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OVERLAP INFLUENCE FOR THE PROCESS OF RETAIL OF MINERAL AND NANOPARTICLES FERTILIZERS AND STAGES OF ADDITION ON GROWTH AND YIELD OF WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

A field experiment was carried out in one of the agricultural fields in Al-Fudaliyah city, which is located 11 km south of Dhi Qar province , to study overlap influence for the process of retail of mineral and nanoparticles fertilizers, and stages of addition On Growth &Yield of Wheat *Triticum aestivum* L. during the winter agricultural season 2017-2018. The experiment was carried out according to split plot design and by using Randomized Complete Block Design(RCBD) (Factorial inside split plot), and three replications. The varieties whose code is symbolized by A (Al-Rashid (A1), Bohouth 22 (A2) were placed in the main plot, while levels of fertilization that included (B1, B2, B3, B4, B5) and stages of addition that included (C1, C2, C3, C4) where placed in the sub plot. The results showed differences in varieties in some studied traits. Al-Rashid variety gave the highest average plant height, spikes length (108.38 cm, 17.252 cm), respectively, which did not differ significantly from the Bohouth variety 22 in total grain yield. The level of fertilization B3 showed its superiority in giving the highest average length of spikes, the total grain yield (15.737 cm, 11.20 t. h^{-1}), respectively and without significant difference with B1, B5, B4. The level of fertilization B1 gave the highest average height of the plant, number of grains (103.5 cm, 70.67 grain. $Spikes^{-1}$), respectively, which did not differ significantly from B3, B5, B4. The level of fertilization B5 gave the highest average number of total Tillers (603.7) $Tillers.m^{-1}$, which did not differ significantly from B1, B3, and B5. Results showed a significant decrease in level B2 in all studied traits, as well results showed did not a significant for stages of addition of all traits except for total Tillers, which the C4 level gave it the highest average of 608.3 $Tillers.m^{-1}$, while the addition stage C1 gave a lower average of 569.5 $Tillers.m^{-1}$, which doesn't differ from C2, C3. The combination (B1 × C4) gave the highest average grain yield of 12.19 t. h^{-1} compared with the combination (B2 × C3) which gave the lowest average of 8.62 $t.h^{-1}$. The combination (Bohouth 22 × B1 × C4) gave the highest average oftotal grain yield 12.75 $t.h^{-1}$ compared with the combination (Al-Rashid × B2 × C3) which gave the lest average of 5.89 $t.h^{-1}$.

***Keywords*:** varieties, fertilization, stages of addition, influence.

Introduction

Cereal crops are one of the oldest crops known to humans because they are the main source of food (Al-Anbari, 2004). Wheat is the most important because of its strategic role in achieving food security. The cultivated area reached (736.5 million ha) and its productivity is about 739.9 million tons globally (FAO, 2017). Fertilizer recommendations are added to the assumption that the plant needs nutrients during the growing season (Roland, 2010). Many scientific studies have confirmed that plant needs for these nutrients vary according to the growth season, soil, and plant growth stages (Panahyane and Jamaati, 2010). These requirements are related to the plant's phylogenetic nature, its stages of development and the prevailing environmental factors. The genetic factors of the varieties are controlled in the characteristics of their growth and production, and the interaction of these factors with the environmental factor will have effects on the graphic characterization and productivity as well as field practices and the use of modern technologies. When two factors of growth interfere, one effect will be affected by the other. This effect is either positive or negative or without effect. Negative impact or interference occurs when the plant response to composite factors (two or more factors) is less than a response to these two factors if added separately (i.e., response to combined factors less than total response to add each factor separately). Positive overlap follows Liebig's Law of the minimum or Limiting Law, and that the overlap may be between two nutrients or more, or between nutrients and agricultural processes, or between fertilizer and variety, or between varieties and the intensity of agricultural or nutrient, heat and humidity, (Ali, 2012).Growth analysis is an idea and concept used to identify and find appropriate plant models that are essential for plant breeders to find appropriate genetic structures. It will also determine the responsible factors in the high yield and therefore provide the basis for the application of appropriate field practices (Robert and Proter, 2006). The growth and emergence of wheat plant is a complex process, during the life cycle of the plant, many stages of growth overlap between them, and there is part of the plant in the case of the emergence and

there is another part may be in the case of death. The stages of growth guide provide us with overlapping processes in which the potential and the actual sum are determined. Effective crop management depends on the ability to determine crop growth stages and here the growth scale becomes a valuable tool. The growth scale is considered a general reference to describe the stage of growth, which facilitates good and rapid communication between farmers, crop workers, researchers and other agriculturists. An example of the importance of such a measure is the timing of fertilizer and the addition of agricultural chemicals to plants (Jadwa *et al.*, 2017).There is a great importance of nutrients to plants because of their distinctive role in many vital processes that take place at the level of the cell and the plant as a whole and which are positively reflected on the increase in production, but it may not be available in the soil in a ready and sufficient quantity, whether it is already in the soil or added as fertilizer for exposure to adsorption, precipitation or booking. And because of the continuous need during the period of growth of the plant, so the study aimed to provide mineral and nanoparticles fertilizers during the stages of growth of the plant as long as possible.

Materials and Methods

A field experiment was carried out in one of the agricultural fields in al-Fudaliyah city , which is situated 11 km south of Dhi Qar province , and located in the latitude (30°57' N), and Longitude (46° 21' E), and 5 m above sea level, during the winter planting season 2017-2018. In order to study the overlap influence for the process of retail of mineral and nanoparticles fertilizers, and stages of addition on two varieties of wheat (Al-Rashid & Bohouth 22). The soil of the experiment was plowed by the mold board plow twice and orthogonal, then the ground was softened by disk Plows and leveled by land leveling machine. The Split plot Design and the use of RCBD (Factorial inside split plot) and three replications were used. The replications were divided into experimental units with dimensions of 2 × 2 m, which included 10 agricultural lines and 20 cm between the lines (Advisory Bulletin, 2012). A distance of (1) m was left between the experimental units and the blocks and a distance of 2 m between the main plot for each block. The varieties whose code is symbolized by A (Al-Rashid (A1), Bohouth 22 (A2) were placed in the main plot, while levels of fertilization and stages of addition where placed in the sub plot. The fertilizer levels were marked with the symbol B which included:

First level B1 (N, P recommended mineral fertilizer).
Second level B2 (N, P recommended nanoparticles fertilizer).
Third level B3 (0.5(N, P) mineral+0.5 (N, P) nanoparticles).
Forth level B4 (0.25(N, P) mineral+0.75 (N, P) nanoparticles).
Fifth level B5 (0.75(N, P) mineral+0.25 (N, P) nanoparticles).

The stages of addition of fertilizer were marked with C Four stages of growth were selected according to the Feekes scale:

The first level C1 included the stages, the emergence (F 2.1) + tillering (F 2) + elongation (F 4).The second level C2 included the stages, the emergence (F 2.1) + tillering (F 2) + elongation (F 4) + booting (F 10).The third level C3 included the stages, the emergence (F 2.1) + tillering (F 2) + elongation (F 4) + booting (F 10) + expulsion (F 1. 10).The third level C4 included the stages, the emergence (F 2.1) + tillering (F 2) + elongation (F 4) + booting (F 10) + expulsion (F 1. 10) + Flowering (F1.5.10).

The varieties seeds were planted on 16 \ 11 \ 2017 for the winter season 2017 -2018, and the seed rate was 120 kg. ha^{-1} (Advisory Bulletin, 2012). (Mineral fertilizer) Urea fertilizer N 46% was added by 260 kg urea per Ha and phosphate fertilizer DAP P_2O_5 46% at a rate of 200 kg DAP. Ha, (Jadwa and Saleh, 2013). However, for the nanoparticles fertilizer obtained from the Iranian company Sepehr Parmis, containing 20% N as an emulsion and 25% P as granules, the Guidelines of nanoparticles fertilizing recommendations have been used. The nanoparticles and mineral fertilizing recommendations were classified according to the levels of the second factor (B) and were added according to the levels of the third factor (C). Weeding and weed control were carried out during the planting seasons. The plants were harvested on 10/4/2018. The traits of growth (plant height, length of spike, total Tillerings), yield and its components (number of grains in spike, weight of 1000grains, economic yield, bio yield, total yield).Statistical analysis of all studied traits was carried according to the design used by the statistical program Genstat version 5. The averages were measured using the test of the least significant difference at level 0.05.

Results and Discussion

Plant Height

The results of Table (1) show the significant effect of each of the varieties, fertilization and bilateral overlap between varieties and stages of addition, as well as the triangular overlap between the varieties and fertilization and the stages of addition in this trait. Al-Rashid variety achieved an average height of 108.38 cm while Al-Bohouth22 variety gave average heights of 94.12 cm. This is result agreed with Al-Asil (1998), Al-Anbari (2004), Al-Baldawi (2006), Al-Hassan (2011) and AL-Refai (2015) and (Al-Salem and others (2017), who pointed out that the varieties of wheat varieties vary in height, Moreover, this variation in height between wheat varieties is due to the fact that this characteristic is under the influence of the extra gene act, as well as to genetic variation in the number of

phalanges and lengths, especially the upper ones, which represent about half to one third of the height of the plant, and may also be due to the difference in content of the hormones of Auxin and Gibberellin, which responsible for elongation and expansion of cells, which has a significant effect on plant height. The height averages was significantly affected by different levels of fertilization, the level B1 recorded the highest average height of 103.56 cm, which did not differ significantly from the level of B3, B5, which gave an average height of 103.10), 102.83) cm respectively, while level B2 gave the lowest average height of 96.42 cm. This may be due to the fact that the level of B1, B3 has increased the amount of nutrients necessary to increase the concentrations of Auxins & Gibberellins, which play an important role in the elongation of plant cells and activity of Meristematic tissues and cell division. Nitrogen is one of the fastest moving elements within the plant and is transferred to modern parts such as the Meristematic responsible for the growth of the young plant, leading to increased cell division and elongation, thus increasing plant height. This result was agreed upon with the findings of Lami (2004), Nouri (2005), Hussain *et al.* (2006), Mattas (2011) and al-Abdullah (2015).The effect of the bilateral overlap between the variety and the stages of the addition significantly in the height of the plant, the highest elevation of the overlap factor between Al- Rashid variety and the addition stage C4 was recorded at 111.40 cm, while the overlap factor between Al- Bohouth 22 and the addition stage C4 gave the lowest average height of 92.77 cm. This may be due to the fact that differences in plant height traits, may lead to their differences in employability of nutrient absorption, especially nitrogen, and this is supported by Noulas (2002). The triangular overlap between the varieties, fertilization and the stages of addition had a significant effect. Al Rashid variety, fertilizing level B3, and addition stage C4 have recorded the highest elevation of overlap factor of 115.0 cm, while the overlap factor gave Al- Bohouth 22 variety and the level of fertilization B2 and phase C4 addition the lowest average height was 88.33 cm. The retail of fertilizer and its addition to the plant during the different stages of growth reduces the loss of fertilizer and improve the efficiency of the plant to absorb. The fertilizer is available during the stages of growth and be more effective for the performance of biological and metabolic processes, and thus lead to growth and increase the height of the plant. This result was consistent with Sanan and Jana (2001), Samsujjaman *et al*. (2009) and Mattas *et al.* (2011).

Table 1 : Effect of the varieties and fertilization and the stages of addition and overlap between them in plant height (cm) for the agricultural season 2017-2018.

A×B	Addition stages C				Fertilization B	Varieties A
	C4	C3	C2	C1		
111.21	113.00	114.00	109.00	108.83	B1	A1
102.25	106.00	94.33	104.67	104.00	B2	
111.17	115.00	114.33	105.67	109.67	B3	
106.33	112.00	102.33	105.00	106.00	B4	
110.96	111.00	112.33	111.67	108.83	B5	
95.92	95.67	90.67	97.33	100.00	B1	A2
90.58	88.33	93.00	91.33	89.67	B2	
95.04	100.50	91.67	95.33	92.67	B3	
94.33	90.00	97.33	96.00	94.00	B4	
94.71	89.33	96.33	97.50	95.67	B5	
20.824					**8.062**	**LSD**
Average of varieties						
108.38a	111.40	107.47	107.20	107.47	A1	A×C
94.12b	92.77	93.80	95.50	94.40	A2	
9.005					**6.973**	**LSD**
Average of fertilization						
103.56a	104.33	102.33	103.17	104.42	B1	B×C
96.42c	97.17	93.67	98.00	96.83	B2	
103.10a	107.75	103.00	100.50	101.17	B3	
100.33b	101.00	99.83	100.50	100.00	B4	
102.83a	100.17	104.33	104.58	102.25	B5	
2.35					**14.7**	**LSD**
	102.08	100.63	101.35	100.93	**Average of addition stages**	
					2.102	**LSD**

The Length of spike

The results of Table (2) showed the significant effect of varieties, fertilization and overlap among varieties and fertilization in this trait. Al-Rashid variety was superior in the trait of the length of spike, and gave an average length of 17.252 cm, while Al-Bohouth 22 variety gave an average length of spike 13.317 cm . This variability in the length of spike may be due to the genetic differences between the varieties, because this trait may be more related to the genetic factor (number of grains in the spike) (Anbari, 2004) and (Baldawi, 2006). The difference in the length of spike can be due to differences in the length of the period from planting until the emergence of spike, which are located within the flag leaf and expand it. This result was consistent with Ali (2009), Kubaisi (2010), and Hasan & Khadr (2012).The level of fertilization B3 gave the highest average heading length of 15.737 cm, which did not differ significantly from the level of fertilization B1, B5, B4, who gave the average length (15.654, 15.646, and 15.121) respectively, while the level of fertilization B2 gave the least average length of 14.262 cm. The significant effect of the fertilizer in the length of spike coincides with the stages of the emergence and development of the spike, which extends from the stages of the formation of the Tillerings to the booting stage, which means to create a better incentive for the growth and development of spike as a result of the availability of food supply on the one hand, and the effect of these nutrients in raising the efficiency of photosynthesis on the other hand, which encouraged better growth of spike and reflected clearly on the increase in its length. The decrease in the length of spike may be attributed to the increase in the number of Tillering in the unit area (Table 3), which has provided a state of competition for nutrients and reduced the length of spike. This result was consistent with Lami (2004), Nouri (2005), Badrani and Roumi (2013), Hassan and Daoudi (2014).The effect of bilateral overlap between varieties and levels of fertilization was significant. Al-Rashid variety was superior to fertilization level B1 and gave the highest average heading length of 18.042 cm, which did not differ significantly from the level of fertilization B3 and B5, which gave (17.758, 17.708) cm, respectively, while the factor between Bohouth 22 and the level of fertilization B2 gave the lowest average length of 12.983 cm. The increase in spike length may be due to nutrient utilization during the spike growth phase and the low probability of competition between vegetative and reproductive parts. This result was consistent with Faleh *et al*. (2003), Laghani et al. (2010), Hassan and Khader (2012), Al-Shabib (2013), Nouri and Anas (2013).

Table 2 : the Effect of varieties, Fertilization and Addition stages and overlap in the trait of spike Length (cm) for Agricultural Season 2017 – 2018.

A×B	Addition stage C				Fertilization B	Varieties A
	C4	C3	C2	C1		
18.042	18.333	18.333	17.667	17.833	B1	A1
15.542	16.667	13.833	16.333	15.333	B2	
17.758	18.500	17.500	16.867	18.167	B3	
17.208	18.167	17.000	16.000	17.667	B4	
17.708	18.000	18.167	17.333	17.333	B5	
13.267	13.000	12.300	13.933	13.833	B1	A2
12.983	13.033	12.900	13.167	12.833	B2	
13.717	14.333	13.667	13.667	13.200	B3	
13.033	13.333	13.167	12.633	13.000	B4	
13.583	13.167	13.667	14.500	13.000	B5	
1.75					**6.944**	**LSD**
The average of varieties						
17.252a	17.933	16.967	16.840	17.267	A1	A×C
13.31b	13.373	13.140	13.580	13.173	A2	
2.314					**4.786**	**LSD**
The average of fertilization						
15.654a	15.667	15.317	15.800	15.833	B1	B×C
14.262b	14.850	13.367	14.750	14.083	B2	
15.737a	16.417	15.583	15.267	15.683	B3	
15.121a	15.750	15.083	14.317	15.333	B4	
15.646a	15.583	15.917	15.917	15.167	B5	
0.616					**3.231**	**LSD**
	15.653	15.053	15.210	15.220	**The average of addition stages**	
					0.551	**LSD**

The Tillers

The results in Table (3) showed the significant effect of fertilization levels, stages of addition, and the triangular overlap between varieties, fertilization and stages of addition. The level of fertilization B5 gave the highest average of this trait at 603.7 Tiller. m^{-1}, which did not differ significantly from B1, B3, B4, who gave an average of (602.2, 590.1, 584.0)tiller.m^{-1}, while the level of fertilization B2 gave the least average of 529.5 Tiller.m^{-1}. This may be due to the effect of fertilization in producing as many Tillerings as possible, as the availability of fertilizer at the beginning of growth encourages the growth and emergence of roots and primary and secondary Tillerings, and the availability of fertilization in the elongation phase and beyond cause a decrease in the proportion of death of some Tillerings and survival, causing an increase in the number of Tillerings. This result was consistent with Alam *et al*. (2007), Al-Rafiai and Al-Anbari (2013) and Al-Abdullah (2015).The results showed that the addition phase C4 gave the highest average number of Tillerings reached 608.3 Tiller.m^{-1}, while the addition phase C1 gave the lowest average number of Tillerings reached 569.5 Tiller.m^{-1}, which did not differ significantly from the addition phase C2, C3, who gave the average number of Tillerings (573.8, 575.9)Tiller.m^{-1}, respectively. The increase in the number of Tillerings may be due to increased nutrient readiness, absorption and increased in plant content, which in turn increases the activity of vital events and increases the division and growth of metastatic cells, which gives a large vegetative and root growth with high efficiency by absorbing the other nutrients and thus increasing the number of Tillerings in the unit area. These results have been consistent with Davis et al.(2002).It was observed that the triangular overlap was significant, the factor of the variety of Al-Bohouth 22, the level of fertilization B4, and the addition stage C3 achieved the highest average number of total Tillerings amounted to 679.3 tiller.m^{-1}, while the factor of Al-Rashid variety, the level of fertilization B2, and the stage of addition C3 gave the lowest average number of Tillerings amounted to 409.7 Tiller.m^{-1}. This may be due to the fact that the retail of fertilizer and its addition to the plant at different stages improves the efficiency of photosynthesis process, and increases the amount of nutrients represented, it also can be attributed to the difference in response of varieties to levels of fertilization and stages of addition and genotypes of the variety. Or it may be due to the genetic susceptibility of the variety to form a larger leaf area, in the sense of increasing the opposition of sunlight with high efficiency, and increase the resulting representations in this objection, and the distribution and production of modern Tillerings. This result was consistent with Malghania *et al*. (2010), Galabi and Ahsan (2012) and Al-Rafiai and Al-Anbari (2013).

Table 3 : Effect of varieties and fertilization and the stages of addition and overlap between them in the total Tillers (tiller. m^{-1}) for the agricultural season 2017-2018.

A×B	C stages of addition				Fertilization B	Varieties A
	C4	C3	C2	C1		
586.1	586.7	595.0	545.3	617.3	B1	A1
498.8	509.3	409.7	549.3	526.7	B2	
561.2	601.3	596.0	536.7	510.7	B3	
563.1	636.0	489.7	536.0	590.7	B4	
571.1	593.0	572.0	544.3	575.0	B5	
618.3	652.0	554.7	640.0	626.7	B1	A2
560.2	593.3	600.0	503.7	544.0	B2	
619.1	657.0	613.3	653.7	552.3	B3	
604.8	618.7	679.3	578.7	542.7	B4	
636.2	636.0	649.3	650.7	609.0	B5	
165.12					**101.62**	**LSD**
Average of varieties						
556.0	585.3	532.5	542.3	564.1	A1	A×C
607.8	631.4	619.3	605.3	574.9	A2	
83.92					**103.46**	**LSD**
Average of fertilization						
602.2a	619.3	574.8	592.7	622.0	B1	B×C
529.5b	551.3	504.8	526.5	535.3	B2	
590.1a	629.2	604.7	595.2	531.5	B3	
584.0a	627.3	584.5	557.3	566.7	B4	
603.7a	614.5	610.7	597.5	592.0	B5	
33.70					**167.39**	**LSD**
	608.3a	575.9b	573.8b	569.5b	**Average of stages of addition**	
					30.14	**LSD**

Number of grains in spike

The results of Table (4) indicate the effect of the fertilization levels on the number of grains in spike. The level of fertilization B1 gave the highest average number of grains reached 70.67 grain.spike^{-1}, this was not significantly different from the level of fertilization B3, B5, B4, which gave an average number of grains (70.58, 69.12, and 66.04) grain. Spike^{-1}, while the level of fertilization B2 gave the least average of 60.71 grain. Spike^{-1}. This may be due to the fact that the increase in the number of grains is due to the availability of nutrients, especially nitrogen in the first crop growth stages, and that its emergence helps to increase the efficiency of photosynthesis process, and helps to increase the represented materials, as well as increase chlorophyll content, leading to an increase in the spikelets initiates of grains, and to find an appropriate opportunity to reduce Florets abortion by reducing the competition between them over the food produced. The increase in the number of grains per spike was associated with an increase in spike length (Table 2). This result was consistent with Alam *et al*. (2007), Shahzadi *et al*. (2013) and Hassan and Daoudi (2014).

Table 4 : The effect of varieties, fertilization, stages of addition, and overlap between them in the number of grains in spike(grain .spike^{-1}) for the agricultural season 2017 – 2018.

A×B	Stages of addition C				Fertilization B	Varieties A
	C4	C3	C2	C1		
71.58	74.33	73.33	71.33	67.33	B1	
55.75	58.33	46.33	62.00	56.33	B2	
71.08	68.00	78.33	70.67	67.33	B3	**A1**
63.58	71.67	57.67	62.33	62.67	B4	
68.83	67.33	78.67	63.00	66.33	B5	
69.75	71.00	71.33	66.33	70.33	B1	
65.67	67.33	67.33	63.67	64.33	B2	
70.08	77.67	67.00	71.33	64.33	B3	**A2**
68.50	70.67	76.33	63.33	63.67	B4	
69.42	71.67	69.33	70.00	66.67	B5	
18.489					**34.915**	**LSD**
Average of varieties						
66.17	67.93	66.87	65.87	64.00	A1	**A×C**
68.68	71.67	70.27	66.93	65.87	A2	
10.014					**8.003**	**LSD**
Average of fertilization						
70.67a	72.67	72.33	68.83	68.83	B1	
60.71b	62.83	56.83	62.83	60.33	B2	
70.58a	72.83	72.67	71.00	65.83	B3	**B×C**
66.04a	71.17	67.00	62.83	63.17	B4	
69.12a	69.50	74.00	66.50	66.50	B5	
5.126					**20.253**	**LSD**
	69.80	68.57	66.40	64.93	**Average of stages of addition**	
					5.585	**LSD**

Weight of 1000 grains

The results of Table (5) showed no significant differences in the factors studied in this trait.

Total Grain Yield

The results of Table (6) show the effect of the levels fertilization and overlap between fertilization and addition stages, as well as the triangular overlap between the varieties and fertilization and the stages of addition in this trait. Results showed that the level of fertilization B3 gave the highest average grain yield of 11.20 t. Ha^{-1}, which did not differ significantly from the level of fertilization B1, B5, which gave (11.05, 10.75) t. Ha^{-1}, while the level of fertilization B2 gave a lower average grain yield of 9.44 t.Ha^{-1}. The increase in grain yield is due to the positive effect of fertilization levels and their ability to provide nutrients and increase the efficiency of photosynthesis and thus their positive effect in increasing the number of total tillers and productive Tillers (Table 3), leaf area, chlorophyll and vital yield (Table 7), and then increase the grain yield. This result confirmed the positive relationship of association between the mentioned traits and the grain yield. This result was consistent with Ottman *et al.* (2000), Staggenbong *et al*. (2003) and Williaun *et al.* (2008). The effect of the bilateral overlap between fertilization and the stages of addition was significant.

The overlap factor between the level of fertilization B1 and the stage of addition C4 achieved the highest average of the grain yield of 12.19 t. Ha^{-1}, while the overlap factor between the level of fertilization B2 and the stage of addition C3 achieved the least average of the grain of 8.62 t. Ha^{-1}. This may be due to the effect of retail and addition of fertilizer during the growth stages, especially the post-branches, which worked to increase the vegetative total of the leaf area and its content of chlorophyll, as well as the increase in the number of Tillerings produced in the unit area and the number of grains spike, which Result an increase in the grain yield. This result was consistent with Reynolds *et al*. (1998).

According to the effect of triangular overlap between varieties and levels of fertilization and stages of addition, the overlap factor between Al-Bohouth 22 variety, the level of fertilization B1, and the stage of addition C4 achieved the highest average of the grain yield of 12.75 t. Ha^{-1}, while the overlap factor Al-Rashid variety, the level of fertilization B2, and the stage of addition C3 gave the least average of the grain yieldof 5.89 $t.ha^{-1}$. The reason may be attributed to the combined effect of each variety on its genetic ability by forming the number of Tillerings, as well as the process of retail and addition of fertilizer during the stages of plant growth, which has helped to sustain the largest number of produced Tillerings, as well as supporting the growth of the main tiller spike, which is the increase in the number of spikelets and the number of grains in it, this is reflected in the increase in the number of grains of spike and increase the grain yield. This result was consistent with Ogunela *et al*. (2001).

Vital Yield

The levels of fertilization and bilateral overlap between varieties and stages of addition, as well as between fertilization and stages of addition and triangular overlap between varieties and fertilization and stages of addition, affected as indicated by the data in Table (7).The data of Table 7 shows the superiority of the B3 fertilization level, which gave an average of 23.97 $t.ha^{-1}$, which did not differ significantly from the level of fertilization B1, B5, which gave an average (23.54, 23.34) $t.ha^{-1}$, respectively, while the level of fertilizer B2 gave an average of 20.25 $t.ha^{-1}$, which did not differ significantly from the level of fertilizer B4, which gave an average of 21.43 $t.ha^{-1}$. This is due to the role of nutrient availability, which leads to increased vegetative growth, generally leaf area duration (LAD) and plant height, Table (1) leaf area, chlorophyll, number of total tillerings and number of tillering producing of spike Table (3), and then increase the vital yield. This is supported by a relation of association of vital yield with the qualities mentioned positively and significantly. This result consistent with Lami (2004), Ahmad and Mahawash (2014) and Al-Abdullah (2015). The effect of bilateral overlaps between the varieties and stages of the addition significantly, the overlap factor gives Al-Rashid and the addition stage C4 the highest average of the biological yield of 23.96 $t.ha^{-1}$, while the overlap factor gives Al-Rashid and the addition stage of C3 the least average of the biological yield of 20.93 $t.ha^{-1}$. The addition of fertilizer in the late stages of plant growth led to the increase of the plant canopy in general, and this is reflected in the increase in the biological yield. This result was consistent with Al-Rubaie (2002), Faraj and others (2002). According to the bilateral overlap between fertilization and phases of addition, the level of fertilization B3 and addition stage C4 achieved the highest average of 25.68 $t.ha^{-1}$, while the level of fertilization B2 and addition stage C3 achieved the least average of 18.76 $t.ha^{-1}$. The increase in vital yield is due to the increase in the total number of Tillerings and the leaf area in the unit area, in addition to the role of the late additions of fertilizers in increasing the general vegetative growth of the plant and prolonging the duration of the effectiveness of the green leaf area, which reflected positively on the increase of the vital yield. In accordance with the effect of triangular overlap between varieties, fertilization and addition stages, the overlap factor Bohouth 22, the level of fertilization B3, and the stage of addition C4, which corresponded with the overlap factor of the Bohouth 22, the level of fertilization B1, and the addition phase C2 achieved an average of 26.32 $t.ha^{-1}$, while the overlap factor of Al-Rashid, the level of fertilization B2 and, and additional stage C3 achieved an average of 14.53 $t.ha^{-1}$. This may be due to the different varieties in the composition of the plant canopy resulting from the difference in height of the plant, and the leaf area and its susceptibility to the formation of Tillerings and grain yield, and the variation in the survival time of the crop also affects the production of total dry matter, which reflects the total plant effectiveness in the process of photosynthesis during the plant growth stage. In addition, providing the ideal level of fertilization will increase the components of the crop, and thus increase the yield itself, and its role in providing the reasons for increasing the number of Tillerings, plant height, and the area of flag leaf, pushed towards increasing the straw product and the increase of these components (grain and straw) and then increase biological yield. This result was consistent with Hussain *et al*. (2006) and Al-Rafiai and Al-Anbari (2013).

Table 5 : The effect of varieties, fertilization, stages of addition, and overlap between them in trait of weight 1000 grains(gm) for the agricultural season 2017 – 2018.

A×B	stages of addition C				Fertilization B	Varieties A
	C4	C3	C2	C1		
42.53	43.20	43.03	41.87	42.03	B1	A1
44.32	44.63	43.73	43.60	45.30	B2	
42.73	43.07	42.13	42.40	43.33	B3	
43.11	42.10	43.87	43.47	43.00	B4	
42.74	42.87	41.93	42.93	43.23	B5	
41.65	41.43	41.20	41.53	42.43	B1	A2
41.90	41.20	41.10	43.17	42.13	B2	
41.39	40.50	41.47	41.57	42.03	B3	
41.22	41.50	40.03	41.83	41.50	B4	
41.27	41.67	40.83	40.90	41.67	B5	
3.35					**6.549**	**LSD**
Average of varieties						
43.09	43.17	42.94	42.85	43.38	A1	A×C
41.48	41.26	40.93	41.80	41.95	A2	
4.307					**3.452**	**LSD**
Average of fertilization						
42.09	42.32	42.12	41.70	42.23	B1	B×C
43.11	42.92	42.42	43.38	43.72	B2	
42.06	41.78	41.80	41.98	42.68	B3	
42.16	41.80	41.95	42.65	42.25	B4	
42.00	42.27	41.38	41.92	42.45	B5	
1.949					**2.899**	**LSD**
	42.22	41.93	42.33	42.67	**Average of stages of addition**	
					0.849	**LSD**

Table 6 : The effect of the varieties, fertilization, the stages of addition, and overlap between them in total grain yield (t. Ha^{-1}) for the agricultural season 2017 - 2018

A×B	stages of additionC				Bfertilization	Avarieties
	C4	C3	C2	C1		
10.69	11.63	10.19	10.41	10.55	B1	A1
9.24	10.40	5.89	10.00	10.66	B2	
10.88	11.33	11.55	10.73	9.89	B3	
9.56	9.77	8.57	9.42	10.48	B4	
10.86	11.37	11.31	10.09	10.67	B5	
11.41	12.75	8.63	12.56	11.71	B1	A2
9.64	9.37	11.35	8.53	9.30	B2	
11.53	12.45	11.92	12.10	9.63	B3	
10.65	10.37	11.52	9.35	11.34	B4	
10.64	8.38	11.87	11.67	10.63	B5	
2.425					**2.772**	**LSD**
Average of varieties						
10.25	10.90	9.50	10.13	10.45	A1	A×C
10.77	10.66	11.06	10.84	10.52	A2	
3.18					**2.486**	**LSD**
Average of fertilization						
11.05a	12.19	9.41	11.48	11.13	B1	B×C
9.44c	9.89	8.62	9.26	9.98	B2	
11.20a	11.89	11.74	11.42	9.76	B3	
10.10bc	10.07	10.05	9.38	10.91	B4	
10.75ab	9.88	11.59	10.88	10.65	B5	
0.79					**1.58**	**LSD**
	10.78	10.28	10.49	10.49	Average of stages of additional	
					0.707	LSD

Table 7 : The effect of varieties, Fertilization, and Addition stages and overlap between them in the trait of vital yield (gm.0.25 m^{-1}) for the Agricultural Season 2017 - 2018

A×B	Addition stages C				Fertilization B	Varieties A
	C4	C3	C2	C1		
582.5	622.0	566.0	548.0	594.0	B1	
516.8	584.0	363.3	532.0	588.0	B2	
592.5	626.0	634.0	584.0	526.0	B3	**A1**
518.8	540.7	436.7	502.0	596.0	B4	
584.5	622.0	616.0	530.0	570.0	B5	
594.5	651.3	458.0	658.0	610.7	B1	
495.7	490.0	574.7	452.0	466.0	B2	
605.8	658.0	625.3	656.0	484.0	B3	**A2**
552.8	510.0	640.0	476.0	585.3	B4	
582.3	484.0	641.3	628.0	576.0	B5	
137.8					**159.16**	**LSD**
Average of varieties						
559.0	598.9	523.2	539.2	574.8	A1	**A×C**
566.2	558.7	587.9	574.0	544.4	A2	
181.07					**141.1**	**LSD**
Average of fertilization						
588.5a	636.7	512.0	603.0	602.3	B1	
506.2b	537.0	469.0	492.0	527.0	B2	
599.2a	642.0	629.7	620.0	505.0	B3	**B×C**
535.8b	525.3	538.3	489.0	590.7	B4	
583.4a	553.0	628.7	579.0	573.0	B5	
45.69					**91.38**	**LSD**
	578.8	555.5	556.6	559.6	**Average of addition stages**	
					40.87	**LSD**

Conclusions

The same effect is applied to the process of using and retail mineral and nanoparticles fertilizers, and the stages of adding them to the varieties together with no differences in the total yield. Get the highest yield of grain and vital yield at the level of fertilization B3.The process of use and retail of mineral and nanoparticles fertilizers was so effective, that there were no significant differences between their levels in most studied traits. The stages of the addition did not show differences in the total yield. The combination (B3 × C4) and (B1 × C4) gave the highest yield of the grains and the vital yield.

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