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THE RESPONSE OF THREE GENOTYPES OF YELLOW CORN *ZEA MAYS L.* TO DIFFERENT LEVELS OF MINERAL AND NANO FERTILIZER OF N.P.K. AND THEIR EFFECT ON THE YIELD COMPONENTS

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Abstract

This experiment was carried out to find out the response of three genotypes of yellow corn (*Zea mays* L.) to different levels of mineral and Nano N.P.K. fertilizer and its effect on the yield components of the yield, at the agricultural research station of the faculty of Agriculture - the University of Al-Muthanna. Used clay soil mixture for the autumn season (2018) in mixture clay soils. Use of this experiment three genotypes of yellow corn (Alfajer 1, 5018, Baghdad 3) which symbolled by (V1, V2, V3) respectively, which occupied the sub-plots and five levels of mineral and Nano fertilizers of N.P.K. are: = F1 (recommended mineral N.P.K.), F2 (75% mineral N.P.K. + 25% Nano N.P.K.), F3 (50% mineral N.P.K. + 50% Nano N.P.K.), F4 (25% mineral N.P.K. + 75% Nano N.P.K.), F5 (recommended Nano N.P.K.) that put in the main Plots. Fertilizers were added in two and three stages for plant growth. The split-plot system was used in the design of the complete randomized sectors with three replications. The results indicate the superiority of cultivar V3 significantly in the characteristics of the number of grains per ears and total grains yield. In contrast, the cultivar V2 recorded the lowest mean of the traits in succession, as evidenced by the results. The level F1 was significant in the characteristics of the number of grains per ears and weight of 500 grains. Whereas, the F3 level exceeded the total grain yield, while the F5 level gave the lowest mean for all traits. We did not notice the presence of significant differences for the factors included in the experiment and their interactions according to the number of stems in the plant.

Key words: yellow corn, *Zea mays* L., Nano fertilizer

Introduction

Yellow corn (*Zea mays* L.) is considered one of the major cereal crops important in world production, as it comes third after wheat and rice in terms of cultivated area and economic importance (F.A.O., 2013) and ranks first in cereal production per unit area (Corazzina, 1991). The importance of yellow corn is highlighted through its diversified use in the production of food, feed and raw materials for many industrial applications as its grains contain a high percentage of carbohydrates, proteins, starch, enzymes and vitamins, especially vitamin A, which is estimated at twenty times what is contained in wheat grains, which is essential in the manufacture of fodder for livestock and poultry and is important like the importance of soybeans in providing essential amino acids for animal growth. In contrast, in the industry, yellow corn is used In the production of corn flakes, corn oil, alcohol and wax. Yellow corn belongs to the Poaceae family, Monocotyldonae, a monoclonal plant.

Yellow corn production in Iraq is still low compared to global production and the gap in the rate of domestic production per unit area over the global average has increased from 37% in previous years to 55% in 1998. This decline in production calls us to seriously search for all possible means to increase production, which is done through the use of modern methods in agriculture and attention to soil and crop service operations, especially fertilization operations, in addition to choosing useful genotypes that are appropriate for the conditions of the region and are highly efficient in metabolic processes.

As yellow corn is considered as one of the crops with a high response to fertilizers, especially nitrogen, potassium and phosphorus, as these are considered

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determinants of production, and the yellow corn response to fertilizers is affected by many factors, including genetic, environmental and climatic, in addition to that, an increase in yield can be obtained when there is a compatibility between the genetic makeup. The growth factors available to him in that region and works to optimize the investment of these factors (Wahib, 2001).

This experiment was carried out to know the response of yield components of genotypes from yellow corn to fertilize with combinations of N.P.K. mineral and Nano fertilizer.

Materials and Methods

A field experiment was carried out to find out the response of three genotypes of yellow maize (*Zea mays* L.) to different fertilizer levels of metallic and Nano N.P.K. and their effect on the yield components of the autumn season (2018) at the agricultural research station of the faculty of Agriculture - the University of Al-Muthanna. In the Bandar region / Samawah district. The experiment was applied according to the arrangement of the design of split-plot design in R.C.B.D., with three replicates, fertilizing occupied the main plots, which included five levels of mineral and Nano fertilizers of N.P.K. are: = F1 (recommended mineral N.P.K.), F2 (75% mineral N.P.K. + 25% Nano N.P.K.), F3 (50% mineral N.P.K. + 50% Nano N.P.K.), F4 (25% mineral N.P.K. + 75% Nano N.P.K.), F5 (recommended Nano N.P.K.). Sub-plots were occupied by the sub-plates, which included three genotypes of yellow corn (Alfajer 1, 5018, Baghdad 3) which symbolled by (V1, V2, V3) were given successively.

Urea was used as a source of nitrogen (46% N), triple calcium superphosphate as a source of phosphorous (47% P2o5) and potassium sulfate as a source of potassium (K_2O, 50%). The recommendation used the N.P.K. mineral fertilizer for yellow corn (320 N + 200 P_2O_5 + 120 K_2O) kg. ha^{-1}, according to (Ali *et al.,* 2014). As for the Nano fertilizer, it was obtained from the Iranian company (Sepehr Parmis), which contains in its composition the nutrients N.P.K. with a concentration (5% K, 4% P and 8% N). 3 liters. ha^{-1}) which is 2 liters. ha^{-1}.

After performing the cultivation and smoothing operations of the soil and dividing the field according to the design used in the experiment, the cultivation of the seeds of the varieties was carried out on a two-meter furrow length of 75m and the distance between one and the other 75cm and the distance between holes and another 20cm so that the number of plants in one experimental unit becomes 40 plants with a plant density of 66666 plants. ha^{-1}, It left a distance of 0.75m between one experimental unit and another 2m between one replicator and another. The required concentration of the manure was prepared in a 1 liter volumetric flask and complete volume to liters by adding distilled water.

Ground mineral fertilizer was added in lines 5cm away from the cultivation line and one side. As for the fertilizer, it was sprayed on the vegetative parts of the plant to the point of getting wet and in the early morning to avoid the rise in temperature. The spray was sprayed with a 20-liter dorsal sprinkler. The diffuser (brightly) was added by 1.50 cm^3 per 10 liters of the nanoparticle to reduce tension Surface surfaces of water and to ensure complete wetness of the leaves to increase the efficiency of the spray solution in penetration of the kyotical layer of the vegetative total of the plant.

Statistical analysis was conducted according to the design used by the statistical program (GenStat version 5) and the averages were compared using the least significant difference (L.S.D) at the level $_{0.05}$.

Before planting, the samples of the soil randomly and at a depth of (0-30) cm and mixed well and Air drying and then ground and took from them one sample in which some physical and chemical characteristics of the soil were estimated in the Laboratory of Soil and Water Department at the Faculty of Agriculture - Muthanna University. As shown in Table 1.

Results and Discussion

Height of the corn cobs (cm)

The results in table 2 indicate that F2 fertilizer level exceeded by giving it the highest average of height cobs of 60.80 cm, which did not differ significantly from F3, F1 and F4 levels who gave averages of (59.55, 59.29, 57.76) cm, while F5 fertilization level was recorded

Table 1: Some of physical and chemical properties of the field soil before planting.

Characteristics		Values	Units
E.Ce.		3.3	Desimines m^{-1}
TDS		2.9	g. l^{-1}
pH		7.6	
Organic matter		0.58	%
Nitrogen Ready		20.8	Mg kg^{-1} soil
Phosphorus Ready		8.1	Mg kg^{-1} soil
Potassium ready		150.8	Mg kg^{-1} soil
Analysis of minute volumes	sand	212	Kg kg^{-1}
	silt	412	
	clay	376	
Texture		clay soil mixture	

Table 2: Effect of cultivars, fertilization and their interaction on the average height of cobs (cm) of corn.

F / V	F					Mean V
	F1	F2	F3	F4	F5	
V1	58.81	60.48	59.37	56.89	53.70	57.85
V2	59.34	60.44	59.53	57.70	55.36	58.47
V3	59.71	61.48	59.75	58.67	55.27	58.98
Mean F	59.29	60.80	59.55	57.76	54.78	
L.S.D.$_{0.05}$	F	V	F × V			
	3.200	N.S	N.S			

minimum average height of corn cobs was 54.78 cm. The reason for the increase in the height of the cobs was maybe due to the positive effect of the level of fertilizer F2 has contributed to the increase in the concentration of elements N, P, K absorbed by the roots and stomata on the diffuse on the surfaces of the leaves, which reflected positively on the increase in the activity of vital processes and growth, which led to an increase in the length of phalanges which increased from the rise of the sprouts and this result is identical to the findings of Al-Jabouri and Anwar (2009). They emphasized the increase in the rise of the sprouts by increasing the levels of added nitrogen fertilizer.

Number of cobs per plant (cob. plant^{-1})

The results of the statistical analysis in table 3 showed that there were no significant differences for the factors included in the experiment and their interactions on the characteristic of a number of cobs in the plant, this result is identical to what was reached by Al-Tamimi (2017), which indicated that there were no significant differences on cobs in the plant for cultivars different genetics of the yellow corn. The result is contrary to the findings of Ekeka and Al-Asadi (2017). They indicated that there were significant differences in the number of cobs in the plant for different genotypes of the yellow corn.

As for the effect of the levels of fertilizer on the characteristic number of cobs in the plant, the result is similar to that of Saleh *et al.,* (2013) and Fayyad (2008), who indicated that there were no significant differences in the number of cobs in the plant when using different

Table 3: Effect of cultivars, fertilization and their interaction on the number of cobs per plant (cobs. plant^{-1}).

F / V	F					Mean V
	F1	F2	F3	F4	F5	
V1	1.10	1.15	1.16	1.12	1.09	1.12
V2	1.12	1.12	1.12	1.00	1.05	1.08
V3	1.11	1.11	1.12	1.11	1.05	1.10
Mean F	1.11	1.13	1.13	1.08	1.06	
L.S.D.$_{0.05}$	F	V	F × V			
	N.S	N.S	N.S			

Table 4: Effect of cultivars, fertilization and their interaction on the weight of 500 grains (g).

F / V	F					Mean V
	F1	F2	F3	F4	F5	
V1	121.48	121.16	122.16	119.50	115.52	120.03
V2	121.45	121.31	121.22	119.50	116.21	119.94
V3	123.24	121.05	121.74	120.57	117.10	120.74
Mean F	122.24	121.17	121.83	119.86	116.27	
L.S.D.$_{0.05}$	F	V	F × V			
	2.236	N.S	N.S			

levels of phosphorous and nitrogen fertilizer.

Weight of 500 grains (g)

The results showed in table 4 that there were significant differences for fertilizing levels only in the weight of 500 grains, as they significantly exceeded the F1 level and recorded the highest average weight of grains reached 122.06 g, which did not differ significantly from the F3, F2 and F4 levels who gave averages of (121.83)., 121.17, 119.86) g compared to the level of F5 which gave the lowest average attribute of 116.27 g, The reason for the increase may be due to the positive role of ground fertilization with N.P.K. elements at the level of F1 in increasing the yield components, as both nitrogen and phosphorus participate in raising the efficiency and formation of many compounds such as carbohydrates, proteins, hormones and chlorophyll, which increases the accumulation of dry matter in the grains and prolonging the period of full IPI (2000). As for the positive role of potassium, it raises the efficiency of processed nutrients from the leaves (source) to the final (estuary) grains of the products of the carbon representations Obaidi (2008).

Number of grains per the cobs (grain. cobs^{-1})

Table 5 indicates that the superiority of cultivar V3 with the highest average number of grains per cob was 335.15 grain. cob^{-1}, with a significant difference from the other cultivars V1 and V2, which gave an average number of grains amounted to (325.03, 324.55) grain. cob^{-1}, in succession, that the superiority of genotype V3 was due to an increase the significance of the variety is in the height of the plant, thus reducing the shading of the

Table 5: Effect of cultivars, fertilization and their interaction on the number of grains per the cobs (grain. cobs^{-1}).

F / V	F					Mean V
	F1	F2	F3	F4	F5	
V1	337.65	336.70	331.57	316.90	302.33	325.03
V2	333.62	327.43	320.90	326.82	313.98	324.55
V3	340.63	340.73	350.23	332.87	311.28	335.15
Mean F	337.30	334.96	334.23	325.53	309.20	
L.S.D.$_{0.05}$	F	V	F × V			
	12.304	7.766	N.S			

Table 6: Effect of cultivars, fertilization and their interaction on total grains yield (t. ha^{-1}).

F / V	F					Mean V
	F1	F2	F3	F4	F5	
Vl	6.042	6.237	6.302	5.646	5.086	5.863
V2	6.075	5.941	5.817	5.205	5.096	5.627
V3	6.240	6.104	6.383	5.931	5.110	5.954
Mean F	6.119	6.094	6.167	5.594	5.097	
L.S.D.$_{0.05}$	F	V	F × V			
	0.3679	0.2220	N.S			

leaves above the cobs, which results in increased pollination and fertilization, and thus an increase in the number of grains formed in the cobs Al-Timimi (2017).

The results showed that the level of F1 fertilization was significantly higher in the number of grains in the cobs by giving it the highest average of 337.30 grains. cob^{-1}, which did not differ significantly from the level of fertilization F2, F3 and F4 who gave an average of (334.96, 334.23, 325.53) grains. cob^{-1} on the relay. The plant height increased significantly at the level of F1 fertilization in addition to the decrease in the time interval between the dates of male and female flowering at the level of F1 fertilization contributed to the increase in the number of grains in the cobs by increasing the proportion of pollination and fertilization. This result is identical to what was reached by Al-Dawdi *et al.,* (2015).

Total grains yield (t. ha^{-1})

The results of table 6 indicate that there are significant differences between cultivars and fertilizer levels, as the class V3 recorded the largest average of total grains yield of 5.954 t. ha^{-1}, which did not differ significantly from the class V1 with an average of 5.863 t. ha^{-1} compared to the type V2, which recorded the lowest average attribute of the value reached 5.627 t. ha^{-1}. The reason for the superiority of the synthetic cultivar V3 may be attributed to the fact that it is late maturity. Therefore it took a long time in the period of growth and increased in the leafy area, and this reflected positively on the grain yield compared to other varieties.

The table also indicated that the F3 level was significantly superior and gave the highest average of grains yield of 6.167 t. ha^{-1} compared to the level of F5, which recorded the lowest average of grains yield of 5.097 t. ha^{-1}. It is the number of cobs in the plant and the weight of 500 grains of table 3 and 4, which increased the total grain yield and this corresponds to the result of Mahmoud and Essam (2017) who indicated a significant increase in the total grain yield of yellow corn in the treatment of using fertilizer k, p with Nano-fertilizer spraying k, p compared to the treatment of using composting only or the treatment of nanoferting only.

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