The Impact of Foliar Spray with Ascorbic Acid on Some Growth Parameters and Grain Yield for Two Genotypes Of Maize Zea Mays L.

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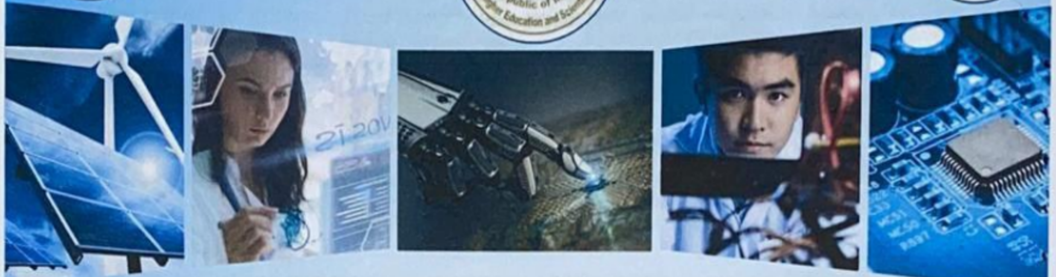

Conference Proceeding

2nd Al-Noor International Conference for Science and Technology

2NCSIT2020

August 28-29, 2020
Baku, Azerbaijan

2NCSIT2020

6- 02:50-03:00	AG1011	Khudhair J. Y. AL-Saidan;	Effect of Heat Accumulation on Length and Dry Weight of Spike for Wheat *Triticum Eastivum* L. Cultivars Fertilized with Mineral and Nanofertilization.
7- 03:00-03:10	AG1013	Yousif Yakoub Hilal; Raqeeb Hummadi Rajab; Arkan M. Sedeeq;	Plural Genetic Algorithms Approach to Control Agricultural Mechanization and Wheat Production.
8- 03:10-03:20	AG1014	Omar Mohsin Rashid; Saad Yassen Taha; Firas Jumaah Taha;	Study the Performance of Locally Manufactured Rotavator For Weed Control.
9- 03:20-03:40	AG1017	Lamiaa M. Al-Freeh; Anhar M.Al-shumary; Sundus A. Alabdulla;	The Impact of Foliar Spray with Ascorbic Acid on Some Growth Parameters and Grain Yield for Two Genotypes of Maize Zea Mays L.

Break (04:00-5:00)

Presentation Sessions (05:00-07:00) **Friday, August 28th, 2020**

Session Theme: **Engineering A** **Friday, August 28th, 2020**

Session Chair: **Dr. Ali Abbar khleif;** Session Co. Chair: **Asst. Prof. Salman Hussien Omran.**

Time	Paper ID	Authors	Title
1- 05:00-05:10	EN1028	Samer Saeed Abdulhussein; Ashraf A. Alfeehan;	Utilization of Iron Lathe Waste and Post-tensioned Steel Reinforcement in Lightweight Concrete Ribbed Slabs
2- 05:10-05:20	EN1029	Mohammed Abd-Alrasool; Alaa H. Ali; Ali K. Nahar;	A New Hybrid Method for Reducing the High PAPR in F-OFDM System with Low Complexity
3- 05:20-05:30	EN1046	Laith Jaafer Habeeb; Faez Abid Muslim Abd Ali; Muwafaq Sh. Alwan; Humam Kareem Jalghaf;	Enhancement the Performance of Compression Refrigeration Cycle by Cooling Condenser Air in Hot Climate.
4- 05:30-05:40	EN1047	Laith Jaafer Habeeb; Ali Abd Al-Nabi Abaas; Hasanen Mohammed Hussain; Ali Najim Abdullah Saieed;	Computational Investigation on Free and Forced Convection inside an Enclosure.
5- 05:40-05:50	EN1031	Amani Mezher Zedan; safa Aussian Abd awn;	The Effect of Bulb Size of Franki Pile in Collapsible Soil.
6- 05:50-06:00	EN1032	Ahmed Adnan Shandookh; Shaker S. Hassan; Omar Alaa Ihsan;	Investigating Different Types of Bearing on the Performance &Operation of Evaporative Cooler.
7- 06:00-06:10	EN1033	Mohammed Hasan Mustafa;	An Engineered Amelioration and Sustainability Enhancement Technique for Performance Upgrading of a Mechanical System.
8- 06:10-06:20	EN1063	Laith Jaafer Habeeb; Wajeeh Kamal Hasan; Ameer Resan Kalash; Hasanen Mohammed Hussen;	Numerical Investigation of Nanofluid in a Rectangular Microchannel Heat Sink.
9- 06:20-06:30	EN1037	Hadeer Ahmed Khudhair; Ali Laftah Abbas;	Influence of Replacing Stirrups Reinforcement by Longitudinal Steel Pate with High Performance Concrete Beams.
10- 06:30-06:40	EN1038	Salwa Tariq Omar; Fouad A. Saleh;	Impact of the Nozzle Angles, Distance between Burners, and N2 on Burning Velocity for Premixed Counter Flame.

Agriculture

2nd Al-Noor International Conference for Science and Technology

The Impact of Foliar Spray with Ascorbic Acid on Some Growth Parameters and Grain Yield for Two Genotypes Of Maize Zea Mays L.

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Paper ID: 2NICST2020AG1017

***Abstract*—** A Field experiment was carried out at the field crops department agriculture college / university of Basrah, Iraq during fall season 2019 to study the effect of foliar spray with different concentrations of ascorbic acid (0, 2, 4, 6, 8 g l-1) on some growth characteristics ,grain yield and its components of two genotypes of maize (Furat , Buhooth- 106).Treatments were arranged in according split-plot design in RCBD with three replication. The spray concentration is placed in the main plots, while the sub plots includes genotypes . Furat genotype gave the highest yield (5.560 t ha-1).Spraying ascorbic acid at the concentration of 8 g l-1 produced a maximum yield (6.320 t ha-1) .Minimum grain yield was found in the control treatment(4.230 t ha-1). Spraying of Furat genotype with a high concentration of ascorbic acid (6 and 8 g l-1) was superior and gave 7.550 and 7.232 t ha-1 as compared to all interactions.

Keywords: *Maize, foliar spray, Ascorbic acid, growth characteristics, yield component.*

I.INTRODUCTION:

Maize (*Zea mays* L.) is a cereal crop which belongs to the family poaceae .It is an important cereal crop , where ranks the third after wheat and rice in the world (Imran, 2015). It is grown widely in many countries of the world. Maize is an important cereal crop in Iraq it is widely used in both the food and by-products like corn starch, corn oil, dextrose, corn syrup, corn flakes, cosmetics, wax, alcohol (Abdullah and Karim, 2019), as well as the maize grains are rich in vitamins A, C and E, carbohydrates, proteins and essential minerals (Nuss and anumihardjo,2010) Corn.is grown in Iraq in most of Iraq's governorates, the production for two seasons (spring and autumn) estimated 473.1 thousand tons for the summer season, with a total area of 515.2 thousand dunums, with an average yield of 918.3 kg dunums^{-1}. (Cotton, Potato and Maize Production Report for 2019), but the average yield is still lower than the developed agricultural countries, such as the United States (1044 t ha^{-1}) Turkey (10.75 t ha^{-1}) and Canada (9.72 t ha^{-1}) (USDA, 2019).

Consequently, it has become necessary to think about new methods that increase the yield of the unit area, including the use of chemicals that are safe in the environment and have no side or negative effects in humans and animals, to manage the crop to achieve the highest possible functional and genetic capacity. Aascorbic acid (AsA) increases the tolerance of the plant to salinity and cold (Darvishan *et al.,* 2013). It has been shown to play an important role in many plant physiological processes including growth regulation, differentiation and metabolism The use of growth regulators alone is not sufficient to raise the productivity of the crop unless it was accompanied by the use of a highly efficient variety in use of nutrients and other growth factors to improve plant growth and transformation of Photosynthesis products to economical yield (Dolatabadian *et al*.,2010).The study was conducted due to the lack of studies in the region related to examine more details on the impact of foliar spraying with different ascorbic acid concentrations on growth, yield components and yield of Maize.

II. MATERIALS AND METHODS

The experiment was conducted at the research station/ Agriculture College/University of Basrah, Iraq (30°57 N lat.,47°80 long). during the fall seasons 2019 to study the effect of foliar spray of ascorbic acid (AsA) on growth, yield components and yield of two maize genotypes. In this experiment the split plot arrangement based on the randomized complete block design (RCBD) was used with three replications. The main plots consisted of five foliar AsA concentrations (0, 2, 4, 6, 8g l^{-1}),while the subplots included two genotypes, Furat (hybrid) and Buhooth-106 (Synthetic Variety) corresponding to V_1 and V_2 The experimental field soil was silty loam, evaluating its physical and chemical properties according to methods described in Black (1965) and Page *et al*.,(1982), (Table1). Sowing was completed on the 15th of August 2019 .The experimental unit covered an area of 12 m^2 and consisted of four ridges,70cm across, 4m long,25 cm between plants .It produced a population density about 5.7plant m^{-2}.According to soil analysis results, nitrogen was used from urea (240 kg N ha-1), it was applied at three times including sowing, six leaves and tasseling stages (Mohsin , 2007) .Phosphorous fertilizer as superphosphate of 60 kg P ha^{-1} was added through The preparation of soil .Different concentration of AsA were foliar sprayed at two growth stages ,V10(10 leaves with collars visible) and R1 (silking stage). .The plants were sprayed at the early morning with solutions using manual sprayer and the control plants were sprayed with distilled water. Weed control and irrigation were done as necessary. five plants from each plot were randomly chosen from each of the 2nd and 3rd ridges at 22nd November to determine: plant height, number of leaves ,leaf area, rows number ear^{-1}, number of grains ear^{-1}, grains weight and grain yield. The data were analyzed according to means of variance analysis using the Statistical Analysis Software (SPSS) The average treatments were compared with the mean level of 0.05 using LSD test (AL-Rawi and Khalaf Alla(1980).

Table 1. Some initial physical and chemical characteristics of the soil

Soil properties	Value
pH	7.50
E.C. (ds/m)	7.83
Organic matter (g/kg)	2.30
Available N(mg/kg)	31.16
Available P(mg/kg)	17.30
Available K(mg/kg)	116.11

III.RESULTS AND DISCUSSION

Plant height(cm)

The data presented in Table (2) illustrate the response of corn genotypes for ascorbic acid foliar spraying application .The genotypes differed in plant height, where Furat (V_2) genotype gave the highest plant height of 132.63 cm, while Buhooth-106 genotype (V_1) gave the lowest plant height (127.22cm).This may be related to the variations in the genetic potential of these genotypes .These results are in line with Beiragi *et al*.,(2011) and Nwogboduhu (2016) who also reported that plant height significantly varied among different genotypes. On the other hand Foliar spray of AsA had significant effect on plant height, the highest plants were found by 8 g l^{-1} plants (141.20 cm) ,while the shortest plants were recorded by control (113.24cm). It may be due to the role of the ascorbic acid in stimulating the division and growth of cells, which led to increase in plant height (Dolatabadian *et al*.,2010).The interaction between factors (genotypes and AsA) showed significant effect on plant height, $V_2 \times$ 6 g l^{-1} AsA spraying (gave the highest of plant height (144.87 cm) which is statistically at par with 4 and 8 g l^{-1} with plant height of 143.37 and 143.17 cm respectively ,while, treatment V_2×without AsA (control) gave the lowest values of plant height (106.17cm).

Number of leaves

There were significant variation between genotypes on leaves number on plant (Table2).V_2 genotype was superior by giving the highest leaves number (11.67), while V_1 gave the lowest value (10.87). This was caused by genetic differences between the genotypes. The same results were also reported by Radma and Dagash (2013) , Enujeke (2013) .AsA treatments caused a significant effect ,the level of 6 g l^{-1} gave the highest number of leaves (12.33) compared to the control treatment, which gave the lowest (10.33) (Table 2). The interaction V1 × 6 g l^{-1} produced the highest number of leaves (12.67) in plant and V_1 × without AsA spraying produced the lowest number (9.33) (Table 2).

Leaf area (cm2)

Both maize genotypes and ascorbic acid showed significant influences on leaf area. Highest values of leaf area was obtained from the V_2 genotype (4374.45cm^2), while the lowest was made by V_1 (4275.28cm^2) .This difference was due to genetic factors which differed .Similar results were obtained by Akram *et al*.,(2013), Gomaa *et al*.,(2014) and Zaidan *et al*.,(2019). It was clear that there were significant differences in leaf area between the different concentrations of AsA. The spraying of 8 g l^{-1} gave significantly higher leaf area (4709.38 cm^2) compared to control (3923.69cm^2). The probable reason may be that AsA plays multiple roles in plant growth, such as cell division, cell wall expansion, and other processes of development (Pignocchi and Foyer, 2003). Moreover, AsA protects metabolic processes against H_2O_2 and other toxic oxygen derivatives, which have affected many enzyme activities, minimizes the damage caused by oxidative processes by synergizing with other antioxidants, and stabilizes membranes(Shao *et al*.,2008) .The interaction between the factors caused significant effect ,spraying V_2 genotype with high concentration of AsA (8 g l^{-1}) was superior (4862.25cm^2), while V_2 with control treatment gave the lowest leaf area (3888.50cm^2). Rows number ear^{-1}

Data revealed that genotypes had no significant effect on rows number ear^{-1} (Table 2). Mean values of data showed that increasing AsA concentration consistently increased rows number ear^{-1}. Plots spraying with 8 g l^{-1} showed higher numbers of rows number ear^{-1} (13.34 rows ear^{-1}) which is statistically at par with 6 and 4 g l^{-1} with rows number ear^{-1} of 12.84 and 12.66 rows ear^{-1} ,while control plots took lower numbers of rows number ear^{-1} (11.67 rows ear^{-1}). The interaction between genotypes and AsA levels significantly affected rows number, in which V_2 genotype gave high rows number (14.00 rows ear^{-1}) .when spraying with ascorbic concentration 6 g l^{-1}, while V_2 genotype gave less rows number ear^{-1} (11.33 rows ear^{-1}) when spraying with 2 g l^{-1} of AsA.

Grains n. row-1

Statistical analysis of the data revealed no significant differences in grains per row between maize genotypes (Table 2). Mean values of the data showed that Maximum number of grains per row was found in 8 g l^{-1} of AsA (38.67 grains row^{-1}) with no differences with 4 and 6 g l^{-1} of 36.73 and 37.94 grains row^{-1} respectively , however lower number of grain number row^{-1}(34.28 grains row^{-1}) was recorded by control treatment. The role of AsA is increasing the area of the vegetative system, which resulted in giving a greater number of flower inflorescences (Abbas *et al*.,2013), it may be attributed to produced more grains per row

.The interaction effects of maize genotypes and ascorbic acid showed significant influences on the number of grains per row. The highest (43.33 grains row^{-1}) and lowest (30.33 grains row^{-1}) grains per row were obtained under V_2×6 g l^{-1} and V_1×control treatment, respectively (Table 2).

300 grain weight(g)

Results showed that 300 grain weight were significantly affected by different maize varieties (Table 2). Mean values of the data indicated that higher 300 grain weight (66.76g) was found with V_2, and lower 300 grain weight (61.99g) was observed in V_1. Influence AsA had significant effect on 300 grain weight of maize. Maximum weight recorded with the spraying of ascorbic at the rate of 8 g l^{-1}. Minimum 300 grain weight was recorded from the control plots .There were significant differences in 300 grain weight among different treatments interactions .The highest 300 grain weight of 76.47g and the lowest of 58.47g were obtained under the treatment combinations $V_2 \times 8$ g l^{-1} and $V_1 \times$control treatment, respectively (Table 2). Grain yield (t ha^{-1})

Statistical analysis showed that grain yield of maize as influenced by genotypes and AsA concentration (Table 2). Highest grain yield was found for V_2 genotype (5.560 t ha^{-1}) while lowest grain yield was recorded for V_1 genotype (4.884t ha^{-1}). This result is consistent with Olaoye *et al*.,(2009) who indicated that the difference in the genotypes in the grain yield is due to genetic factors that lead to morphological, anatomical, and physiological differences. Mean values of the data showed that spraying of AsA at the concentration of 8 g l^{-1} produced maximum grain yield of 6.320 t ha^{-1}which is statistically at par with 6 g l^{-1} with grain yield of 5.729 t ha^{-1}. Minimum grain yield was found in control treatment (4.230 t ha^{-1}). This increase is a result of the increase in the rows number , grain per row and 300 grain weight (Table 2).The results of interaction showed that genotypes and AsA were significantly and positively affected grain yield

.V_2 genotype spraying with high concentration of AsA 6 and 8 g l^{-1} were superior with 7.550 and 7.232 t ha^{-1} compared to all interactions of V_1 and V_2 genotypes.

IV.CONCLUSIONS

In this study, maize genotypes were highly responsive for spraying of ascorbic acid, improved most of growth and productivity parameters : Plant height, leaves number ,leaf area, , rows number, grain per rows, weight of 300 grain, and grains yield.

Acknowledgement

The authors would like to thank Dr. Yahia Jahad Shabib the manager of research station of, for providing facilities and technical assistance.

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Table.2 Effect of Ascorbic acid concentration on growth, yield components, and yield for two genotypes of maize during 2019 fall season.

Treatments		Plant height (cm)	Leaves number	Leaf area (cm^2)	Rows number	Grain per rows	300 grain weight (g)	Grain yield ($t\ ha^{-1}$)
Genotypes	V1	127.22	10.87	4275.28	12.38	35.74	61.99	4.884
	V2	132.63	11. 67	4374.45	12.75	37.34	66.76	5.560
LSD ($P \leq 0.05$)		**2.36**	**0.38**	**83.43**	**N.S**	**N.S**	**2.38**	**0.42**
Ascorbic acid (g/l)	0	113.24	10.33	3923.69	11.67	34.28	59.34	4.230
	2	128.67	10.83	4011.25	12.33	35.07	62.49	5.119
	4	135.12	11.17	4359.00	12.66	36.73	63.54	5.251
	6	133.32	12.33	4621.00	12.84	37.94	65.72	5.729
	8	141.20	11.67	4709.38	13.34	38.67	70.80	6.320
LSD ($P \leq 0.05$)		**3.33**	**0.549**	**178.33**	**0.96**	**2.29**	**1.69**	**0.65**
V_1	0	120.30	9.33	3958.88	11.57	30.33	58.47	3.648
	2	131.77	9.67	4097.25	13.33	38.47	60. 60	5.526
	4	126.87	11.33	4282.50	11.65	39.67	63.07	5.929
	6	121.77	12.67	4481.25	11.67	32.55	62.70	4.227
	8	138.23	11.67	4556.50	13.67	37.67	65.13	5.090
V_2	0	106.17	11.33	3888.50	11.76	38.23	60. 20	4.812
	2	125.57	12.00	3925.25	11.33	31.67	64.38	4.712
	4	143.37	11.00	4435.50	13.67	33.78	64.00	4.572
	6	144.87	12.00	4760.75	14.00	43.33	68.73	7.232
	8	143.17	12.00	4862.25	13.00	39.67	76.47	7.550
LSD ($P \leq 0.05$)		**5.77**	**0.95**	**302.58**	**1.84**	**3.78**	**1.27**	**1.73**

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