

# Response of Some Maize Hybrids to Foliar Spraying Treatments 1-Growth Characteristics

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## ABSTRACT

With the purpose of decide the response of growth characteristic of some maize hybrids to foliar spraying treatments, two field experiments were carried out at the Experimental Station Farm, Faculty of Agriculture, Mansoura University, Egypt, during seasons of spring and autumn 2017 and 2018. All experiments were in strip-plot arrangement in 4 replications. Mean –plot was with maize included: hybrids *i.e.* Three Way Cross 324 (TWC 324), Single Cross 128 (SC 128) and Single Cross 131 (SC 131). The second plot was occupied with foliar spraying: without (0), Spraying on plants: trader fertilization Fert-plus (20:20:20, NPK), Amino acid (AA), yeast essence (YE) and mix Fert-plus powder (20-20-20, NPK) + amino acids (AA) + yeast extract (YE). The results showed that SC 131 hybrid surpassed other studied hybrids and recorded the highest values of stalk diameter, ear leaf area, ear length and diameter, in both seasons. SC 128 hybrid registered the tallest plants and the highest values in both seasons. Foliar spraying maize plants three times with the mixture treatment (Fert-plus + amino acids (AA) + yeast extract (YE) exceeded other foliar spraying treatments and produced the highest values of growth in both seasons. Promising results were obtained when using foliar fertilizing maize hybrids SC 131 or SC 128 with the mixture Fert-plus powder (20-20-20, NPK) at average 4 g/litre + Amino acid (AA) at of average 2.5 mL/litre + yeast essence (YE) at average of 100 mL/litre of water in each spraying. These results increased productivity and grains quality into ecological conditions of Dakahlia state, Egypt.

**Keywords:** Corn, Sprinkle on plants, macroelements, Amino acid, yeast essence, hybrids, genotypes, Growth indicators.

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## INTRODUCTION

Corn (*Zea mays* L.) was the generality serious cereals grain crops posterior wheats and rice in the world as well as in Middle east, Preparation most nutrients for animals and humans. Corn is complete either for human food or animal forage and a combined ingredient for industry product. Accordingly, broad attention must be paid to increasing its growth indicators through horizontal superiority by increasing its area designated for agriculture or vertical superiority by increasing in growth and working to reducing the space between global productivity and human and animal consumption. Undoubtedly corn has a high need for nutrients and other production factors. Hence, there are some factors that enhance corn productivity such as choosing high yield hybrids and foliar fertilization with microelements and natural growth stimuli, such as amino acids and yeast essence.

The choice of high yield ability hybrids certainly is important to promote maize production. Significant varietal differences on growth of maize were observed by many investigators. In this concern; Mahgoub & El-Shenawy (2006) gave the single cross 10 had the elevated height of plants, followed by SC 122. Khalil (2007) found that there were significant and highly significant differences between the studied hybrids in plant height, ear length. El-Sharifi *et al.* (2009) indicate corn hybrid had different response in growth characteristics. Abdou *et al.* (2012) find the TWC 352 hybrid has high number of row in ear.

Attia & El-Dissoky (2016), Awadalla & Morsy (2016) stated that S.C 166 corn hybrid gave significant bigger average accoding to S.C 162 & TWC.352 in all Vegetative growth parameter, like being; ear length, grains in row number, ears weight, grain weight in ear. Hassaan (2018)

indicated that maize hybrids (SC 168, SC. 176, TWC. 353 & TWC. 360) significantly affected height of plants, number of grains per row. Manjunatha *et al.* (2018) revealed that significant differences among maize hybrids were found in growth. Ul-Allah *et al.* (2020) revealed that eight single cross maize hybrids significantly varied in yield under irrigation and potassium treatments.

Sprinkle nutrients on plant is used comprehensively to reduce the deficiency of plant content by low nutrient processing by root. Foliar feeding creates root secretions, making it easier for the microorganisms to work at high capacity, which increases the absorption of nutrients from the soil. Foliar fertilizers play a secondary fertilization role that greatly increases the depletion of soil components and elements present in it. This method is not a substitute for ground fertilization, but rather complements it and increases the efficiency of fertilizers added to crops. (Ryan, 2002). Amino acid known bio-stimulant, it has positive effects on growth by increased & significantly reduced the injuries caused biotical stress, (Thomas *et al.*, 2009 & Kasraie *et al.*, 2012). Yeast extract is naturally sources of cytokinin & has stimulator effect at plant. Furthermore, yeast extracts were recommend to participates on a beneficial roles in division of cell & increased (Khedr & Farid, 2000 ; Wanas, 2002 and Amer, 2004). Moreover, applications of activity dry yeast were high effect in release CO<sub>2</sub> which reflect on improvement in net photosynthesis (Ferguson *et al.* 1995; Vas & Papanas, 2019). Attia *et al.* (2012) indicated that foliar application maize plants with of Crystal Nasr as a source of macro and microelements significantly increased growth as compared with control treatment (without foliar application) in both seasons. El-Moursy (2013) find the foliar sprayed corn plant with amino total of a sources for Amino acid double for 25 & 35 day after strewing

(D.F.S.) gave high mean of study's characteristics. El-Ghareib *et al.* (2014) indicated that foliar maize plants with 1500 cm Dolfan as a source of many amino acids +1 % Zn or 1000 cm Dolfan +1% Zn gave the highest values of plant height and ear weight in the two seasons. Habibi *et al.* (2015) showed that the foliar bio stimulants containing amino acids and nutrient elements significantly increase maize plants height, nitrogen content and chlorophyll content. Seadh *et al.* (2015) show the foliar spraed maize plants with the mix of Amino acid (A.A.) of average for 500 ml + yeast essence (YE) for average 2000 ml/200 litre water in fed exceed another foliar fertilizer treatments & Record high mean for growth characteristics, whereas foliar spraying plants with yeast extract gave the best values of all studied characteristics after afore mentioned treatment in both seasons. Abido *et al.* (2017 a and b) and quality was created for foliar spraed plant 3 time for amino acids (A.A.) and yeast essence (Y.E.) in both seasons. Seadh *et al.* (2017) showed that foliar application twice of maize with yeast (YE) significantly increased growth, yield and its components. Tadros *et al.* (2019) indicated that the maize plant height significantly affected by foliar application with amino acids as bio-stimulants at appropriate growth stage. Therefore, this study was conducted to investigate the response growth of certain maize hybrids to foliar spraying treatments.

#### MATERIALS AND METHODS

To study two important factors in corn productivity carried out 2 field experiment in: The Experimental Farm, College of agriculture, University of Mansoura. Through two consecutive summer season of 2017 & 2018 for study response: growth description, three corn hybrids to foliar spraying.

Two experiment was carried out in a strip-plot design with four replications. The vertical plots were assigned with three maize hybrids *i.e.* Three Way Cross 324 (TWC 324), Single Cross 128 (SC 128) and Single Cross 131 (SC

131). Studied maize hybrids were obtained and released by Maize Research Department, Field Crops Research Institute, Agricultural Research Centre, Giza, Egypt.

The horizontal-plots were occupied with the following five foliar spraying treatments; without foliar spraying (control treatment), foliar spraying with; trader fertilizer (Fert-plus) (20:20:20) its equipped for N.P.K of average 4 g/litre, amino acids (AA) at the rate of 2.5 ml/litre, yeast essence (Y.E.) mean of 100 ml/litre and the mixture Fert-plus powder (20-20-20, NPK) at the rate of 4 g/litre + Amino acid (A.A.) at the rate of 2.50 ml/litre + yeast essence (YE) for mean of 100 mL /litre in each spraying. Fert-plus (Commercial fertilizer), It is a powder that contains (N: 20, P:20& K:20) acquired for GAARA company. Amino acid (A.A.) in the form of Amin. -Zinc (15.0 % Amino acid and 5.50 % Zn). Yeast essence (Y.E.) as nature bio-stimulant was path use a technical allowed yeast cell for mature and more efficient through conducive aerial & nutrition. This process was produced beneficial bio-constituent, (protein, amino acids, carbohydrates, sugar, hormones, fatty acid, ...) this constituent should release outside for yeast cell in ready. The activity of Dry yeast was dissolved in water at ratio 1.0 g in L follow for added sugar 1 :1 and keep overnight for activity & reproduction of yeast & 2 cycle of freeze and dissolve for unrest of yeast cell & release them contents. (Spencer *et al.* 1983).

Volume of foliar solution: 500 litre/ ha & sprayed was conducted by sprayer's hand until saturation point three time at the aforementioned rates after 30, 37 & 44 days after sowing date (DFS). For the purpose of hydration process has been used Tween-20 (0.02 %.)

The secondary plots contained five pilot units, each experimental unit of 10.5 m<sup>2</sup> (3.50 m x 0.6 m) The preceding winter crop was Egyptian clover (*Trifolium alexandrinum* L.) in the first and second seasons.

Soil samples were randomly taken from the plots at a depth of 15 and 30 cm pre- soil preparation during the growing seasons to measure the physical and chemical soil properties as shown in Table 1.

**Table 1:** Physical and chemical soil characteristics at the experimental areas during growing seasons 2017 and 2018.

| Soil analyses               | 2017   | 2018   |
|-----------------------------|--------|--------|
| <b>Mechanicals analysis</b> |        |        |
| (%) sand                    | 21.55  | 21.4   |
| (%) Coarse                  | 3.95   | 3.96   |
| (%) Silt                    | 27.45  | 27.35  |
| (%) Clay                    | 49.05  | 49.29  |
| texture of soil             | Clayey | Clayey |
| <b>Chemicals analysis</b>   |        |        |
| EC ds / m (1: 5) at 25 °C   | 1.83   | 1.78   |
| pH                          | 7.65   | 7.62   |
| (%) O. M.                   | 1.55   | 1.62   |
| (%) CaCO <sub>3</sub>       | 4.75   | 4.69   |
| (ppm)available Nitrogen     | 21.30  | 25.39  |
| (ppm)available phosphorous  | 8.95   | 9.09   |
| (ppm)exchangeable Potassium | 155.52 | 163.51 |

The field soil was appropriately serviced by conducting two perpendicular tillage, smoothing, levelling, dividing and distributing the field.

During soil preparation, calcium superphosphate fertilizer (12.5 % P<sub>2</sub>O<sub>5</sub>) was added at a rate of 360 kg / ha, it was added urea (46.0 % N) average 300 kg N /ha in 2 batches equally, The first batch before planting and the second batch after 14 days after the first batch. As for potassium fertilizer (potassium sulphate ,48 % K<sub>2</sub>O) rate of 120 kg/ha it was added before planting.

Corn seeds were sowing by hands in hills 0.25 m apart at the rate of 3 grains/hill using dry sowing method (Afir) on one side of the ridge through the first May 2017 & 2018. Thinning was performed by leaving one plant in the hill after germination was completed for all field plants. Irrigation was carried out whenever the need arises, according to soil condition and weather heat.

All agricultural operations were completed to serve the crop according to the recommendations of the Ministry of Agriculture, and after signs of maturity appeared, the harvest was carried out.

#### Study characteristics of growth:

The growth characteristics were as follows; height of plants (cm) which were measured from the soil surface up to top for tassel, stalk diameters which were measured in cm on at a height of 15 cm from the soil surface below the plant and ears leaf Area which was calculated in cm square by: Gardner *et al* (1985):

E.L.A = Length of ear leaf × Max. width to ear leaf × 0.75

All obtained data were statistically analysed according to the technique of analysis of variance (ANOVA) for the strip-plot design as published by Gomez and Gomez (1984) by using "MSTAT-C" computer software package. Least significant of difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Snedecor and Cochran (1980).

## RESULTS AND DISCUSSION

### Maize hybrids performance:

Significant differences among the three studied maize hybrids *i.e.* Three Way Cross 324 (TWC 324), Single Cross 128 (SC 128) and Single Cross 131 (SC 131) were detected in plant height, stalk diameter, ear leaf area, ear length and diameter, during the two growing seasons as shown from data in Tables 2. From obtained results it could be noticed that SC 131 hybrid surpassed other studied hybrids (TWC 324 and SC 128), As it gave the highest rates for the traits under study (mentioned above) and for the two growing seasons 2017 and 2018. And so on, SC 128 hybrid gave tallest plants and high mean in grain in all season. Hybrid TWC 324 has recorded the low mean for all characteristics in seasons of 2017 & 2018.

The differences in the genetic makeup and gene factor were the reason for obtaining this disparity in the results. This result is in similarity: Mahgoub & El-Shenawy (2006), Khalil (2007), Sharifi *et al.* (2009), Abdou *et al.* (2012), Attia and El-Dissoky (2016), Awadalla and Morsy (2016), Hassaan (2018), Manjunatha *et al.* (2018) and Ul-Allah *et al.* (2020).

### Foliar spraying effects:

Foliar fertilization treatments effected *i.e.* control (0), foliar spraying with; Commercial fertilization Fert-plus powder (20:20:20) as a contains N.P.K., amino acid (A.A.), yeast essence (Y.E.) and mix. Fert-plus powder (20-20-20, NPK) + amino acids (AA) + yeast essence (Y.E.) corn growth characteristic (plant height, stalk

diameters & ear leaf area) were significant in 2017& 2018 (Table no.2). results show, them could be recommend that foliar spraying corn plant 3 times with the mix. Fert-plus powder (20-20-20, NPK) average of 4 g litre<sup>-1</sup> + amino acid (A.A.) mean of 2.5 ml /litre + yeast essence (Y.E.) average 100 ml /litre water in each spraying, where it distinguished itself from the rest spraying treatments & them gave high rates of growth characteristics in season 2017&2018. While foliar spray treatments three times also with yeast (Y.E.) avarge 100 ml /litre water in each spraying record outstanding rates growth in the mix. Treatment , followed by foliar spraying plants three stages for composting traders (Fert-plus) (20:20:20) which contains N.P.K average of 4 g/litre & then foliar spraying plants three times in amino acids (A.A.) average of 2.5 ml /litre water for each spraying 2017 &2018 season. And also, wise, control treatment (without foliar spraying) resulted in the lowest values of growth in both seasons.

The desirable effect of spraying maize plants three after 30, 37 and 44 days from sowing with the mixture of Fert-plus (20-20-20, NPK) + AA + YE might have been foliar fertilization replaces nutrient uptake for root (Ling & Moshe , 2002 ), as well as working on the addition effects of microelements (NPK), amino acids and yeast extract. Where, foliar nutrition plants with fertilizers contains microelements lead the effectiveness of the plant's biochemical processes, its physiological activity and the hormonal balance, or perhaps because of its metabolic effect of the n component, which results in the best growth, increase the accumulation of green matter and the activation of metabolic products. In addition, the role of amino acids (A.A.) Hormone and auxin composition, and chlorophyll content is increasing, which is finally reflected in the photosynthesis process (Thomas *et al*, 2009). Besides, yeast works positively as it contains natural organic compounds in stimulating growth, cell division and replication, synthesizing proteins and nucleic acids and increasing chlorophyll. (Wanas , 2002), which was reflected on improving early maize growth, more dry matter accumulation and stimulated the building of metabolic products which translocate to grains. This result was parallel: El-Moursy (2013), El-Ghareib *et al.* (2014), Habibi *et al* (2015), Seadh *et al.* (2015), Abido *et al.* (2017 a & b), Seadh *et al.* (2017) & Tadros *et al.* (2019).

### Effects interaction :

Note interaction effects, a significant effect was found for the interaction between yellow corn hybrids and foliar spray treatments.

## CONCLUSION

From the achieved results of this study, it can be concluded that foliar fertilizing maize hybrids SC 131 or SC 128 with the mixture Fert-plus powder (20-20-20, NPK) and 4 g/litre + amino acid (A.A.) in 2.5 ml /litre + yeast essence (Y.E.) at the rate of 100 ml /litre each spraying in order to maximize growth under the environmental conditions of Dakahlia Governorate, Egypt.

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**Table 2:** Plants height, stalks diameter, ears leaf area, ears length and diameters and ear rain weight as affected by foliar spraying treatment of some maize hybrids and their interaction during 2017 and 2018 seasons.

| Characteristics<br>Treatments<br>Seasons | Plants height<br>(cm) |       | Stalks diameter<br>(cm) |       | Ear leaf area<br>(cm <sup>2</sup> ) |       | Ears length (cm) |       | Ears diameter<br>(cm) |      | Ear grains<br>weight (g) |       |
|--|-----------------------|-------|-------------------------|-------|-------------------------------------|-------|------------------|-------|-----------------------|------|--------------------------|-------|
|  | 2017                  | 2018  | 2017                    | 2018  | 2017                                | 2018  | 2017             | 2018  | 2017                  | 2018 | 2017                     | 2018  |
| <b>A. Maize hybrids:</b>                 |                       |       |                         |       |                                     |       |                  |       |                       |      |                          |       |
| TWC 324                                  | 285.5                 | 289.3 | 2.310                   | 2.165 | 793.6                               | 783.2 | 23.76            | 23.60 | 4.96                  | 4.91 | 269.2                    | 237.8 |
| SC 128                                   | 309.7                 | 313.8 | 2.484                   | 2.328 | 853.5                               | 842.3 | 25.55            | 25.38 | 5.33                  | 5.28 | 289.5                    | 255.7 |
| SC 131                                   | 307.0                 | 311.1 | 2.505                   | 2.349 | 860.9                               | 849.6 | 25.78            | 25.61 | 5.38                  | 5.32 | 292.0                    | 257.9 |
| LSD at 5 %                               | 0.2                   | 0.2   | 0.005                   | 0.003 | 2.5                                 | 2.7   | 0.03             | 0.05  | 0.01                  | 0.01 | 0.5                      | 0.4   |
| <b>B. Foliar spraying treatments:</b>    |                       |       |                         |       |                                     |       |                  |       |                       |      |                          |       |
| Without                                  | 262.8                 | 275.2 | 2.019                   | 1.626 | 647.9                               | 646.5 | 22.15            | 21.32 | 4.68                  | 4.65 | 185.8                    | 158.3 |
| Fert-plus (20-20-20,<br>NPK)             | 307.9                 | 309.3 | 2.387                   | 2.393 | 852.4                               | 810.1 | 25.48            | 25.48 | 5.34                  | 5.26 | 302.3                    | 261.9 |
| Amino acids (AA)                         | 292.4                 | 294.9 | 2.271                   | 2.298 | 785.8                               | 774.1 | 24.64            | 24.92 | 5.12                  | 5.06 | 281.6                    | 239.8 |
| Yeast extract (YE)                       | 316.5                 | 317.6 | 2.567                   | 2.476 | 903.4                               | 902.1 | 26.03            | 26.03 | 5.28                  | 5.37 | 313.8                    | 279.9 |
| Mixture of Fert-plus +<br>AA + YE        | 324.0                 | 326.7 | 2.922                   | 2.611 | 990.6                               | 992.2 | 26.86            | 26.58 | 5.70                  | 5.50 | 334.2                    | 312.3 |
| LSD at 5 %                               | 8.7                   | 7.6   | 0.185                   | 0.201 | 59.0                                | 61.9  | 1.49             | 1.51  | 0.31                  | 0.29 | 9.2                      | 10.6  |
| <b>C- Interaction (F. test):</b>         |                       |       |                         |       |                                     |       |                  |       |                       |      |                          |       |
| A × B                                    | *                     | *     | *                       | *     | *                                   | *     | *                | *     | *                     | *    | *                        | *     |