Effect of seed rate and varieties their interactions on number of grain in the spike

varieties	Rate of seeds (kg ha ⁻¹)					Mean of varieties
	40	60	80	100	120	
Aksad	49.33	42.53	50.73	49.1	45.63	47.47
Ibaa 265	47.03	43	49.47	46.3	44.1	45.98
Mean of rate of seeds	48.18	42.77	50.1	47.7	44.87	

L.S.D (0.05)

Seeds rate = (0.729)

varieties = (N.S)

Interaction = (N.S)

7- The weight of 1000 grain

The results in Table (8) showed that there was a significant effect of the quantities of seeds and the absence of any significant effect of the varieties and the interaction between them in the characteristic of the weight of 1000 grain, where the amount of seeds 60 kg ha⁻¹ gave the highest average weight of 1000 grains, which amounted to 26.28 g, while the amount of seeds gave 40 kg ha⁻¹ is the lowest average for this trait, as it reached 24.1 g. This result was in agreement with

Sabri and Ahmed (2018), who indicated that there are significant differences between barley cultivars in the weight of 1000 grains.

As for the varieties, there was no significant effect for this trait, but the variety Ibaa 265 gave the highest average of 25.29 gm for this trait compared to the Aksad variety, which gave the lowest average of 24.58 g. As for the interaction, there was no significant effect.

Table (8) Effect of seed rate and varieties their interactions on the weight of 1000 grain(g)

varieties	Rate of seeds (kg ha ⁻¹)					Mean of varieties
	40	60	80	100	120	
Aksad	23.80	26.40	24.53	23.57	24.60	24.58
Ibaa 265	24.40	26.17	25.23	24.97	25.70	25.29
Mean of rate of seeds	24.1	26.28	24.88	24.27	25.15	
L.S.D (0.05)	Seeds rate = (1.127)		varieties = (N.S)		Interaction = (N.S)	

8- Grain yield ton ha⁻¹

The results in Table (9) showed a significant effect of seed quantities and no significant effect of the varieties and the interaction between them on the character of the grain yield of the barley crop. The amount of seed 120 kg ha⁻¹ gave the highest average grain yield, which amounted to 6.47 tons ha⁻¹, which did not differ significantly from the amount of seed 80 kg ha⁻¹, which amounted to 6.40 tons ha⁻¹, while the amount of seed gave

100 kg ha⁻¹. The lowest mean for this trait was 4.90 tons ha⁻¹, and this result agreed with Hashem and Ali (2012) who found significant differences in this trait with different seed quantities.

As for the varieties, there was no significant effect for this trait, but the variety ibaa 265 gave the highest average of 6.13 tons ha⁻¹ for this trait compared to the aksad variety, which gave the lowest average of 5.46 tons ha⁻¹. As for the interaction, there was no significant effect.

Table (9) Effect of seed rate and varieties their interactions on grain yield ton ha⁻¹

varieties	Rate of seeds (kg ha ⁻¹)					Mean of varieties
	40	60	80	100	120	
Aksad	5.43	5.07	5.85	4.97	5.96	5.46
Ibaa 265	5.76	6.11	6.95	4.83	6.99	6.13
Mean of rate of seeds	5.60	5.59	6.40	4.90	6.47	
L.S.D (0.05)	Seeds rate = (0.232)		varieties = (N.S)		Interaction = (N.S)	

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