



EFFECT OF OPTIMUS PLUS NANOPARTICLES IN SOME CHARACTERISTICS OF THE GROWTH AND YIELD OF CORN (*ZEAMAYS* L.)

Zahraa Mohsen Alassafi and Ahmed Najm Almosawy

Agriculture College, Kerbala University - Iraq.

Abstract

The experiment was carried out at Iraq, kabala ,Hussania during 2019-2018 season. In this study, in order to investigate the effect of optimus plus nanoparticles on growth and yield of some characteristics of corn (*Zea mays* L.). The experiment was laid out in split plot design with three replications. The experiment consisted of optimus plus nanoparticles. first factor were the concentrations of the organic fertilizer (0, 0.75, 1.5 and 2.25 mL⁻¹). The second factor. spraying times (35 days and 50 days spraying after planting).

The results showed that the 0.75 mL⁻¹ C1 concentration treatment was significantly superior and gave the highest plant (171.70) cm, The treatment of the concentration of 1.5 mL⁻¹ C2 stem diameter (2.21) cm, number of leaves (14.70), leaf¹ and grain yield (5.73 tons h⁻¹) and biological yield (15.07 tons h⁻¹), The concentration of 2.25 mL⁻¹ C3 excelled in the leaf area (5318) cm².

Introduction

Corn (*Zea mays* L.) of the important cereal crops represents the third position after wheat and rice in terms of cultivated area, and it is characterized by its high ability to produce dry matter as it is considered one of the four carbon plants (C4) and that the economic importance of maize lies Its cereals contain a high content of oil (4.6%), protein (10.6%) and carbohydrates (81%), as well as cereals containing B1, B2 and E (Mahantesh, 2006, Sachin and Misra, 2009) and its high production capacity and its adaptation to climatic conditions, maize is grown in large areas of the world for its grains, which it uses for human, animal and other industrial purposes (Al-Salmani and Al-Amery (2008); Orhun, 2013; Alafeea *et al.*, 2019). Nanoparticle fertilizers have an important role in increasing the ability of crops to resist various stress conditions and increase crop resistance to disease, as well as maintaining the genetic characteristics required for different agricultural crops and increase the active substances in the plant (Alamery *et al.*, 2018; Almosawy *et al.*, 2018a; Almosawy *et al.*, 2018b, as well as using nanoparticles to cover the traditional fertilizers to facilitate their absorption and increase their efficiency due to the easy entry into the cells and they an appropriate

mechanism for transporting compounds to the target locations, whether the roots, leaves, fruits or other plant parts and to plant feeding during increased photosynthesis by increasing the leaf content of chlorophyll (lin *et al.*, 2014; Alamery, 2014). One of the used nanoparticles is the organic enriched nanoparticles (Optimus Plus) as it is used as an agricultural fertilizer - produced with nanotechnology It contains a group of natural organic materials. It consists of organic materials 30% amino acids and 5% total nitrogen and 3% organic nitrogen. This study aims to: Determine the best concentration of nanoparticle enrichment in order to include it in the programs for improving plant growth and production.

Materials and Methods

The experiment was carried out at the field of Ibn Al - Bitar Vocational Preparatory during the spring Season in 2019 to study the effect of different concentrations of Organic nanoparticles and times of spraying on yield components of maize. The experiment was laid out according to randomized complete block design with split plot with three replicates. The experiment consisted of two factors: the first factor, four concentrations of Organic nanoparticles (C0 control, C1 0.75 mL.L⁻¹, C2 1.5 mL.L⁻¹, C3 2.25 mL.L⁻¹). The second factor. spraying times (35

*Author for correspondence : E-mail : dr.ahmed.abdallah@uokerbala.edu.iq days and 50 days spraying after planting).

Results

Height of plant (cm)

Data in table 1 indicated that plant height was significantly increased with spraying concentrations of nanoparticles enriched (Optimus-Plus), where the highest plant height with the Concentration of Nano-enriched (0.75 ml⁻¹ C1) which was recorded 171.70 cm. The minimum Number of plant height was noticed with control (141.90 cm). Results show that plant height was not significantly affected due to spraying time. The interaction of the nano fertilizer Optimus Plus with the spraying time had a significant impact on the height of the plant, where the superior interaction (treatment of adding 0.75 mL⁻¹ of nanoc fertilizer C1 and the treatment of second stage spray S2 which reached (175.70) cm) and the lowest plant height reached (138.80) cm When comparing treatment with second stage spraying (S2C0).

Table 1: The effect of concentrations of enriched organic nanoparticles Optimus-Plus and spray stages on plant height (cm).

The Average	Spray stages		concentrations Optimus Plus
	S2	S1	
141.90	138.80	145.10	(C0)0.00
171.70	175.70	167.70	(C1) 0.75 MI liter ⁻¹
163.10	167.40	158.70	(C2)1.5 MI liter ⁻¹
162.90	162.90	162.90	(C3) 2.25 MI liter ⁻¹
	161.20	158.60	the average
Concentra-tions of spr-aying stages	concentra-tions Optimus Plus	Spray stages	LSD
4.94	n.s	8.94	

Leg diameter (cm)

Data in table 2 indicated that there was a significant effect of the enriched nanoparticle concentrations (Optimus-Plus) and gave the highest value (2.21) cm when

Table 2: Effect of concentrations of enriched organic nanoparticles Optimus-Plus and spray stages in stem diameter (cm).

The Average	Spray stages		concentrations Optimus Plus
	S2	S1	
2.01	2.05	1.97	(C0)0.00
2.14	2.29	1.99	(C1) 0.75 MI liter ⁻¹
2.21	2.21	2.22	(C2)1.5 MI liter ⁻¹
2.16	2.05	2.26	(C3) 2.25 MI liter ⁻¹
	2.15	2.11	the average
Concentra-tions of spr-aying stages	concentra-tions Optimus Plus	Spray stages	LSD
0.29	n.s	0.17	

adding the concentration 1.5 ml L⁻¹ C2 and that the lowest value was (2.01) cm when comparing the C0 treatment. Results show that there were no morale differences for the spraying stages in the stem diameter. Results of the interference of spraying with the enriched nanoparticles Optimus Plus and the spraying stages significantly affected the characteristic of the stem diameter, to the highest rate achieved when overlapping the treatment of adding 0.75 mL⁻¹ of the nanocomputer (C1) and the treatment of spraying in the second stage (S2), which reached (2.29) cm The lowest rate was (1.97) cm when the first-stage comparison treatment (S1C0) overlapped.

Number of leaves (leaf⁻¹)

Results of table 3 showed a significant effect of all added spray concentrations on the number of leaves of plants that gave values (14.35, 14.70 and 14.30) leaf⁻¹ to concentrations C1, C2 and C3, respectively. Whereas, the comparison treatment gave C0 the lowest mean (13.75) sheet⁻¹. The results showed that the spraying stages did not significantly affect the number of leaves of the plant. Interference results indicated a great importance in the number of leaves of plants, where the highest average number of leaves was achieved when overlapping the treatment of adding 0.75 ml⁻¹ of nanofertiliser (C1) and spray stage in the second stage (S2) reached (14.90) leaf 1 and was less Number of sheets (13.40) sheets⁻¹ when treating comparison with the first stage spray (S2C0).

Table 3: The effect of concentrations of enriched organic nanoparticles Optimus-Plus and the stages of spraying on the number of leaves (leaf⁻¹).

The Average	Spray stages		concentrations Optimus Plus
	S2	S1	
13.75	14.10	13.40	(C0)0.00
14.35	14.90	13.80	(C1) 0.75 MI liter ⁻¹
14.70	14.60	14.80	(C2)1.5 MI liter ⁻¹
14.30	14.40	14.20	(C3) 2.25 MI liter ⁻¹
	14.50	14.05	the average
Concentra-tions of spr-aying stages	concentra-tions Optimus Plus	Spray stages	LSD
0.81	n.s	0.70	

leaf area is (cm²)

Results of table 4 showed a significant effect of all concentrations of Nano-enriched (Optimus-Plus) added in the leaf area of maize plants, which gave values of (5267, 5309 and 5318) cm² for concentrations C1, C2 and C3 respectively, while comparison treatment gave C0 (3462) Cm². Results show that were no significant differences for the spraying stages in the leaf area of

maize plants. Interference results indicated that the highest rate of foliar area was achieved when overlapping the treatment of adding 0.75 ml⁻¹ of the nanoparticle enriched (C1) and spray treatment in the second stage (S2) and the highest rate reached (5707) cm² and the lowest rate (3461) cm² when overlapping comparison treatment With the second stage spray (S2C0).

Table 4: Effect of concentrations of organic enriched nanoparticles Optimus-Plus and spray stages in foliar area (cm²).

The Average	Spray stages		concentrations Optimus Plus
	S2	S1	
3462	3461	3463	(C0)0.00
5267	5707	4826	(C1) 0.75 MI liter ⁻¹
5309	5581	5037	(C2)1.5 MI liter ⁻¹
5318	5097	5538	(C3) 2.25 MI liter ⁻¹
	4962	4716	the average
Concentra-tions of spr-aying stages	concentra-tions Optimus Plus	Spray stages	LSD
507.0	n.s	382.8	

Grain yield (Ton h⁻¹)

Results of table 5 indicated that there was a significant effect of all concentrations of Nano-enriched (Optimus-Plus) spray added in grain yield, which gave values of (4.66, 5.73 and 5.54) tons H1- for concentrations C1, C2 and C3 respectively, while giving the comparison treatment. C0 The lowest grain yield was (3.48) Tons e⁻¹. grain yield was not significantly affect by spraying time. The results of the overlap of spraying plants with nanoparticles enriched with Optimus Plus and spraying stages to the presence of a significant effect in the grain yield of maize plants, that the highest rate of achievement was achieved when overlapping the addition of a treatment of 1.5 mL⁻¹ of nanoparticles enriched (C2) and the treatment of spraying stage (S2) Which amounted to (5.92) tons h⁻¹.

Table 5: Effect of concentrations of organic enriched nanoparticles Optimus-Plus and spraying phases in grain yield (Tons h⁻¹).

The Average	Spray stages		concentrations Optimus Plus
	S2	S1	
3.48	3.18	3.79	(C0)0.00
4.66	4.75	4.57	(C1) 0.75 MI liter ⁻¹
5.73	5.92	5.55	(C2)1.5 MI liter ⁻¹
5.54	5.33	5.74	(C3) 2.25 MI liter ⁻¹
	4.80	4.91	the average
Concentra-tions of spr-aying stages	concentra-tions Optimus Plus	Spray stages	LSD
1.08	n.s	1.06	

Biological yield (Tons h⁻¹)

Results of table 6 show a significant effect of all spray concentrations added in the organic enriched nanoparticle Optimus Plus in the biological yield, which gave values of (14.36, 15.07 and 14.88) tons E1 to concentrations C1, C2 and C3 respectively, while the comparison treatment gave C0 the lowest rate It reached (11.39) tons h⁻¹. Result showed that the spraying time was not play a significant role in affecting biological yield. The results of interference showed that there was a significant effect in the biological yield of maize plants, as the highest rate of verification was achieved when overlapping the treatment of adding 0.75 mL⁻¹ of the nanoparticle enriched (C1) and spray treatment in the second stage (S2), which reached (15.82) e⁻¹ The lowest rate was (10.98) e⁻¹ when the comparison transaction overlapped with the second stage spray (S2C0).

Table 6: Effect of concentrations of organic enriched nanoparticles Optimus-Plus and spraying phases in biological yield((Tons h⁻¹).

The Average	Spray stages		concentrations Optimus Plus
	S2	S1	
11.39	10.98	11.80	(C0)0.00
14.36	15.82	12.92	(C1) 0.75 MI liter ⁻¹
15.07	14.81	15.32	(C2)1.5 MI liter ⁻¹
14.88	14.54	15.23	(C3) 2.25 MI liter ⁻¹
	14.04	13.82	the average
Concentra-tions of spr-aying stages	concentra-tions Optimus Plus	Spray stages	LSD
3.587	n.s	1.397	

Discussion

From the results shown in tables 1, 2, 3, 4, 5 and 6, it is clear that there is a significant effect of the spray concentrations added from the organic nanocatalyst on the growth characteristics and yield of the yellow corn. This is due to the importance of nanoparticles due to their distinctive and unique behavior and characteristics due to their smallness, high surface area and their ability to increase their absorption speed (Alamery *et al.*, 2019; Lateef *et al.*, 2019). Increased enzymatic activity as well as an increase in the speed of biochemical reactions when it is at the nanoscale level. Consistent with his findings Laware and Raskar, (2014). Those who referred to the role nanocomposites work to encourage and improve the characteristics of growth. This is consistent with his findings (Alwan *et al.*, 2009; Almosawy *et al.*, 2014; Alyasari *et al.*, 2019). Those who pointed out that the use of organic fertilizers nanoparticles Optimus Plus led to significant effects, One reason may be attributed

to the Optimus Plus manure containing organic and nitrogenous materials that lead to increased plant growth.

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