استجابة نباتات الذرة العلفية لحمض الهيومك تحت مستويات مختلفة من التسميد الآزوتي في بيئات مختلفة.

ماجد مولود سليمان

أستاذ مساعد في قسم الحراج والبيئة، كلية الزراعة، جامعة الفرات

الملخص

أجريت هذه الدراسة خلال موسم 2010 في مصر وذلك في محطتي بحوث الإسماعيلية (أرض رملية) والكميزة (أرض طينية). كان الهدف من هذه الدراسة هو بحث تأثير ثلاث معدلات من التسميد الآزوتي (60، 90 و120 كغ/فدان) وأربع معاملات من حمض الهيومك أسيد (ppm1000) وهي: نقع الحبوب قبل الزراعة بـــ 24 ساعة من الزراعة، الرش بمحلول الحمض بعد 21 يوم من الزراعة، النقع والرش مع بعض وأخيراً معاملة الشاهد. أستخدم في هذه الدراسة الهجين الفردي 166 من الذرة الصفراء في البيئتين. كما استخدم تصميم القطع المنشقة مرة واحدة في ثلاث مكررات. واتضح من الدراسة أن حامض الهيومك أدى إلى التبكير في ظهور النورات المذكرة والمؤنثة. كما أدت معاملات نقع حبوب الذرة قبل الزراعة بالهيومك أسيد إلى زيادة واضحة ومعنوية في زيادة إنتاجية المحصول من الحبوب في محطة بحوث الإسماعلية. أدت معاملة الحبوب بالهيومك أسيد قبل 24 ساعة من الزراعة إلى تقليل عدد الأيام لظهور الحريرة في محطة بحوث الإسماعيلية حيث كانت عدد الأيام (61.50 يوما من الزراعة). أقصى محصول من الحبوب أمكن الحصول عليه من محطتي الكميزة والإسماعيلية (31.4 و30.44 اردب/فدان) جاء من إضافة 120 N كغ/فدان في الموقعين على التوالي بالإضافة إلى استعمال معاملة النقع في الكميزة ومعاملة النقع والرش في محطة الإسماعيلية. وأخيرا يمكن الخلوص إلى أنه من الممكن زراعة محصول الذرة في التربة الرملية باستخدام نظم الري الحديثة مثل نظام الري بالرش وذلك برش النباتات ونقع الحبوب قبل 24 ساعة من الزراعة بمعدل ppm1000.

الكلمات المفتاحية: هيومك أسيد، نتروجين، ذرة، موقع.

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INTRODUCTION

Corn is one of the most important strategic cereal crops in Egypt. It is widely used in bread making in rural areas of the country. Recently, 20% of corn flour is mixed with wheat flour for bread making in order to reduce amount of imported wheat. Also, it is used as feed for livestock and poultry, either as green fodder and silage or as a main component (grains) of dry feed. In addition, it is used as a row material for several industries such as starch, fructose and corn oil (Eisa, 1998).

To increase corn production, it is fundamentally necessary to pay particular attention to nutrients supply to the crop, since corn has been proved to be very responsive to various nutrients, particularly nitrogen. Little work on the effect of different minerals (N, P, and K) and organic fertilization in sandy and calcareous soils have been done. Factors that determine corn production are numerous, among which farm yard manures, nitrogen fertilization and plant population density are of great importance. Several forms of mineral fertilizers as well as organic nitrogen manure, especially farm yard manure (FYM) and chicken manure are commonly used in Egypt. The organic manure has been widely used in new reclaimed soils to improve physical and chemical soil properties (increasing fertility). Accordingly, this investigation was carried out in a new sandy soil to study the response of corn to different levels of NPK fertilizers as well as farm yard manure on growth characters, yield and yield components. It is hoped that the present investigation may help in getting some useful information concerning better management and utilization of sandy soil in Egypt (Garcia,. *et al* 1994).

Organic matter of the soil is considered to be the magic remedy for all types of soil. Application of organic manure enriches the soil with nutrient elements and humus, which is the final product of decomposition of organic matter. Humus has a very vital role in improving soil physical and chemical properties. It increase the water holding capacity of the soil as a result of its colloidal status, and also humus increases cation exchange capacity of the soil, which is a remedy of one weakness of the light soils.

Humic matter has significant impact on the development of plant organisms. The optimum plant growth can be obtained by a combined effect of humic substances and mineral nutrients (Garcia *et al.*, 1994; Arancon et al., 2004). Humic substances stimulate growth and division of the plant cells. They enhance plant circulatory systems, promote optimum plant respiration, decrease plant stress, and premature deterioration. They dramatically improve seed germination and promote greater the fibrous root growth. Humic substances also increase size of legume roots, number of nodules, increase drought, tolerance and insect infestation. In addition, they modify and improve structure of the soils reduce the over salinity, and fight against soil erosion (Ayuso *et al.*, 1996; Tan 1998; Eladia *et al.*, 2005).

On the other hand, water hyacinth has become a worldwide problem due to its spreading and water pollution effect. People have been trying to remove the plant from water ways spending billions of dollars in doing this action. In Egypt, particularly in Al-Kanater El-Khyria area, the growth of water hyacinth plants is prevented. So the plants are collected from water ways and fired (Mourad,. *et al* 1986). This work aimed to utalize the Nile water hyacinth plants in production of humates solutions in order to be used in improving crop production of corn plants. This work also include the characterization of humic acids extracted from Nile water hyacinth by 0.1M NAOH after two - hour soaking in the absence of air and their use in the preparation of humates solution that is suitable for plant application.

Nitrogen is the most important nutritive element for the production of corn. One of the reasons responsible for low productivity of corn is using lower rates of nitrogen fertilizer than that recommended by the Ministry of Agriculture. Some of the Egyptian farmers use low-N fertilizer rates because of high price ratio between fertilizer and grain. Limited availability of N fertilizers and low purchasing power of farmers continued to be an important yield limiting factor in farmer's fields. In that context, Cimmyt, (1992) and Gerner and Harris, (1993) revealed that price ratios between fertilizer and grain are high where fertilizer is not subsidized, and the supply of fertilizer often limits its use.

Two other factors could limit the use of N or its availability to hybrids of high N-response. The first factor is related to the high risk of crop failure especially due to drought where N fertilizer rates are often lower than N rates that give maximum yield under optimum conditions (McCown *et al*., 1992). Even under optimum conditions, the problem of fertilizer abuse through over application to get more yield, would cause nitrate leaching which in turn leads to ground water contamination (Raun and Johnson, 1999).

Mamo *et al.* (2003) reported that uniform application recommendation of (145 kg N ha^{-1}) for the whole field over fertilized these areas, while other areas were under fertilized. Variable-rate of N applications according to the EONR would have resulted in 69 and 75 kg ha^{-1} less N being applied than the uniform N rate in 1997 and 1999, respectively. Potential economic benefits were $8 and $23 ha-1 higher than the uniform N rate in 1997 and 1999, respectively. Approximately 60% of the field responded in a similar manner in both 1997 and 1999, suggesting that temporal variations must also be considered with site-specific N management.

Hybrid corn breeding programs in Egypt and all over the world concentrated their activity in the last decades on developing high-yielding hybrids under high soil-N conditions i.e. hybrids of high N-responsiveness. Current breeding programs should pay attention to develop hybrid corn of high tolerance to the low soil nitrogen conditions, prevailing in the lands of poor farmers who cannot afford to spend money for purchasing the recommended amount of nitrogen fertilizer, in addition to, its high-N responsiveness if grown under high-N conditions. Breeding for tolerance to low-N is a difficult task because the genetic mechanisms that control the expression of such tolerance in crop plants is poorly understood and because of the polygenic nature of such a complicated character (Rosielle and

Hamblin, 1981 and Kebede *et al.*, 2001). Such tolerance to low-N necessitates that plant breeder should improve nitrogen use efficiency (NUE) under low-N. Nofal,. *et al* (1999) defined NUE in corn as the ratio of grain yield to N taken up from soil, and there are two primary components of NUE, the efficiency of absorption (uptake) and the efficiency with which the N absorbed is utilized to produce grain (utilization). Significant and consistent differences have been reported in the accumulation and distribution of N to various plant parts among corn lines (Chevalier and Schrader, 1977; Pollmer *et al.*, 1979, Muruli and Paulsen, 1981). Souza *et al.* (2008) studied the genetic control of grain yield (GY) and nitrogen (N) use efficiency (NUE, grain yield/N applied) and its primary components, N uptake efficiency (NUPE, N uptake/N applied) and N utilization efficiency (NUTE, grain yield/N uptake), in corn grown in environments with high and low N availability.

MATERIALS AND METHODS

This study was carried out at Ismailia (Ism) and Gemmiza (Gem) Stations in Delta region in Egypt during 2010 season to study the response of maize plants to humic acid under different nitrogen rates under different environments. Four humic acid treatments were used; soaking seeds 24 h before planting (So), spraying maize plants at 21 days after planting (Sp), (So + Sp) and control (untreated). Three treatment, of nitrogen rates were followed 60, 90, and 120 kg per feddan (fed). Yellow Single cross 166 (SC 166) was used in both experiments. Split-plot design with 3 replications was used; humic acids treatments were assigned to main plots, while N treatments were randomly distributed in the sub-plots. Plot size was 4 rows; 80 cm in width, 6 m in length and 21 cm between hills (30 plants row). One blank row was left between experimental plots. Soil Samples were taken at (0-30 cm depth) from the experimental site before planting for physical and chemical analysis (Table 1 and 2). Ear-bearing leaves from 5 plants at the 4th row were taken at flowering then dried, weighed, and kept for chemical analysis. All plants of the inner two rows were harvested and adjusted to 15.5% moisture. Using the SAS Computer Program for Statistical analysis.

Kernel samples of 0.25 kg each were kept for chemical analysis. Data recorded were days to 50% tasseling (DT), days to 50 % silking (DS), plant height (PH), ear height (EH), number of ears/plant (EP), 500-kernel weight (KWT) were adjusted at 15.5% grain moisture, and grain yield in ardab per fed (GYPF, one ardab (ard) = 140 kg and one fad = 4200 m^2). Plant height was measured from ground surface to the top of flag leaf insertion. Ear height was measured from ground surface to the top base of flag leaf insertion. Ear position was estimated by dividing EH by PH expressed in percentage.

Table (1): Physical properties of soils of the experimental site (0-30 cm layer) at Ismailia and Gemmiza Stations in 2010.

Practical	Ismailia	Gommiza
Clay %	14.30	51.32
Silt %	20.00	8.00
Fine sand %	51.21	16.32
Coarse sand	13.20	7.00
Texture	Sandy	Clay Loma

Table (2): Some soil chemical characteristics of experimental site (0-30 cm layer) at Ismailia and Gommiza Station in 2010.

Total N%	Available N ppm	Available P ppm	Available K ppm	pH (1.25)	Ec (mmhos/cm) at 25 °C
			Ismailia		
0.08	27.00	10.00	150.00	7.39	0.10
			Gommiza		
1.45	35	20	368	8.40	1.27

The value obtained is in Table (3) is in general agreement with the values obtained for humic acids extracted from soils. The contents of COOH group and OH groups give a total acidity of 7.4 meq/g which means that the acids are of a moderate acidity (Ludmila *et al.*, 2005).

Table (3) Chemical and spectroscopic characteristics of humic acids extracted from the humified Nile water hyacinth after 2h soaking in 0.1 M NaOH

Parameter	Value	Parameter	Value
C (%)	57.04	Empirical formula	CIQH1
H (%)	5.67	Absorpitivity in L of dissolved carobn·1cm'l	9A
N(%)	6.97	Q4/6	4.74
O(%)	30.32	Average molecular weight (Da)	15000-
H/C(%)	1.123	Total acidity (meq/g)	7.39
O/C(%)	0.399	COOHin (meq/g)	2.64
N/C(%)	0.105	OH in (meq/g)	4.75

RESULTS AND DISCUSSION

A. Humic acid effect:

Adding humic acid was associated with decreasing number of days to 50% tasseling and silking at Ism station (Table 4). In contrast, applying humic acid was associated with significant increase in number of days to 50% tasseling and silking at Gem site. This may be attributed to the higher heat stress at Ism (sandy soil) compared with Gem (clay soil), which drove maize plants to early tasseling and silking in response to higher rates of humic acid compared with Gem. However, the difference between application of So + Sp and Sp was not significant for Tasseling and Silking at Ism and Gem. No significant difference were detected among So, So+ Sp and control at both stations. Plant and ear heights was not affected a Humic acid different treatment at Ism and Gem. Application of Humic acid treatments did not significantly affect ear position at Ism and Gem station. This might indicate that plant height and ear height increased by the same ratio as a result of adding humic acid. Humic acid treatments significantly increased E/P at Ism. In contrast, E/P was not affected by increasing humic acid treatments at Gem. These results were in general agreement with those obtained by Bader *et al.*, (1993), Meky (1993), Abd El-Gawad and El-Batal (1996), Atta Allah (1996), Ponisica *et al.*, (1998), Younis *et al.*, (1994) and Gamal El-Din (2001).

Adding humic acid through soaking and spraying gave the highest grain yield at Ism, while no significant difference were detected between soaking, soaking + spraying and control at Gem location. However, adding humic acid at soaking and (soaking +

spraying) was not associated with significant increase in PH, EH, and E/P at Ismailia and Gemmiza stations and grain yield at Gem (Fig 1). The present results were also reported by Bedeer *et al.*, (1992), Amer Samia *et al.*, (1995), Faisal *et al.*, (1996), Badawi and El-Moursy (1997), Gamal El-Din (2001) and Al-Shibany (2002).

Table 4. Effect of humic acid on DT, DS, PH, EH, EP, E/P and grain yield at Ismailia and Gemmeiza in 2010.

Humic acids, 1000ppm	DT (d)	DS (d)	PH (cm)	EH (cm)	EP (%)	E/P	Grain yield (ard fed^{-1})
				ISM			
soaking	58.42a	60.33a	127.5a	127.5a	50.78a	1.003 ab	22.25 b
spraying	57.50b	58.75b	130.5a	130.5a	51.32a	1.007 a	21.29 b
Soaking +	57.83ab	59.00b	130.8a	130.8a	51.32a	1.004 ab	25.14 a
Control	57.83ab	59.58ab	128.4a	128.4a	51.40a	0.995 b	22.37 b
Mean	**57.90**	**59.42**	**129.3**	**129.3**	**51.21**	**1.002**	**22.76**
CV %	**0.965**	**1.45**	**5.72**	**5.72**	**5.27**	**2.41**	**6.27**
				GEM			
soaking	61.08a	62.08a	221.6a	140.6a	63.45a	1.054 a	26.73 b
spraying	61.17a	61.92a	219.2a	134.2a	61.19a	1.055 a	29.57 a
Soaking +	61.58a	62.42a	216.1a	137.1a	63.44a	1.057 a	29.36 a
Control	61.50a	62.33a	219.4a	137.8a	62.81a	1.064 a	28.64 ab
Mean	**61.34**	**62.19**	**219.1**	**137.4**	**62.72**	**1.058**	**28.57**
CV %	**0.562**	**0.755**	**7.926**	**10.44**	**3.664**	**0.017**	**1.957**

* Vertical means (within year) with the same letter are not significantly different.

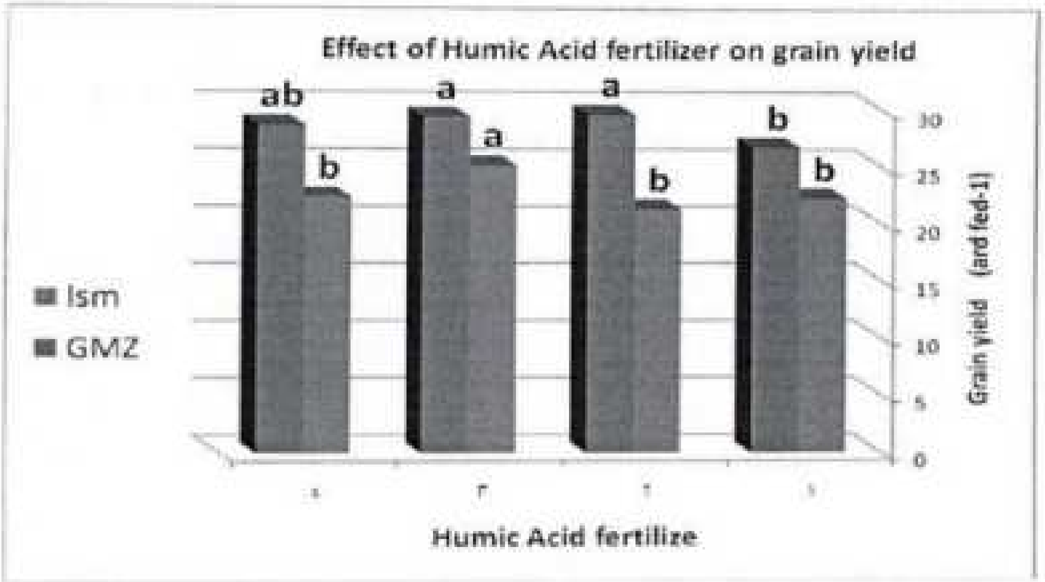

Fig 1. Effect Humic Acid treatment on grain yield (ard/fad) in Ismailia and Gemmeiza in 2010.

B. Nitrogen effect:

Increasing N fertilizer at Ism location was associated with increasing number of days to 50% tasseling and silking; (Table 5). In contrast, increasing N fertilizer was associated with significant decrease in number of days to 50% tasseling and silking at Gem. This may be due to the higher heat stress at Ism (sandy soil) compared to Gem (clay soil), which drove maize plants to early tassel and silk in response to lower rates of N fertilizer compared with Gem. However, the difference between application of 60 and 90 kg/fed was not significant for tassel and silk at both locations. Adding 120 kg N/fad gave taller plants at both stations; where's E/P did not significantly affected by various N treatments at Gem; and between 60 and 90 kg N/fad at Ism.

Grain yield/fad significantly increased by various the rate of N at ISM station but no significant difference between 90 and 120 kg

N/fad at GEM station. This may be due higher fertility of Gem Farm as compared to Ism location as a new reclaimed area (Fig 2).

This might indicate that plant height and ear height increased by the same ratio as a result of increasing N fertilizer. Increasing N fertilizer rates significantly increased E/P at Ismailia. In contrast, E/P was not affected by increasing N rates at Gemmeiza. Grain yield increased as N fertilizer increased. However, increasing N fertilizer from 90 to 120 kg/fad was not associated with significant increase in PH, EH, and E/P at Ismailia; EH and grain yield at Gemmeiza. Similar results were also obtained by Amin, (1994), Abdel-Raouf, (1973), Ali., et al. (1994), Basha,. *et al.* (1995), and Esmail, (1996).

Table 5. Effect of Nitrogen fertilizer on DT, DS, PH, EH, EP, E/P and grain yield at Ismailia and Gemmeiza in 2010.

Nitrogen fertilizer (kg fed^{-1})	DT (d)	DS (d)	PH (cm)	EH (cm)	EP (%)	E/P	Grain yield (ard fed^{-1})
				ISM			
60	57.4b	59.1b	241b	126b	52.1a	0.97b	17.31 c
90	57.6b	59.2b	258a	131ab	50.7a	1.02a	23.70 b
120	58.7a	60.0a	259a	132a	50.9a	1.02a	27.27 a
Mean	**57.90**	**59.4**	**253**	**129**	**51.2**	**1.00**	**22.76**
CV %	**1.0**	**1.5**	**3.4**	**5.7**	**5.3**	**2.4**	**6.3**
				GEM			
60	61.5a	62.4a	215b	126b	62.8a	1.06a	26.13 b
90	61.4a	62.3a	219b	131a	63.2a	1.06a	29.52 a
120	61.1b	61.9b	224a	132a	62.1a	1.06a	30.07 a
Mean	**61.3**	**62.2**	**219**	**129**	**62.7**	**1.06**	**28.57**
CV %	**0.5**	**0.5**	**2.7**	**4.2**	**3.3**	**1.3**	**4.7**

* Vertical means (within year) with the same letter are not significantly different.

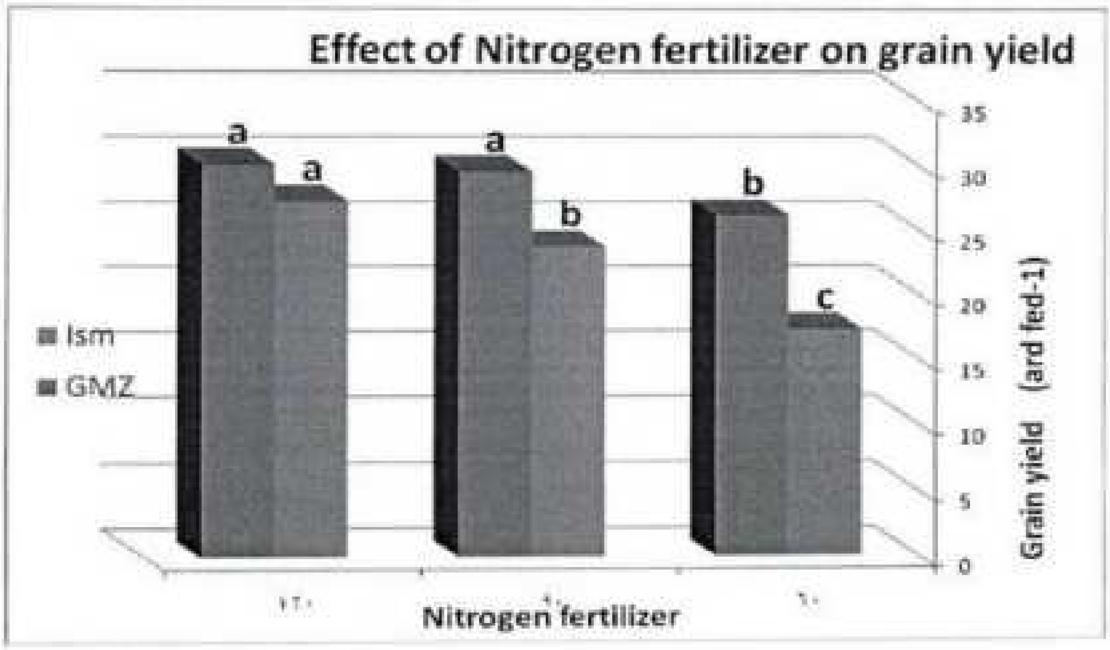

Fig 2. Nitrogen fertilizer levels on grain yield (ard/fad) in Ismailia and Gemmeiza in 2010.

C. Humic acid x N Interaction Effect:

It is quite clear from results in Table (6) that the interaction between humic acid and nitrogen fertilizer had a significant effect on number of days from planting to 50% silking. This is true in Ism and Gem stations. The obtained results showed also that the earliest silking date in Gemmiza station (61.50 days from planting) was achieved by adding humic acid soaking seeds 24 h before planting and adding N fertilizers at the rate of 120 kg/fad . On the other hand, the earliest silking date in Ism station (58.00 days from planting) was obtained by adding N fertilizers at the rate of 60 kg/fad and soaking seeds 24 h before planting + spraying at 21 days from planting.

Results in Table (6) indicated that all of the first order interactions effects on ear position were significant in both stations. The lowest ear placement (favorable) at Ism station (50.17%) was obtained by adding N fertilizers at the rate of 90 kg/fad and adding humic acid at spraying at 21 days from planting. However, adding soaking humic treatment and adding N fertilizers at the rate of 90 and 120 kg/fad with adding humic acid at spraying at 21 days from planting in same station obtain the lowest ear placement 50.31% and 50.45% at the Ismailia station. The higher ear position was at Gem station when adding N fertilizers at the rate of 60 kg/fad and adding soaking treatment + spraying treatment (65.37%). Also, adding soaking seeds 24 h before planting with higher of N fertilizers (120 kg/fad) gave higher ear position (64.39%) at Gem station. These results agree with those obtained by Khalil (1992), who found that FYM application did not cause any significant effect on this trait. Abd El-Hameed (1997), Faisal and shalaby (1998) obtained a significant increases in number of grains/ear due to adding farmyard manures.

Results in the same Table (6) indicated that all interactions between the studied factors had significant effects on maize plant height at harvest in both station. The tallest plants in the Ism and Gem stations (263.8 and 228.0 cm, respectively) were obtained by adding N of 120 kg/fad and adding humia acid at spraying at 21 days from planting. On the other hand, the shortest plants were obtained by adding N of 60 kg/fad and adding humia acid at adding N of 120.

Table 6. Effect of Humic Acid and Nitrogen fertilizer on DTT, DTS, PH, EH, EP, E/P and grain yield at Ismailia and Gemmeiza in 2010.

Characters	Nitrogen fertilizer (kg fed^{-1})	LOC							
		ESM				GM			
		Humic acids, 1000ppm				Humic acids, 1000ppm			
		Control	Soaking+ spraying	spraying	soaking	Control	Soaking+ spraying	spraying	soaking
Silking	60	59.06e	58.00f	59.50	59.00	62.4	62.75a	61.75	62.50
	90	59.19e	60.50d	58.25f	58.50f	62.2	62.25b	63.25	61.75
	120	60.00d	60.25d	59.25	58.75f	61.8	62.00b	62.25	61.50
	Mean	**59.42**	**59.58**	**59.00**	**58.75**	**62.1**	**62.33**	**62.42**	**61.92**
	LSD$_{0.05}$				**0.548**				
	CV %				**1.061**				
Ear position	60	52.65	52.03	52.16	51.57	62.6	65.36a	59.17	64.03
	90	50.72	51.42	50.17	50.31	62.7	63.92	64.34	61.94
	120	50.82	50.52	51.64	50.45	63.0	61.05	60.06	64.39
	Mean	**51.40**	**51.32**	**51.32**	**50.78**	**62.8**	**63.44**	**61.19**	**63.45**
	LSD$_{0.05}$				**1.924**				
	CV %				**4.211**				
P. Height	60	235.0	250.0	237.5	242.5	214.	217.8	215.5	211.5
	90	253.8	257.5	261.3	258.8	218.	215.5	216.5	225.3
	120	261.3	257.5	263.8	252.5	226.	215.0	225.5	228.0
	Mean	**250.0**	**255.0**	**254.2**	**251.3**	**219.**	**216.1**	**219.2**	**221.6**
	LSD$_{0.05}$				**9.312**				
	CV %				**3.115**				
Ear/Plant	60	0.968	0.974	0.974	0.978	1.06	1.049	1.067	1.052
	90	1.011	1.031	1.021	1.010	1.07	1.052	1.048	1.053
	120	1.006	1.006	1.026	1.021	1.04	1.070	1.049	1.058
	Mean	**0.995**	**1.004**	**1.007**	**1.003**	**1.06**	**1.057**	**1.055**	**1.054**
	LSD$_{0.05}$				**0.0135**				
Yield	CV %				**1.919**				
	60	17.73	19.17	16.64	15.70	26.6	26.74	26.51	24.62
	90	23.11	25.80	21.89	24.00	29.1	30.69	30.80	27.50
	120	26.28	30.44	25.33	27.04	30.1	30.64	31.40	28.06
	Mean	**22.37**	**25.14**	**21.29**	**22.25**	**28.6**	**29.36**	**29.57**	**26.73**
	LSD$_{0.05}$				**1.805**				
	CV %				**5.422**				

kg/fad and adding Humia avid at spraying at 21 days from planting (211.5 cm).

The results in Table (6) showed that all interaction effects between Humia Acid, N fertilization and stations were insignificant on number of ear/plant.

Results in Table (6) clearly indicated that the interaction between Humic Acid and Nitrogen fertilizer had significant effect on grain yield/fad in both stations. The highest grain yields (31.40 and 30.44 ard/fad) were obtained to Gem and Ism stations by adding Humic Acid soaking seeds 24 h before planting and adding N fertilizers at the rate of 120 kg/fad and adding N fertilizers at the rate of 120 kg/fad and adding Humic Acid at spraying at 21 days from planting respectively. On the other hand, the lowest grain yield in the Ismailia station (15.70 ard/fad) was obtained by adding Humic Acid soaking seeds 24 h before planting and adding N fertilizers at the rate of 60 kg/fad. The present results were also reported by Gouda. (1982), Kamel et al. (1989), Younis et al. (1990), Bedeer et al. (1992), Amer Samia *et al.*, (1983), Madhavi *et al.*, (1995), matta *et al.*, (1990), Soliman, (1995) and Al-Shibany (2002).

Conclusions:

Finally, it could be concluded that it is possible to plant maize crop in the sandy soils as at Ismailia region using one of the modern irrigation system like sprinkler irrigation system. To improve soil structure and fertility farmers can add the Humic Acid at rate of 1000ppm soaking seeds 24 h before planting and at spraying at 21 days from planting during plowing and land preparation. Our recent results proved the useful effects of Humic Acid on improving soil properties and fertilities which led to obtain high grain yield. Also, the presented results indicate clearly the useful effects of each of nitrogen when added it on increasing the soil amount of available nutrients needs by maize plants. This reflect the fact that adding N at the rate of 120 kg/fad led to improve both growth characters and attributes of maize plants and hence increased the final grain yield.

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Response of Forage maize plants to humic acid under different nitrogen rate under different environments

Majed Maolod Suliman

Assistant Professor of Ecology, Faculty of Agriculture

Al Furat University

ABSTRACT

This study was carried out at Ism and Gem Stations in Delta region in Egypt, Agric.Res. during 2010 season. The aim of this study is to investigate the effect of three N rates (60, 90 and 120 kg N/fad) and four treatments of humic acid (1000ppm) Soaking seeds (so), spraying (sp, so + sp) and control under different environments. Yellow single cros 166 was used. Split-plot design with 3 replications was used in both experiments. Humic acid treatment was associated with decreasing number of days to 50% tasseling and silking. No significant differences are detected among So, So+ Sp and control at both stations. Grain yield/fad significantly increased by various the rate of N at ISM station but no significant difference between 90 and 120 kg N/fad at Gem station. The results showed that the earliest silking date in Ism station (61.50) was achieved by adding humic acid soaking and adding N fertilizers at the rate of 120 kg/fad. The highest grain yields (31.40 and 30.44 ard/fad) were obtained in Gem and Ism stations by adding humic acid soaking seeds and adding N fertilizers at the rate of 120 kg/fad and adding N fertilizers at the rate of 120 kg/fad and adding humic acid at spraying respectively.

Key words: Humic acid, Nitrogen, Forage Maize, Location.

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