Role of nano-particles fertilizers on growth of corn (*Zea mays L.*) c.v. 5018

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Abstract. A field experiment was carried out in the fields of Ibn al-Bitar vocational prep school in Husseiniya district in Kerbala governorate during the spring season 2018 to study the role of nonopartical fertilizers on the growth of corn (5018). cwtival(R.C.B.D) was done in three replicates and in one factor, Control B1 protikculbor with 1 mL.L\(^{-1}\) concentrationP2 protikcalbor with 2 mL.L\(^{-1}\) concentration andoptimus plus B3 protikculbor with 3 mL.L\(^{-1}\)concentrationoptimus plus and B4 Nonotubes with 4 mL.L\(^{-1}\) concentration O1 protikcalbor with1mL.L\(^{-1}\) concentration O2 with 2 mL.L\(^{-1}\), O3 optimus plus with 3 mL.L\(^{-1}\) and O4 optimus plus with 4 mL.L\(^{-1}\). The results showed that the protikcalbor with 3mL.L\(^{-1}\)treatmt was superiorinthe plant height (152.2 cm) chorophyll content (33.57). Spadprotikcalbor with 4mL.L\(^{-1}\) treatmt was superior in the number of leaves (13.47) compared with the contrel which gave the lowest rates for all the traits.

1. Introduction

Corn (*Zea mays L.*) is one of the important grain crops belonging to the Poaceae family, which ranked third after wheat and rice crops in of the productivity and cultivated area in the world [1], [2]. The importance of the maize crop lies in two points: first, it is used in human and animal nutrition because of a good percentage of oil in the grain (10-4%). Secondly, its high productivity and adapts to climatic conditions [3]. Corn is grown in large areas of the world for cereals used in human and animal feed and other industrial purposes [4]. The use of leaves feeding in a scientific manner is more efficient than soil feeding about twenty once this helps to compensate the shortage of elements through spraying on the vegetativewhich is important in increasing the yield [5]. Nanotechnology plays an important role in increasing the ability of crops to resist various conditions as well as increasing crop resistance to diseases. Nanoparticles have been used to compensate for traditional fertilizers used for easy absorption and increased efficiency [6]. Boron is sprayed on the corn leafand added in the form of boric acid at a concentration of 0.5% led to significant differences in plant height [7]and[8]. reported that the boron spray at several levels (0, 0.5, 1, 1.5, and 2) mLg L\(^{-1}\)and three dates (vegetative growth, flowering, and grain formation) for the spraying of boron for both seasons. [9]. Indicates that spraying with boron and manganese at three levels (0, 25 + 50, 50 + 50) mLg. L-1 has significantly
affected the number of leaves of the maize plant. The addition of zinc and boron (seed stimulation and add to soil and spray) to the maize plants alone and their combination gave an increase in the chlorophyll content. leaves spraying gave the highest rate of chlorophyll content compared to the seed stimulation treatment with an increase of 45%[10].

2. Materials and methods

2.1. A field experiment was carried out at the Ibn al-Bitar Vocational School of Kerbala Education Directorate, Vocational Education Section for the Spring 2018 Season. to study the role of nonpartical fertilizers on the growth of maize 5018, varaity three replicates and one factor is the protease concentrations Calcium 15% + dissolved boron (B) and(R.C.B.D) design .The experiment wasdesignal as raudomin zed complete blocll design Optimasplus seeds were grown in22/03/2018. Nitrogen fertilizers were add in the rate of as urea 320 kg Nh-1, N 46% in two doses and phosphate fertilizer with 54 kg per hectar-1 and potassium fertilizers 144 kg per whw in the form of potassium sulphate[11],[12].

2.2. Traits studied in the experiment

Plant height (cm) Plant height at flowering stage was measured at 100% for five plants and randomly for each experimental unit using a measuring ruler from the soil surface to the end of plant leaves and then [13],[14].

2.3. Number of leaves (leaf plant⁻¹)

2.4. Leaf area (cm²) The Leaf area at the flowering stage was calculated as 100% of the five plants then extracted the average and according to the following equation[15].Leafarea = Length of the sequaveleaf under the main ear leaf × 0.75

2.5. Chlorophyll content (SPAD) The chlorophyll content was estimated by a spadchlorophyll meter. The readings were taken from four leaves per plant and their average was calculated[16],[17].

2.6. Statistical analysis

The results were statistically analyzed using(R.C.B.D) and comparing the averages using the least significant difference (LSD) at the probability level 0.05 between the coefficients and using the Genstat statistical program[18].

3. Results and Discussions

3.1. Plant height (cm).The mximum value (156.2 cm) was recorded at (p3) treatment (protikcalbor at 3mL .L⁻¹)and did not differsignificanty from( P1, P2,P4 ,P01 ,P03 and P04) treatments Table (1).The results of the table showed a significant effect of the concentrations of nano fertilizers on plant height.The minimum Plant height was noticed with control treatments which was recorded (106.7 cm).

3.2. Number of leaves (leaf⁻¹).The results of the table showed a significant effect of the concentrations of nanoparticles Fertilizers in the number of leaves. The proteic treatment was significantly higher than 4 ml per liter (P4), giving coefficients at the concentration of 1 ml L⁻¹ and Opatimes with concentrations 1 and 2 ml L⁻¹

3.3. Leaf area (cm²) The mximum value (3136.52 cm²) was recorded at (01) treatment (protikcalbor at 3mL .L⁻¹)and did not differsignificantiy from( P1, P2 ,P4 ,P01 ,P03 and P04) treatments. The results of the table showed a significant effect of the concentrations of nano fertilizers on plant height.The minimum plant height was noticed with control treatment which recorded (950.7 cm²).
3.4. Content of chlorophyll (SPAD). The results of the table showed a significant effect of the concentrations of the nano fertilizers on the chlorophyll content. The proteic treatment significantly exceeded the concentration of 3 ml. -1 liter (P3) with the highest rate of chlorophyll content which reached (33.57) SPAD, while the comparison treatment gave the lowest rate which reached 21.18 (SPAD), and did not differ significantly from the treatment of Optimes at the concentration of 2 ml 1.

Table 1. Showing the effect of nanoparticle fertilizers on some growth characteristics of Cornvaraity(5018)

| Treatments | Plant height (cm) | number of leaves(levas plant⁻¹) | Leaf area(cm²) | Chlorophyll content( SPAD) |
|------------|-------------------|---------------------------------|----------------|---------------------------|
| comparison | 106.7             | 12.00                           | 950.77         | 21.18                     |
| P₁         | 138.6             | 12.27                           | 2559.24        | 28.19                     |
| P₂         | 152.4             | 12.73                           | 2365.90        | 29.63                     |
| P₃         | 156.2             | 13.27                           | 2418.39        | 33.57                     |
| P₄         | 149.5             | 13.47                           | 1475.43        | 29.45                     |
| O₁         | 150.1             | 12.27                           | 3136.52        | 32.29                     |
| O₂         | 134.6             | 12.20                           | 1799.38        | 27.39                     |
| O₃         | 139.7             | 12.87                           | 1934.30        | 32.00                     |
| O₄         | 138.0             | 12.73                           | 2165.11        | 31.02                     |
| LSD0.05    | 19.82             | 0.58                            | 349.30         | 6.09                      |

The results in the table show that the effect of the 3 ml per 1-P3 on the plant height is due to the fact that the spraying of boron on the corn plants has a role in increasing the cell division and growth. The long is what he referred to [19],[20].

The results of the table showed a significant effect on the treatment of protease 4 ml for P4 in the number of leaves in the plant. The reason may be that boron increases cell division and formation of leaf buds [21].

The results of the table showed that there is a significant effect in the treatment of optimus 1 ml for O1 in the area of leaf area. The increase in leaf area may be due to the addition of nitrogen for its role in increasing the length of life of the plant capable of photosynthesis.

The results of the table showed a significant effect in the treatment of proteolytic 3 ml -1 (p3) in the content of chlorophyll (SPAD) unit. This superiority may be attributed to the role of proteic in increasing the transport of nutrients to the leaves, as well as the role of protease by increasing the activity of enzymes, Growth hormones, especially cytokinein, cause increased chlorophyll content [22].

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