Response of some bread wheat cultivars to different types of organic and chemical fertilizers

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Abstract

A field experiment was conducted during the 2022-2023 agricultural season in Salah al-Din province /Shirqat District (AL-khasm area), to know the effect of five Types of fertilizers on the growth and yield of four bread wheat cultivars. Each replicate contained five main plots that represented the levels of the first factor (fertilizer treatments), then the levels of the second factor (cultivars), which were four secondary experimental units, were randomly distributed within them. The two-factor experiment was coundected using a randomized complete block design (RCBD) with a split plot system and three replicates. Each replicate contained five main plots to which fertilization levels were distributed. Each main plot was divided into four secondary experimental units to which the varieties were randomly distributed. The fertilizers used in the experiment were (Mineral fertilizer, organic fertilizer, nanofertilizer, biofertiliser, humic). As for the cultivars, they are four cultivars of bread wheat (Baghdad 1, Buhouth 158, Adna 99 and Jihan 99). The following traits were studied: number of days until flowering, plant height, number of tillers, Flag leaf area, number of spikes, number of grains per spikes, weight of 1000 grains, grain yield. The results obtained from this study were as follows:

The organic fertilizer treatment was excelled in number of days to flowering and weight of 1000 grain, with averages reaching (117.41 days, 48.82 g), respectively. The biofertilizer treatment was excelled of the number of grains per spike, with an average of (60.33 grains. spike^{-1}). The Baghdad 1 cultivar achieved significantly excelled in plant height and 1000 grain weight, with an averages of (92.54 cm, 51.64 g), respectively. The Bohuth 158 cultivar achieved significantly excelled in the number of grains per spike, with an average of (66.1 grains. spike^{-1}), respectively. The Aadna99 cultivar below gave a significantly excelled in traits of the number of spike and the number of tillers, with averages reaching (512.67 spike.m^{-2} and 464.60 tillers.m^{-2}). The interaction of the Jehan99 cultivar achieved the highest number of tillers and the Aadna99 cultivar achieved the highest number of ears with nanofertilizer treatment, with averages reaching (557.33 tillers.m^{-2} and 520.33 grain.m^{-1}), respectively.

Keywords: mineral fertilizer, organic fertilizer, nanofertilizer, biofertilizer, humic fertilizer, fine wheat

Introduction

Bread wheat (*Triticum aestivum* L.) is one of the most important strategic grain crops and the most produced and consumed at the global level due to its role in producing bread and achieving food security, where it is considered one of the most important sources of basic energy that humans need. Among traits that wheat possesses and makes it important in food are: Good balance between proteins and carbohydrates in its grains [12]. Cultivars are considered to have a high adaptability to various surrounding environmental conditions. Cultivars directly affect the characteristics of growth, productivity and quality. Among the studies on Cultivars of fine wheat, according to [7], when he studied five cultivars of fine wheat, noted the excelled of the Tammuz 2 cultivar in the area of the flag leaf, which amounted to (57.73 cm2), in the length of the spike, which amounted to (10.09 cm),

and in the number of grains in spike, which amounted to (53.18 grains. spike $^{-1}$) The Abu Ghraib 3 cultivar excelled in the ability to expel 75% of the ears, with a significant difference, on the rest of the cultivars, reaching (102.00 days). The Adnaniyah cultivar excelled in the number of spike per year, which reached (610.40 spike . m^{-2}), and in the weight of 1000 grain, which reached (47.49 g). The cultivars did not differ. Among them, in terms of plant height and grain yield, [11] found that in their experiment on ten genotypes of bread wheat, it was observed that there were differences between all the genotypes included in the study and for all traits, as the Razgari genotype was excelled in the traits of number of days until ears were expelled and leaf area. Science, weight of 1000 grains, and grain yield. The Jehan cultivar was exceled in number of spikes per square meter, and Alaa cultivar was excelled in number of grains. spike^{-1}. Mineral fertilizers are considered one of the most important means used to increase production in wheat crops due to the lack of nutrients in the soil and their exposure to loss, whether present in the soil or added to it due to erosion and drift by water or wind, such as nitrogen, or stabilization such as phosphorus. Studies have shown that the use of fertilizers in the soil has had an effect. Significant increase in wheat yield by up to 70% compared to no addition. [3] Organic fertilizers are considered one of the most important types of fertilizers due to their effectiveness in improving the chemical and physical properties of the soil and activating microorganisms such as bacteria and fungi, which secrete enzymes that stimulate growth, which reflects positively on the yield and its components, with an increase estimated at 50% compared to not adding organic fertilizer when planting. [15] Nanotechnology is one of the most important modern technologies known to this day, and interest in it is increasing in all areas of life. In the coming years, it will lead the applications of nanotechnology and contribute significantly to the development of the agricultural sector. This technology has the potential to revolutionize agricultural systems, as it works, despite its small size, to Raising hopes for improving agricultural production and reducing environmental protection costs in light of facing traditionally unresolved problems [16]. Nanofertilizers are considered an effective alternative to traditional fertilizers due to their ease of absorption and entry into cells, improving their vital functions and the efficiency of their effect due to their small size and the ability of nanoparticles to bind to protein carriers and penetrate the cell wall, thus encouraging an increase in the transfer of nanomaterials between cells [14] Biofertilizers are known as compatible inoculants of microorganisms such as bacteria, fungi, and algae that are added to grain, seedlings, or soil individually or in a mixture. This is known as biofertilization. They work to increase the readiness of nutrients for the plant as they settle on the internal surfaces of the plant and the rhizosphere area [17]. Humic acid is a water-soluble organic acid that is produced naturally from humic compounds that result from the decomposition of organic matter [2].

MATERIALS AND METHODS

This study was conducted during the 2022-2023 agricultural season in Salah al-Din province/Shirqat District (Al-khasm area). Rainfall rates were obtained, amounting to a total of (221 mm) throughout the agricultural season from the Department of Water Resources in Salah al-Din.

Soil analysis

Three random soil samples were taken from different places for the two experimental locations at a depth of (30 cm) before planting. To know the amount of phosphorus and nitrogen ready for the plant. They were mixed together and mixed well to form a complication sample for the purpose of analyzing it and knowing its contents of elements and physical traits. Analyzes of soil and water samples were conducted in the central laboratory of the College of Agriculture and Forestry/University. Mosul and the results shown in Table (1) were obtained.

Table 1: Results of analysis of soil and water samples for the experimental location

Traits	**Al-Sharqat**
Electrical conduction (EC) ($ds.m^{-1}$)	2.00
PH	7,1
Organic matter %	1.66
Nitrogen ppm	0.023
Phosphorous ppm	0.00284
Potassium ppm	26
Sand %	26.55
Silty %	43.25
Clay %	30.2
Water PH	6.1
Electrical conductivity of water EC ($ds.m^{-1}$)	0.80

A sample of organic manure (sheep waste), which was used as a source of fertilizer, was also taken and analyzed in the same laboratory. The percentage of nitrogen, phosphorus and potassium in it was (2.15, 1.054 and 0.81%), respectively.

soil preparation and field operations

Planting took place in the 2022-2023 agricultural season, and the land, and all field operations were conducted, including plowing, leveling, and leveling. A factorial experiment was implemented with two factors, with a completely randomized block design (RCBD), with a split plot arrangement, and with three replicates. Each replicate contained five main plots that were distributed within it. The first factor levels (Mineral fertilizer, organic fertilizer, nanofertilizer, biofertiliser, humic), which contain four secondary experimental units cultivars of bread wheat (Baghdad 1, Buhouth 158, Adna 99 and Jihan 99), included four items distributed randomly. Each main experimental unit had an area of (6 x 2.5 m^2), and 1.5 m was left between the main experimental unit within one replicate and 2 m between one replicate and another, while the area of the secondary experimental unit was (1 x 2 m^2) and the distance between one secondary unit and another was 0.60 m. was planted on 18/11/2022. The harvestwas done on a date 13/5/2023.

The experimental unit contained 13 lines, each line 1 m long, and the distance between one line to another was 17 cm. Grain were placed at a depth of 3-4 cm at a rate of 300 grain per square meter.

Table 2: Names of wheat varieties used in the study, their proportions, and source of obtaining them

Name varietie	Pedigree varietie	source varietie
Baghdad 1	The Ministry of Science and Technology/ Department of Agricultural Research and Food Technology	Directorate of Agricultural Research and Extension/Erbil
Buhouth 158	General Authority for Agricultural Research/ Ministry Of Agriculture	Directorate of Agricultural Research and Extension/Erbil
Adna 99	Ministry of Agriculture and Water Resources/ Kurdistan Region	Directorate of Agricultural Research and Extension/Erbil
Jihan 99	Turkish Holland Lukas Company	Directorate of Agricultural Research and Extension/Erbil

Fertilizer factor

Mineral fertilizer: Mineral fertilizer, which is the compound fertilizer NPK of Russian origin, was added at concentrations of 15-15-15 based on soil analysis so that the concentration used is consistent with the recommendation of the Iraqi Ministry of Agriculture and approved by the farmer to reach the approved dose. of fertilizer per hectare, which is (50 kg N/ha + 50 kg P/ha + 50 kg K/ha). Nitrogen fertilizer was added in the form of urea (46%N) at an amount of 100 $kg.ha^{-1}$ at the branching stage in the experimental units in which fertilizer recommendation parameters were applied [9].

Organic fertilizer (sheep waste): - Sheep waste was used at an average of 5 tons.ha-1. Sheep waste was obtained from a sheep breeder and was left for a year before using it in the experiment. Before planting in two months, the required amount was mixed for each unit. Experimental with the surface layer of soil.

Balanced nanofertilizer: The process of adding the balanced NPK nanofertilizer of Turkish origin produced by a company Nanofarm (18 - 18 - 18) was coundected by spraying the plants in the branching stage using the knapsack sprinkler, where 1 g was added for every 1 liter of water, and the spraying was done until it was completely wet. .

Cropak biofertilizer: Biofertiliser, which was in the form of granules, was added at planting at a rate of 40 $kg.ha^{-1}$ and according to the recommendation of the producing company, as it was mixed with the grain at planting produced by a Hungarian company (ZE RUBRR).

Humic acid fertilizer: The application process was done, one at planting, at a rate of 10 $kg.ha^{-1}$ produced by a Chinese company.

The experiment was irrigated immediately after planting, and sprinkler irrigation was adopted according to the needs of the plant and the condition of the soil. The process of manual hoeing of the growing weeds was carried out twice during the growing season to get rid of the growing bush along with the crop.

Experiment design and statistical analysis

A factorial field experiment was conducted with two factors according to a randomized complete block design (R.C.B.D) and with three replicates. The levels of the first factor (fertilizers) were randomly distributed in the main plots and the second factor (coarse wheat cultivars) in sub plots. Thus, the number of experimental units was 60 experimental units for each. location. The experiment data were analyzed using the Statistical Analysis System program (SAS 9.0 for both locations [10] and the averages of the coefficients were compared using the Duncan multiple range test [13].

studied traits

vegetative growth traits

1- Number of days to flowering (day), 2- Plant height (cm), 3- flag leaf Area (cm^2), 4- Total tillers number (tillers. m^2).

traits of the yield and its components

5- Number of spike (spike.m^2-), 6- The number of grains per a spike (grain. $spike^{-1}$), 7- Weight of 1000 grain (g), 8- Grain yield (tons.ha^{-1}).

Results and discussion

The effect of fertilizers, cultivars and their combinations on the vegetative growth traits

The results of Table (3), in which the effect of the averages of fertilizers and cultivars and the interaction between them on traits of the vegetative growth of Al- Sharqat location, are shown in Table 2. In terms of the number of days to flowering (day), it is noted that there are significant differences between the averages of the fertilization treatments for trait of the number of days to flowering, where the organic fertilizer treatment recorded the highest number of The days to flowering were (117.42 days), with a significant difference from the humic treatment, and the humic treatment gave the smallest number of days, which was (115.83 days), indicating early maturity, and with a non-significant difference from the mineral, bio and nano fertilizer treatments. As for the effect of cultivars on the trait, the cultivars Adna99, Jihan99, and Buhouth158 showed the highest number of days to expel spike, with averages reaching (118.13, 117.87, and 117 days), respectively, while the Baghdad1 cultivar recorded a significant decrease in the number of days, with an average of (113.4 days), indicating that it is earlier. With maturity, the reason for the significant difference between cultivars in this trait may be due to the genetic factors that control it and the effect of its interaction with environmental conditions (temperatures and light). These results are consistent with the findings of [9], who indicated that the difference in the number of days from planting to Flowering is due to the genetic factor between cultivars. As for the interaction between the average combinations of fertilization treatments and cultivars, the Jehan 99 cultivar with the biofertilizer and organic fertilizer treatments gave the highest number of days to flowering with averages of (119 and 118.33 days), respectively, with a significant difference from some combinations between the treatments, while the Baghdad 1 cultivar achieved the desired significant decrease. At all fertilization treatments, the lowest was (112.33 and 112.66 days) with the humic fertilizer and mineral fertilizer treatments, respectively. The early flowering characteristic is important because this increases the period of filling of the seed, and this is reflected in its size and weight, thus increasing the yield. This is in line with what [7] reached, as he indicated that the difference between cultivars in flowering periods depending on the fertilization treatments led to an increase in the size and weight. grain and thus an increase in grain yield.

Regarding plant height (cm), it is clear from the results presented in the same table that there are no significant differences between the averages of fertilization treatments for plant height, and these results agree with [4] in her study on three types of fertilizers. The cultivars showed significant differences between them, as the Baghdad 1 cultivar was significantly excelled and gave the highest average plant height of (92.54 cm) compared to the two cultivars, Buhouth 158 and Adana 99, where the average height of each of them reached (79.96 and 87.57 cm), respectively, and did not differ significantly from the cultivar Jihan 99, which recorded an average height. The plant reached (90.58), and the reason for the excelled of the Baghdad 1 cultivar may be due to the genetic factor, as the Buhouth 158 cultivar gave a significant decrease in all fertilizer treatments, and this confirms that the greatest effect is due to the

genetic action, and these conclusions are consistent with the findings of [7], who confirmed that the difference The characteristic of plant height among wheat cultivars is due to genetic action, which is the main influence on the trait. In the interaction between the two factors, the Baghdad 1 cultivar with the biofertilizer treatment recorded the highest plant height with an

average of (96.08 cm), while the Baghdad 158 cultivar achieved a significant decrease in the humic and mineral fertilizer treatments with averages of (77.20 and 77.66 cm), respectively. This may be due to the excelled of the Baghdad 1 cultivar. With the treatment of biofertiliser, there is a combined effect, which is the genetic action of the cultivar on the one hand, and the effect of the biofertiliser, which works through microscopic organisms in the soil to prepare the necessary elements for the plant, such as nitrogen, and thus causes an increase in the height of the plant on the other hand.

Regarding the number of tillers (tillers m^{-2}), the results showed that there were no significant differences between the averages of fertilization treatments for the number of tillers. In the cultivars, the Adana99 cultivar was significantly excelled, with the highest average for the trait reaching (512.67 tillers.m^{-2}), compared to the cultivars Jihan99, Baghdad1, and Buhouth 158, which recorded a significant decrease with averages reaching (400.67, 363.93, and 214.67 tillers.m^{-2}), respectively. The reason for the excelled of the Adana99 cultivar may be due to the genetic factors of the cultivar and their interaction with environmental conditions, these results are consistent with [1]. As for the comparison between the average combinations of fertilization treatments and cultivars, the Jehan 99 cultivar recorded the highest number of cuts with nano, organic, and mineral fertilizer treatments, with averages reaching (557.33, 549.33, and 535.67 spike.m^{-2}), respectively, while the Bohuth 158 cultivar achieved a significant decrease in all fertilization treatments and reached The lowest is (179.00 sh.m-2) with organic fertilizer treatment.

Table (3): Effect of average fertilizers and cultivars and their combinations on the vegetative growth traits

Fertilizers	Varieties	Traits			
		No. of spikes (spikes . m^{-2})	No. of grains per spike (grain. $Spike^{-1}$)	Weight of 1000 grain (g)	Grain yield ($kg.ha^{-1}$)
Mineral fertilizer	Baghdad1	349.67 b c d	57.61 a – e	48.33 a – d	9145 a
	bohuth 158	175.00 e f	62.90 a – d	38.93 c d	3732 e
	Adna99	489.00 a b	47.66 c d e	37.01 d	8237 a
	Jehan99	415.33 a b c	51.38 b – e	46.71 a - d	9206 a
Organic fertilizer	Baghdad1	276.33 c – f	60.48 a – d	51.81 a b	7973 a b
	bohuth 158	132.00 f	74.14 a	48.60 a - d	4272 d e
	Adna99	482.00 a b	44.92 d – e	44.70 a – d	9083 a
	Jehan99	310.33 c d e	58.47 a – e	50.17 a b c	8684 a
nano fertilizer	Baghdad1	295.00 c d e	46.68 c d e	52.58 a b	6951 a – d
	bohuth 158	203.33 d e f	66.95 a b	39.66 c d	5172 b – e
	Adna99	520.33 a	39.80 e	38.41 c d	7556 a b c
	Jehan99	366.33 a b c	51.28 b – e	45.33 a - d	8207 a
bio fertilizer	Baghdad1	275.67 c – f	67.32 a b	55.44 a	9395 a
	bohuth 158	181.67 e f	64.20 a b c	41.93 b c d	4370 d e
	Adna99	400.00 a b c	54.05 b – e	37.59 d	7437 a b c
	Jehan99	281.00 c – f	55.75 a – e	46.82 a - d	6906 a – d
Humic fertilizer	Baghdad1	344.00 b c d	52.84 b – e	50.03 a b c	8577 a
	bohuth 158	160.00 e f	61.85 a – d	48.83 a - d	4824 c d e
	Adna99	431.67 a b c	59.67 a – d	42.24 b c d	8396 a
	Jehan99	385.67 a b c	48.42 b – e	48.31 a – d	9335 a
means of fertilization	Mineral fertilizer	357.25 a	54.89 a b	42.74 b	7579.9 a
	Organic fertilizer	300.14 a	59.50 a b	48.82 a	7503.2 a
	nano fertilizer	346.25 a	51.18 b	43.99 a b	6971.3 a
	bio fertilizer	284.58 a	60.33 a	45.44 a b	7026.8 a
	Humic fertilizer	330.33 a	55.69 a b	47.35 a b	7782.8 a
mean of varieties	Baghdad1	308.13 b	56.99 b	51.64 a	8408.2 a
	bohuth 158	170.40 c	66.01 a	43.59 b c	4473.9 b
	Adna99	464.60 a	49.22 c	39.99 c	8141.9 a
	Jehan99	351.73 b	56.56 b c	47.47 a b	8467.5 a

Table (4): effect of average fertilizers and cultivars and their combinations on yield traits and components

Fertilizers	Varieties	Traits			
		No. of days to flowering (day)	Plant height (cm)	No. of tillers (tiller.m^{-2})	Flag leaf area (cm^2)
Mineral fertilizer	Baghdad1	112.66 d	93.67 a b c	405.67 a b	38.36 a b
	bohuth 158	116.33 a b c	77.66 f	217.67 d e	35.67 a b c
	Adna99	117.66 a b	86.56 b – e	535.67 a	18.14 e
	Jehan99	117.00 a b	88.79 a – d	457.00 a b	29.09 b c d
Organic fertilizer	Baghdad1	114.66 b c d	91.59 a – d	326.67 b – e	36.47 a b c
	bohuth 158	117.66 a b	84.31 c – f	179.00 e	38.46 a b
	Adna99	119.00 a	87.59 a – e	549.33 a	28.46 b c d
	Jehan99	118.33 a	93.67 a b c	376.67 b c	31.64 a – d
nano fertilizer	Baghdad1	113.66 c d	86.48 c – f	333.33 b c d	31.05 a – d
	bohuth 158	117.00 a b	82.67 d e f	245.00 c d e	39.91 a
	Adna99	117.33 a b	87.73 a – e	557.33 a	22.53 d e
	Jehan99	118.00 a b	88.86 a – d	407.00 a b	26.71 c d e
bio fertilizer	Baghdad1	113.66 c d	96.08 a	340.00 b c d	39.53 a
	bohuth 158	118.00 a b	78.98 e f	224.67 c d e	37.47 a b
	Adna99	118.66 a	87.06 a – e	441.67 a b	23.35 d e
	Jehan99	119.00 a	90.42 a – d	327.33 b – e	28.17 b c d
Humic fertilizer	Baghdad1	112.33 d	94.88 a b	414.00 a b	35.46 a b c
	bohuth 158	116.00 a b c	76.20 f	207.00 d e	36.21 a b c
	Adna99	118.00 a b	88.93 a – d	479.33 a b	26.69 c d e
	Jehan99	117.00 a b	91.18 a – d	435.33 a b	29.54 a – d
means of fertilization	Mineral fertilizer	115.91 a b	86.67 a	404.00 a	30.32 a
	Organic fertilizer	117.41 a	89.29 a	357.92 a	33.76 a
	nano fertilizer	116.50 a b	86.43 a	385.67 a	30.05 a
	bio fertilizer	117.33 a b	88.13 a	333.42 a	32.13 a
	Humic fertilizer	115.83 b	87.79 a	383.92 a	31.97 a
mean of varieties	Baghdad1	113.40 b	92.54 a	363.93 b	36.17 a
	bohuth 158	117.00 a	79.96 c	214.67 c	37.54 a

	Adna99	118.13 a	87.57 b	512.67 a	23.83 c
	Jehan99	117.86 a	90.58 a b	400.67 b	29.03 b

Regarding the flag leaf area (cm^2), the results indicate that there are no significant differences between the averages of fertilization treatments for the flag leaf area. As for the cultivars, the two cultivars, Buhouth 158 and Baghdad 1, had the highest average flag leaf area of (37.54 and 36.17 cm^2), respectively, and a significantly excelled on the two cultivars Jihan99 and Adna99, whose flag leaf area reached (29.03 and 23.83 cm^2), respectively. The difference in flag leaf area may be due to

Cultivars include the genetic composition of each cultivar, the genetic factor controlling this trait, the extent of its response to environmental conditions, and the difference in the period from planting to expelling the ears. These results are consistent with [6]. While the interaction of the cultivar Bohoth 158 with the nano-fertilizer treatment and the cultivar Baghdad 1 with the bio-fertilizer treatment recorded the highest flag leaf area with averages reaching (39.91 and 39.53 cm^2), respectively, with a significant difference from some combinations between the two factors, while the cultivar Adna99 achieved a high significant decrease when treated with mineral fertilizer with an average an area of (18.14 cm^2).

The effect of fertilizers, cultivars and their combinations on traits of the yield and its components

The results of Table (4), which show the effect of the averages of fertilizers and cultivars and the interaction between them on trait of the yield and its components for Al-Shirqat location, and on the character of the number of spike (spike.m^{-2}). The results indicate that there are no significant differences between the averages of fertilization treatments. It appears from the same table that there are significant differences between the averages of the cultivars, as the Adana 99 cultivar was significantly excelled in number of spike, with an average of (464.60 spike.m^{-2}), on the cultivars Buhouth 158, Baghdad 1, and Jihan 99, which recorded a significant decrease with an average of (170.40, 308.13, and 351.73 spike.m^{-2}). respectively, and the reason for the excelled of the cultivar Adna 99 may be due to its excelled in

the number of tillers, which had a direct impact on increasing the number of spike, in addition to the cultivar's ability to produce effective shoots. These conclusions are consistent with [9].As for the interaction between the two factors of the study, the cultivar Adna99 with the nanofertilizer treatment recorded a significantly excelled and gave the highest numb er of ears reaching (520.33 ears.m^{-2}), while the cultivar Buhouth 158 achieved a significant decrease in all fertilization treatments, the lowest of which reached (132 spike.m^{-2}) with Organic fertilizer treatment.

In trait of the number of grains per spike (grain. $spike^{-1}$), the bio-fertilizer treatment was significantly excelled on the nano-fertilizer treatment, with an average number of grains for each of them reaching (60.33 and 51.18 grains. $spike^{-1}$), respectively, while the same treatment was excelled , with a non-significant difference, to the rest of the treatments. Fertilization is for the same trait, The reason may be due to the direct effect of fertilizer on the length of the spike, which in turn increased the number of florets inside the spike, and these results are consistent with [11]. As for the cultivars, the cultivar "Buhooth 158" was significantly excelled in the number of grains

per spike, with an average of (66.01 grains. spike^{-1}), on the cultivars below 99, Jihan 99 and Baghdad 1, which recorded a significant decrease, with averages reaching (49.22, 53.06, and 56.99 grains.m^{-2}), respectively, and these results agree. With [8]. In the interaction between the two factors of the study, the cultivar buhouth 158 with the organic fertilizer treatment recorded the highest number of grains per spike, reaching (74.14 grains. spike^{-1}), with a significant difference from some of the combinations between the two factors, while the lowest cultivar 99 with the nano-fertilizer treatment achieved a significant decrease over all combinations and reached (39.80 grains. spike $^{-1}$), and the reason may be due to the excelled of the same combination significantly in trait of spike length.

Regarding the weight of 1000 grains (g), the organic fertilizer treatment was significantly excelled to the mineral fertilizer treatment, with an average of (48.82

and 42.74 g) for both, respectively, while it was excelled , with a non-significant difference, to the other fertilization treatments. Perhaps the reason for the excelled

of the organic fertilizer treatment is due to the increase in organic matter. And the activity of microorganisms in the soil, which works to increase the nutrients that the plant needs, and these results are consistent with [4]. As for the effect of the cultivars, the Baghdad 1 cultivar was significantly excelled and gave the highest average weight of 1000 grains, amounting to (51.64 g), compared to the two cultivars, Bohuth 158 and Adana 99, which recorded a significant decrease with an average of (43.59 and 39.99 g), respectively, while it was excelled , with a non-significant difference, to the cultivar Jihan 99. The reason for the difference may be due to Genetic as well as the ability of the cultivar to utilize the outputs of the photosynthesis process and its impact on increasing the nutritional material and transporting it to the sink, and then increasing the weight of the grains. These results are consistent with [6]. In the interaction between fertilization treatments and cultivars, the Baghdad 1 cultivar with the biofertilizer treatment gave the highest weight for 1000 grains with an average of (55.44 g), while the cultivar achieved the lowest 99 with the mineral fertilizer and humic fertilizer treatments. A significant decrease in the trait with an average of (37.01 and 37.59 g) respectively. This may be due to the reason The excelled of the Baghdad 1 cultivar with biofertilizer treatment is due to the interaction of the genetic factors responsible for the weight and size of the grain with the environmental conditions and its positive impact on the weight of the grain.

Regarding grain yield (kg.ha^{-1}), it is noted that there are no significant differences between the average fertilization treatments for grain yield. The reason for the lack of difference in fertilizer treatments for grain yield may be due to their lack of difference in the number of spike per unit area, which is considered one of the components of the yield. Main. These results are consistent with [7] and [4]. As for the cultivars, the cultivars Jihan99, Baghdad1, and Adana99 were significantly excelled , with averages for the trait reaching (8467.5, 8408.2, and 8141.9 kg.ha^{-1}), respectively, on the cultivar Buhouth 158, which recorded a significant decrease in average grain yield of (4473.9 kg.ha^{-1}). This may be due to the reason There are significant differences between the cultivars, mainly due to the excelled of the cultivars Jihan99, Baghdad1, and Adana99 in terms of the number of spike per unit area, and a high significant difference on the Bohoth 158 cultivar. The reason may also be attributed to the differences in the cultivars in their ability to benefit from the products of the photosynthesis process, which led to their differences in trait of yield.. These results are consistent with [11]. In the interaction between the two factors, the cultivars Baghdad 1, Jihan 99 and Adna 99 with most fertilizer treatments recorded a significant excelled. The cultivar Baghdad 1 with the biofertilizer treatment recorded the highest grain yield with an average of (9395 kg.ha^{-1}), with a significant difference on the

cultivar Buhouth 158 at all fertilization treatments, and a significantly decrease was recorded. With an average mineral fertilizer treatment of (3732 kg.ha^{-1}), the reason for the excelled of the Baghdad 1 cultivar in the biofertilizer treatment may be attributed to its excelled in the same treatment in trait of the weight of 1000 grains, the number of grains per spike, and the area of the flag leaf.

Conclusions and recommendations

It is noted that the Baghdad 1 cultivar is significantly excelled in the weight of 1000 grains, and the Adna 99 cultivar is excelled in both the number of tillers and the number of spikes. Accordingly, it is preferable to adopt the cultivation of the Baghdad 1 and Adna 99 cultivars, and as a result of the excelled The interaction of the cultivar below 99 with the nanofertilizer treatment in trait of the number of shoots and the number of spike. It is recommended to use these combinations.

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