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EFFECT OF NITROGEN SOURCE AND RATE AS WELL AS SOME MICRO ELEMENTS TREATMENTS ON YIELD AND YIELD COMPENENTS OF MAIZE UNDER SALT AFFECTED SOILS CONDITIONS

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ABSTRACT

Two field experiments were carried out at Demo-El-Faiyoum ,Governorate in 2002 and 2003 seasons to study the effect of two nitrogen sources (Ammonia gas and Urea), three nitrogen rates (100,120 and 140 kg N/fad) and six micro element treatments (Zn, Fe and Zn+Fe as a soil and foliar application methods) on yield and yield components of maize. The experiment was laid out in split-split plot design. The obtained results showed clearly that plants received nitrogen fertilizer in the form of ammonia gas gave the highest values of ear length ,100 grain weight , grain yield per fad and protein percentage in grain as compared with those received nitrogen source of urea. Increasing nitrogen fertilizer rate from 100 to 140 kg N/fad significantly increased ear length , 100 grain weight , stover and grain yield per fad and protein percentage in grain. Sprayed maize plants with mixed from micro elements Zn+Fe as a foliar application surpassed all other treatments in all previously mentioned characters. Applied ammonia gas as a source of nitrogen at the rate of 140 kg N/fad gave the highest ear length, grain yield per fad and grains protein percentage . Plants grown on soil injected by ammonia gas and sprayed with mixed from micro elements Zn+Fe gave higher grain yield per fad and protein percentage than other treatments. Plants fertilized with 140 kg N/fad and sprayed with micro element mixed Zn+Fe gave the highest ear length , grain yield / fad and protein % . Plants treated with ammonia gas at 140 kg N fad and sprayed with mixed from micro elements gave the highest ear length , grain yield per fad.

Generally, it could be recommended that applying nitrogen in the form of ammonia gas at the rate of 140 kg N /fad and sprayed with mixed from Fe+Zn micro elements gave greatest grain yield of maize grown under salt affected soils at El-Faiyoum Governorate conditions.

INTRODUCTION

Maize (*Zea mays*, L.) is one of the most important cereal crops in the world. In Egypt maize is a great important for human consumption (20% mixed with Wheat flower to reduce the imported quantity of Wheat),animal and poultry feeding as well as industrial purpose. Nowadays, the first step of the Egyptian strategic aims to bridge the gap between production and consumption of maize. Such increase of productivity is likely to be obtained byincreasing cultivated new areas with maize and increasing the productivity of unit area.Most of the new areas face some stress problems, i.e salinity, drought and unbalance nutrient elements. Salinity is a major environmental problem that cause a reduction in plant productivity. Salinity stress is causing poor response of crops to fertilizer application.There for it is necessary to mange such soils for profitable agriculture by adopting on farm management practices. Attempts have been made to over come these injurious effect of salinity on growth and yield of maize crop, one of these attempts is likely to be applied the adequate fertilization. Nitrogen is an essential nutrient for maize production. Management system must be developed for efficient nitrogen utilization for maximizing maize production.

Source of nitrogen application is important management tool in this respect because maximum nitrogen efficiency is obtained when nitrogen is applied in the form which is available for uptake by plants as needed. Hammam (1995), reported that the highest values of ear length, 100 kernel weight and grain yield of maize were recorded with the addition of ammonium nitrate compared to urea and calcium nitrate.The superiority of N sources for grain yield was in the order of urea fromaldhyd > ammonium sulphate> ammonium nitrate (El- Nemr *et al*.1996). El- Sayed *et al*. (1998) showed that the application of ammonium gas fertilizer gave the highest grain yield and protein content in grain of maize compared to the other nitrogen sources. Osman *et al.*(2001) found that the effect of different nitrogen sources was significant on 100 grain weight, grain yield (t/fed) and grain protein content of maize.

Nitrogen is a major nutrient element and it is needed in large amount for high yield of maize, it considers the most factors affecting the growth and productivity of maize plants. Darwish (2003), Mohamed(2004), Leilah *et al.*(2009) and Ragab and Ibrahim(2009 a and b), reported that increasing nitrogen fertilizer rate up to 120 kg N/fad increased ear length, 100 grain weight, stover yield/fad, grain yield/fad and protein contnent in grain of maize.

Micro elements such as Zn and Fe have become limiting factors for increasing maize productivity. Egyption soil had the high PH, it is considered a problem to available of micro element i.e Zn and Fe. Foliar application was the best method for Zn and Fe uptake. This may be due to the quick absorption of the elements by spraying, and concequcntly could solve the problem of unavailability of micronutrient. Abdel Messih *et al*. (1999), Omran (2000), Osman *et al* (2001), El-Akbawy *et al*(2001),
El-Nagar(2002) and Darwish (2003) reported that spraying plants with Zn and Fe increased ear length, 100 grain weight, stover yield/fad, grain yield/fad and protein percentage in grains.

Therefore, this investigation was laid out to study the effect of nitrogen source and rate and some micro elements treatments on yield and its component of maize in salt affected soils under EL-Faiyoum Governorate conditions.

MATERIALS AND METHODS

Two field experiments were carried out at Demo –El Faiyoum Governorate in 2002 and 2003 seasons to study the effect of nitrogen source and rate as well as some of micro elements treatments on yield and yield components of maize under salt affected soils.

Studied factors

A-Nitrogen source

Two nitrogen sources were tested as follows:

1-Ammonia gas injection(82%)

2-Urea fertilizer (46% N)

Ammonia gas was mechanically injected in the soil after seed bed preparation and 7 days beriore sowing at the following studied nitrogen rates. While urea was placed on the soil surface before 1st and 2nd irrigations.

B- Nitrogen fertilizer rate

Three nitrogen rates were applied as follows:

1. 100 kg N/fad.
2. 120 kg N/fad.
3. 140 kg N/fad.

Nitrogen fertilizer in the form of Urea at the previously mentioned rates were applied in two equal parts, the first was applied before the first irrigation and the second part was applied before the second irrigation in both seasons.

C- Micro elements treatments:

1- Application of chelated iron(Fe) fertilizer at the rate of 2 kg /fad as a soil application.

2- Application of chelated zinc(Zn) fertilizer at the rate of 2 kg /fad as a soil application .

3- Application of mixed from iron and Zinc chelated(1:1 ratio) at the rate of 2 kg / fad as a soil application.

4- Application of chelated Fe at the concentration of 0.6 g/liter as a foliar application.

5- Application of chelated Zn at the concentration of 0.6 g/liter as a foliar application.

6- Application of mixed from Fe and Zn(1:1ratio) at the concentration of 0.6 g/liter as a foliar application.

Micro elements were applied as the soil application method before sowing with the previously mentioned rates, and as the foliar application method at 35 and 55 days from sowing at the previously mentioned concentration. The foliar treatments were carried out using had operated compressed air at the rate of 600 liter water/fad of each spraying date.

The experiments were laid out in split-split plot design in three replications. The main plots were assigned to nitrogen sources while sub plots were allocated to rates of nitrogen and the sub-sub plots were assigned to micro elements treatments .The sub-sub plot area was 10.5m2 (3.5 m long x 3.0 m width).

Mechanical and chemical analysis of soil at the experimental sites are presented in Table 1.

The soil of the experiments was prepared as usual for maize and phosphorus fertilizer at the rate of 200 kg superphosphate/fad(15.5% P2O5) and100 kg of potassium sulphate (48% K2O) was applied at the seed bed preparation. Seeds of maize (single hybrid10) were hand sown on 15th May in both 2002 and 2003 seasons. All the other recommended cutural practices for maize production were done.

Data recorded:

1-Ear length (cm).
2-100 grain weight(g).
3-Stover yield per fad (ton).
4-Grain yield per fad (ardab).
5-Protein percentage in grains, it was measured as a total N in grain sample by Kieldahel Lechinque, Jackson (1973) and N % multiplying 6.25.

Data were statistically analyzed according to the technique of analysis of variance (ANOVA) and the lest significant difference (LSD) method was used to test the difference among the treatment means as published by Gomez and Gomez (1984).

Table(1):Mechanical and chemical analysis of the soil experimental sites

Soil properties	Season 2002	Season 2003
Mechanical analysis		
Coarse sand%	10.44	15.50
Fine sand %	27.41	22.37
Silt %	15.35	19.40
Clay %	46.80	42.73
Soil texture	Caly loam	Caly loam
Chemical analysis		
Ec (ds/m) (soil paste textract)	4.23	4.75
PH (1:2.5,Soil:water)	7.95	8.45
CaCo3 %	5.60	5.20
O.M. %	1.31	1.67
Available nutrients (mg/kg)		
N (ppm)	19.00	15.00
P (ppm)	13.00	12.00
K (ppm)	20.00	23.00
Fe (ppm)	2.10	1.10
Zn (ppm)	0.40	0.31

RESULTS AND DISCUSSION

Average ear length (cm), 100grain weight (g), Stover yield (ton/fad), grain yield (ardab/fad) and protein percentage in grains of maize as affected by source,and rate of nitrogen and micro elements treatments in 2002 and 2003 seasons are shown in Tables 2,3,4,5 and 6. Results presented in Tables 2 to 6 show clearly that the effect of nitrogen source was significant on ear length, grain yield / fad and protein percentage in grain in both seasons, but it was significant on 100 grain weight (g) in 2002 season only and it was insignificant on stover yield / fad in both seasons. Applied ammonium gas as a source of nitrogen gave the highest values of ear length(20.69 and 20.74 cm) , 100 grain weight(34.11 and 33.35 g) ,grain yield / fad (20.66 and 29.52 ardab) and protein percentage in grain (11.76 and 11.86 %) as compared with nitrogen soruce of urea in 2002 and 2003 seasons, respectively.

The increase in yield and yield components due to nitrogen source may be attributed to that ammonium gas which considered as nitrogen source can a rise physiological strategies such as increased dry matter production translocated and stored resulted in increasing ear length and 100grain weight increased. These results are in harmony with those of El-Nemr *et al*. (1996), El-Sayed *et al* (1998), Khalifa and Zidan (1999), Osman *et al* (2001), Sarhan *et al* (2004) and Ragab and Ibrahim (2009a).

Results recorded in Tables 2 to 6 indicate that average values of ear length, 100 grain weight, stover and grain yield and protein percentage significantly affected by nitrogen fertilizer rate in both seasons. Increasing nitrogen rate from 100 to 140kg N/fad increased ear length by 7.31 and 7.35 %, 100 grain weight by 1.82 and 2.22 %, stover yield by 5.44 and 7.02 %, grain yield by 7.81 and 8.68 % and protein percentage in grain of maize by 5.77 % and 5.15 % in 2002 and 2003 seasons, respectively.

The increment of grain yield according to increasing nitrogen rate might be attributed to the active effect of nitrogen in raising photosynthesis which led to increasing yield components such as ear length and 100 grain weight resulted in increasing grain yield, also increased nitrogen uptake and stored in grains, hence increasing protein % in grain of maize. These results are in agreement with those of El-Agamy *et al*. (1999), Allam et al .(2001),El-Bana (2001), Mohamed (2004),Gebraiel *et al* .(2005), Leilah *et al* .(2009) and Nawar *et al* .(2009).

Results recorded in Tables 2-6 reveal that micro elements had a significant effect on all previously mentioned characters in both seasons. Also results indicated that application micro elements as a foliar application gave the highest values of all studied charaeter as compared with soil application in both seasons. Sprayed maize plants with mixed from micro elements (Fe+Zn) as a foliar application method gave the highest values of ear length (20.88 and 20.89 cm) ,100 grain weight(34.64 and 34.22 g),stover yield / fad(3.61 and 3.76 ton), grain yield /fad(27.93 and 30.67 ardab) and protein % (12.00 and 12.09) as compared with all other micro elements treatments in 2002 and 2003 seasons, respectively. These results are in agreement with those Abdel Messih *et al* .(1999),Omran (2000), Osman *et al* .(2001), El- Akbawy et al .(2001), El – Nagar (2002) and Darwish (2003).

The increase in grain yield and its components owing to micro elements (Fe+Zn) may be due to the effect of Zn in the formation and the activity of the enzyme responsible for protein synthesis. Also Zinc enhanced plant growth and improve transferring the photosynthetic substances from leaves to grains during synthesis process because of their effect the engymatic group, therefor increasing ear length (Table 2), 100 grain weight (Table 3), stover yield (Table 4), grain yield (Table 5) and protein percentage (Table 6). These results are in harmony with those of Omran (2000), Osman *et al* .(2001), El-Nagar (2002),He *et al* .(2002), Darwish (2003) and Zein *et al* .(2009).

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The obtained results showed that the interaction effect between nitrogen source and nitrogen rate was significant on grain yield / fad and protein percentage in grain of maize in both seasons, but it had a significant effect on ear length in the second season only. On the other hand , 100 grain weight and stover yield / fad insignificantly affected in both seasons. The tallest ear of maize plants 21.67 was found with applied ammonia gas at the rate of 140 kg N/fad compared to other this interaction treatments in 2003 season. In this connection plants received nitrogen fertilizer at the rate of 140 kg N/fad in the form of ammonia gas gave the highest grain yield / fad (27.42 and 30.92 ardab) and protein percentage (11.95 and 12.05 %) compared to all other interaction treatments in 2002 and 2003 seasons, respectively.

It can be seen from results recorded in Tables 2 to 6 that the interaction effect among nitrogen source and micro elements treatments was insignificant on ear length, 100 grain weight and stover yield / fad in both seasons, and on protein percentage in 2003 season. On the contrary it was significant on grain yield / fad in both seasons and protein % in the first season. However, plants grown under soil injected by ammonia gas and sprayed with mixed from micro element (Fe+Zn) as a foliar application gave the highest grain yield / fad (28.63 and 31.34 ardab) and protein percentage (12.09 and 12.09%) compared to all other this interaction treatments in 2002 and 2003 seasons, respectively.

Results tabulated in Tables 2 to 6 reveal that the interaction effect between nitrogen rate and micro elements treatments was significant on ear length in the secand season as well as on grain yield /fad and protein percentage in both seasons. On the other hand it was insignificant on 100 grain weight and stover yield / fad in both seasons. Generally, maize plants fertilized by 140 kg N/fad and sprayed with micro element mixed (Fe+Zn) as a foliar application method gave the tallest ear (21.69 and 21.70 cm), grain yield / fad (29.07 and 31.96 ardab) and protein % (12.22 and 12.26 %) as compared with all other this interaction treatments in 2002 and 2003 seasons, respectively.

Results recorded in Tables 2 to 6 indicate that the interaction effect between nitrogen source , nitrogen rate and micro element treatments was insignificant on all characters studied in both seasons, except ear length in the second season and grain yield /fad in both seasons. Decidedly, plants received nitrogen fertilizer at the rate of 140 kg N/fad in the from of ammonia gas as sprayed by mixed from micro elements (Fe+Zn) gave the highest ear length (22.17 and 22.20 cm) grain yield / fad (29.35 and 32.49 ardab) as compared with all other this interaction treatments in 2002 and 2003 seasons, respectively.

Generally, it could be recommended that applying of ammonia gas at the rate of 140 kg N/fad and sprayed with mixed from Fe+Zn of micro elements greatest grain yield / fad of maize grown under salt affected soil at Fl-Faiyoum Governorate conditions.

REFERENCES

Abdel Messih, S. G.; A. Sh. Abdel Nour and A.I. El-Shafie. (1999). Response of yellow maize to foliar spray of micronutrients withdifferent acidity solutions under various nitrogen levels. Egypt. J. Appl. Sci, 14 (6) : 140-152.

Allam, S. M. M.; A. S. Osman.; M. Y. Gbraiel and G. M. El-Shebing.(2001).Effect of nitrogen rates and foliar application of zinc and boron on maize. Egypt. J. Appl. Sei.,16:161-168.

Darwish, A.A.(2003).The yield and yield components of maize as influenced by nitrogen, zinc and boron fertilization. J. Agric. Sci. Mansoura Univ., 28 (2) : 799-810.

El-Agamy, A. I.; G. A. Morshed.; F. H. Soliman and M. K. H. Osman. (1999).Performance of some yellow maize hybrids under different plant population densities and nitrogen fertilizer levels. J. Agric. Sci. Mansoura Univ., 24 (3) : 911- 923.

El- Akabawy, M.A.; H. G. Abu El- Fotoh, A. A. Abd El- Magid and Nadia, O. Monged .(2001). Effect of organic and inorganic fertilization on yield and grain mineral content of Zea mays on clay soil of Nil delta. Egypt. J. Appl. Sci, 16 (9) : 300-308.

El-Bana, A.Y.A. (2001). Effect of nitrogen fertilization and stripping leaves on yield and yield attributes of two maize (*Zea mays,*L.)Hybrids.Zagazig.JAgric. Res., 28 (3): 579-596.

El-Nagar,G.R.(2002).Effect of nitrogen fertilizer and foliar application with micronutrients on white and yellow maize. Assiut. J. Agric. Res., 33 (3): 85-102.

El-Nemr ,Hanyat, M.; A. Y. Negm.; Khadra, A. Abbady and I. A. I. Mousa. (1996).and insecticides in calcareous soils and their residual effect on flax. Egypt. J. Agric. Res., 74 (1) : 1-13.

El-Sayed, E.A.; D. S. Darwish and N. S. Rezike. (1998).Effect of nitrogenforms application on the yield and quality of corn plants grown under El- Faiyoum conditions. Faiyoum J. Agric. Res.And Dev., 12 (1): 205- 216.

Gebraiel, M.Y.; M. N. Gohar.; F. S. Salem and H.W.A.Wahba. (2005).Vegetative growth and yield of maize (*Zea mays,* L.) as affected by nitrogen, potassium and zinc fertilization. Egypt. J. Appl. Sci. 20(2b): 739-755.

Gomes, K.A. and A. A. Gomes. (1984). Statistical procedures for Agricultural research. 2nd Ed. PP. 680. John Wiley and Sons, New York, U.S.A.

Hammam, G.Y. (1995). Growth and yield of maize (*Zea mays,* L.) as affected by nitrogen source and time of application. Annals of Agric. Sci. Moshtohor, 33(2) : 483-494.

He-Tianxui.; Wu-Deyi.; He-Chenghui.; Tu-Shihua.; Wu-Guangquan.; Wu-Wangcheng.; Kong- Sheng.; Wang- Jipeng.; He-Tx.; Wu-D.; He-Ch.; Tu-Sh.; Wu-Go.; Wu-Wc.; Kong- S and Wang- J.P. (2002). Fertilization for high yield in corn – sweet potato- Wheat rotation: a systematic approach to nutrient limiting factors of soils in Chonging, China. Pedosphere. 12(3):265-274.

Jackson, M.L.(1973).Soil chemical Analysis Prentice – Hall of India, Private Limited, New Delhi.

Khalifa, K and Zidan,A.(1999). Effect of nitrate addition on efficient use of ammonium sulfate fertilizer on corn under saline conditions. I. Pot experiment. Communications in soil science and plant Analysis, 30 (15-16): 2145-2156.

Leilah, A.A.; M. A. Badawi; M.I.El-Emery and Rasha, S.A. El-Moursy. (2009). Effect of plant population, organic fertilization and nitrogen levels on growth and yield of maize. J. Agric. Sci. Mansoura Univ., 34(2)1253-1264.

Mohamed, N.A.(2004). Principal component and response curve analyses of some maize hybrids to different nitrogen fertilization levels and plant density. Bull. Fac.Agric., Cairo Univ., 55 : 531-556.

Nawar, A.I.;I.E.Mohamadein ,and H.E.Khalil.(2009).Response of maize to fertilization and rotational crop sequences. Alex. J. Agric. Res.Vol. 54,No.3,pp.29-39.

Omran, A.A. (2000). Foliar application of some zinc sources for corn crop. Egypt . J. Appl. Sci.,15 (1) : 305- 315.

Osman, A.S.;S. M. M. Allam.; G. M. El-Shebing and M.Y. Gebrail. (2001).Influence of nitrogen and micronutrient sources on maize plants. Egypt. J. Appl. Sci., 16 (4) : 150-160.

Ragab, A.Y. and M. H. Ibrahim.(2009a). Effect of nitrogen, phosphorus and biofertilizers on maize : 1-Growth traits. J. Agric. Sci. Mansoura Univ., 34 (7): 8027-8042.

Ragab, A.Y. and M. H. Ibrahim. (2009b). Effect of nitrogen, phosphorus and biofertilizers on maize : 2-Yield and its components. J. Agric. Sci. Mansoura Univ. 34 (7) : 8043-8054.

Sarhan, S.H.; M. R. Mohamed.; H. Z. Abd El-Salam and M.M. A. Bader. (2004).Influence of nitrogen sources on growth, yield, some macro and micronutrients content of maize plant (*Zea mays*, L.) in salt affected soils. J.Agric. Sci. Mansoura Univ., (3) : 1589- 1601.

Zein, F. I.; Asmaa. A. El-Basuony and H. S. Hamoud. (2009). Maizeresponse to zinc application under different phosphorus fertilization levels, its nutrients uptake, and availability in allouvial soils. J. Agric. Sci. Mansoura Univ., 34(5) : 5683-5704.

" تاثير مصدر ومعدل النتروجين وبعض معاملات العناصر الصغرى على ناتج الذرة الشاميه تحت ظروف الاراضى المتاثرة بالأملاح "

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اقميت تجربتان حقليتان في موسمي٢٠٠٢و٢٠٠٣ في مركز دمو بمحافظه الفيوم لدراسة تأثير مصدر النتروجين(أمونيا و يوريا) وكذلك معدل النتروجين (١٤٠،١٢٠،١٠٠كجم نتروجين /فدان) ومع بعض معاملات من العناصر الصغرى مثل الزنك والحديد و مخلوطهما اما رش او ارضى في صورة سماد مخلبى أما منفردا سواء أرضى أو رش بمعدل ٢ك جرام للارضى و٦وجرام /لتر للرش او مخلوط من كل منهما بمعدل ١:١ للارضي او الرش على ناتج الذرة الشاميه ومكوناتة(صنف هجين فردى ١٠) وصممت التجربه في قطع منشقه مرتين .

وتتلخص اهم النتائج فيما يلى :-

١- أ عطى استخدام النتروجين في صورة غاز الامونيا أعلى القيم مقارنة باليوريا وذلك لكل من طول الكوز ووزن ١٠٠حبه ،ناتج الحبوب / فدان و نسبه البروتين في الحبوب ٠

٢- أدت زياده معدل النتروجين من ١٠٠الى ١٤٠كجم / فدان إلى زياده معنويه لكل من طول الكوز ووزن ١٠٠ حبه ،و كل من ناتج القش و محصول الحبوب / فدان و نسبه البروتين في الحبوب ٠

٣- أدى رش النباتات بمخلوط من العناصر الصغرى (الزنك + الحديد) إلى زيادة كل الصفات المدروسة عن باقى المعاملات الاخرى.

٤- أعطى التسميد بالنتروجين في صورة غاز الامونيا بمعدل ١٤٠كجم نتروجين /فدان أعلى القيم لكل من طول الكوز ، ناتج الحبوب / فدان و نسبه البروتين في الحبوب ٠

٥- تفوقت النباتات الناميه في الأرض المسمدة بغاز الامونيا و التي تم رشها بمخلوط من العناصر الصغرى (حديد + زنك) في ناتج الحبوب /فدان ونسبه البروتين في الحبوب عن المعاملات الاخرى ، وتفوقت النباتات المسمده بمعدل ١٤٠كجم نتروجين / فدان ورشت بمخلوط من العناصر الصغرى (حديد + زنك) في طول الكوز ، ناتج الحبوب ، نسبه البروتين وايضا اعطت النباتات المعامله بغاز الامونيا بمعدل ١٤٠ كجم نتروجين / فدان والتى تم رشها بمخلوط من العناصر الصغرى (حديد + زنك) اعلى القيم لكل من طول الكوز و ناتج الحبوب / فدان٠

عموما توصى الدراسة باستخدام التسميد النتروجينى في صورة غاز الامونيا بمعدل ١٤٠ كجم نتروجين / فدان مع رش النباتات بمخلوط من العناصر الصغرى (حديد + زنك) لزيادة ناتج حبوب الذرة الشاميه الناميه تحت ظروف الاراضى المتاثرة بالاملاح في محافظه الفيوم ٠

قام بتحكيم البحث

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Table 2 : Average ear length(cm) of maize as affected by nitrogen source and rate as well as some micro element treatments in 2002 and 2003 seasons.

N.sources (S)	N.rate Kg/fad (N)	2002 Season							2003 Season						
		Micronutrient treatments(M)							Micronutrient treatments(M)						
		F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+ZN)	Mean	F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+Zn)	Mean
Ammonia	100	19.83	20.33	20.33	19.50	19.83	20.00	19.97	20.00	20.33	20.33	19.53	19.87	20.03	20.02
	120	19.97	20.83	21.23	19.70	20.43	20.83	20.50	20.00	21.00	21.23	19.73	20.43	20.87	20.54
	140	21.83	21.83	22.17	21.17	21.20	21.40	21.60	21.97	22.00	22.20	21.20	21.23	21.43	21.67
	mean	20.54	21.00	21.24	20.12	20.49	20.74	20.69	20.66	21.11	21.25	20.15	20.51	20.78	20.74
Urea	100	19.17	19.77	20.00	18.93	19.23	19.33	19.41	19.27	19.77	20.03	18.97	19.27	19.33	19.44
	120	19.57	19.90	20.33	19.17	19.68	19.77	19.74	19.60	19.90	20.37	19.20	19.68	19.77	19.75
	140	20.50	20.93	21.20	19.77	20.53	20.93	20.64	20.60	21.00	21.20	19.80	20.57	20.97	20.69
	mean	19.75	20.20	20.51	19.29	19.81	20.01	19.93	19.82	20.22	20.53	19.32	19.84	20.02	19.96
General means of N. rate	100	19.50	20.05	20.17	19.22	19.53	19.67	19.69	19.64	20.05	20.18	19.25	19.57	19.68	19.73
	120	19.77	20.37	20.78	19.44	20.06	20.30	20.12	19.80	20.45	20.80	19.47	20.06	20.32	20.15
	140	21.17	21.38	21.69	20.47	20.87	21.17	21.13	21.29	21.50	21.70	20.50	20.90	21.20	21.18
General mean		20.15	20.60	20.88	19.71	20.15	20.38		20.24	20.67	20.89	19.74	20.18	20.40	

(S)Soil application method
(F)Foliar application method
L.S.D at 0.05 for:

		2002	2003
Sources	(S)	*	*
N. Rate	(N)	0.26	0.12
Micro element	(M)	0.23	0.15
Interaction	SN	N.S	0.16
Interaction	SM	N.S	N.S
Interaction	NM	N.S	0.27
Interaction	SNM	N.S	0.38

Table 3: Average 100 grain weight (g) of maize as affected by nitrogen source and rate as well as some micro element treatments in 2002 and 2003 seasons.

N.sources (S)	N.rate Kg/fad (N)	2002 Season							2003 Season						
		Micronutrient treatments(M)							Micronutrient treatments(M)						
		F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+Zn)	Mean	F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+Zn)	Mean
Ammonia	100	33.23	34.00	34.60	33.13	33.67	34.37	33.83	32.13	33.13	34.00	31.90	33.00	33.90	33.01
	120	33.47	34.23	34.90	33.73	33..93	34.63	34.15	32.23	33.03	34.40	32.50	33.23	34.43	33.30
	140	33.87	34.47	35.23	33.63	34.20	34.97	34.40	33.37	33.43	34.67	33.00	33.47	34.57	33.75
	mean	33.52	34.23	34.91	33.38	33.93	34.66	34.11	32.58	33.20	34.36	32.47	33.23	34.30	33.35
Urea	100	32.87	33.40	34.17	32.63	33.10	33.70	33.31	32.10	32.90	33.90	31.87	32.67	33.50	32.82
	120	33.33	33.73	34.13	33.00	33.47	33.83	33.58	32.60	33.27	33.83	32.40	33.23	33.63	33.16
	140	33.73	33.90	34.77	33.50	33.77	34.17	33.97	32.87	33.57	34.50	32.93	33.43	33.97	33.55
	mean	33.31	33.68	34.36	33.04	33.45	33.90	33.62	32.52	33.25	34.08	32.40	33.11	33.70	33.18
General means of N. rate	100	33.05	33.70	34.39	32.88	33.39	34.04	33.58	32.12	33.02	33.95	31.89	32.84	33.70	32.92
	120	33.40	33.98	34.52	33.19	33.70	34.23	33.84	32.42	33.15	34.12	32.45	33.23	34.03	33.23
	140	33.80	34.19	35.00	33.57	33.99	34.57	34.19	33.12	33.50	34.59	32.97	33.45	34.27	33.65
General mean		33.42	33.96	34.64	33.21	33.59	34.28		32.55	33.23	34.22	32.44	33.17	34.00	

(S)Soil application method
(F)Foliar application method
L.S.D at 0.05 for:

		2002	2003
Sources	(S)	*	N.S
N. Rate	(N)	0.13	0.20
Micro elements	(M)	0.21	0.30
Interaction	SN	N.S	N.S
Interaction	SM	N.S	N.S
Interaction	NM	N.S	N.S
Interaction	SNM	N.S	N.S

Table 4: Average stover yield(ton/fad) of maize as affected by nitrogen source and rate as well as some micro element treatments in 2002 and 2003 seasons.

N.sources (S)	N.rate Kg/fad (N)	2002 Season							2003 Season						
		Micronutrient treatments(M)							Micronutrient treatments(M)						
		F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+Zn)	Mean	F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+Zn)	Mean
Ammonia	100	3.18	3.51	3.58	3.12	3.35	3.47	3.37	3.30	3.60	3.70	3.20	3.45	3.60	3.48
	120	3.27	3.59	3.60	3.14	3.45	3.50	3.43	3.50	3.65	3.80	3.43	3.60	3.75	3.62
	140	3.34	3.65	3.68	3.25	3.57	3.67	3.53	3.70	3.75	3.90	3.50	3.70	3.80	3.73
	mean	3.26	3.58	3.62	3.17	3.46	3.55	3.44	3.50	3.67	3.80	3.38	3.58	3.72	3.61
Urea	100	3.03	3.37	3.52	2.95	3.20	3.38	3.24	3.20	3.50	3.65	3.00	3.35	3.50	3.37
	120	3.20	3.52	3.53	3.08	3.33	3.45	3.35	3.40	3.55	3.73	3.30	3.40	3.55	3.49
	140	3.33	3.53	3.73	3.17	3.43	3.52	3.45	3.50	3.60	3.75	3.40	3.55	3.70	3.58
	mean	3.19	3.47	3.59	3.07	3.32	3.45	3.35	3.37	3.55	3.71	3.23	3.43	3.58	3.48
General means of N. rate	100	3.11	3.44	3.55	3.04	3.28	3.43	3.31	3.25	3.55	3.68	3.10	3.40	3.55	3.42
	120	3.24	3.56	3.57	3.11	3.39	3.48	3.39	3.45	3.60	3.77	3.37	3.50	3.65	3.56
	140	3.34	3.59	3.71	3.21	3.50	3.60	3.49	3.60	3.68	3.83	3.45	3.63	3.75	3.66
General mean		3.23	3.53	3.61	3.12	3.39	3.50		3.43	3.61	3.76	3.31	3.51	3.65	

(S)Soil application method
(F)Foliar application method
L.S.D at 0.05 for:

		2002	2003
Sources	(S)	N.S	N.S
N. Rate	(N)	0.06	0.10
Micro element	(M)	0.11	0.14
Interaction	SN	N.S	N.S
Interaction	SM	N.S	N.S
Interaction	NM	N.S	N.S
Interaction	SNM	N.S	N.S

Table 5: Average grain yield per fad (ardab) of maize as affected by nitrogen source and rate as well as some micro element treatments in 2002 and 2003 seasons.

N.sources (S)	N.rate Kg/fad (N)	2002 Season							2003 Season						
		Micronutrient treatments(M)							Micronutrient treatments(M)						
		F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+Zn)	Mean	F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+Zn)	Mean
Ammonia	100	25.13	26.06	28.11	24.28	25.13	27.13	25.97	27.50	28.56	29.99	27.13	27.85	28.56	28.27
	120	26.13	26.56	28.42	25.06	25.92	27.49	26.60	27.85	29.99	31.55	27.49	28.56	30.70	29.69
	140	26.77	27.27	29.35	25.85	26.70	28.56	27.42	28.56	32.13	32.49	28.56	31.63	32.13	30.92
	mean	26.01	26.63	28.63	25.06	25.92	27.73	26.66	27.97	30.23	31.34	27.73	29.35	30.46	29.52
Urea	100	23.78	24.63	25.71	22.64	23.35	24.99	24.18	25.70	27.85	28.56	25.70	26.42	27.85	27.01
	120	24.35	25.42	27.20	23.61	24.42	25.85	25.14	26.77	28.56	29.99	26.42	27.49	28.20	27.91
	140	25.78	26.56	28.78	24.99	25.99	27.84	26.66	27.85	29.99	31.42	27.13	28.56	29.99	29.16
	mean	24.64	25.54	27.23	23.75	24.59	26.23	25.33	26.77	28.80	29.99	26.42	27.49	28.68	28.03
General means of N. rate	100	24.46	25.35	26.91	23.46	24.24	26.06	25.08	26.60	28.21	29.28	26.42	27.14	28.21	27.64
	120	25.24	25.99	27.81	24.34	25.17	26.67	25.87	27.31	29.28	30.77	26.96	28.03	29.45	28.80
	140	26.28	26.92	29.07	25.42	26.35	28.20	27.04	28.21	31.06	31.96	27.85	30.10	31.06	30.04
General mean		25.33	26.09	27.93	24.41	25.25	26.98		27.37	29.52	30.67	27.08	28.42	29.57	

(S)Soil application method
(F) Foliar application method
L.S.D at 0.05 for:

Sources	**(S)**	*****	*****
N. Rate	**(N)**	**0.29**	**0.14**
Micro element	**(M)**	**0.31**	**0.31**
Interaction	**SN**	**0.41**	**0.19**
Interaction	**SM**	**0.44**	**0.43**
Interaction	**NM**	**0.54**	**0.05**
Interaction	**SNM**	**0.77**	**0.76**

Table 6: Average of protein percentage of grain of maize as affected by nitrogen source and rate as well as some micro element treatments in 2002 and 2003 seasons.

N.sources (S)	N.rate Kg/fad (N)	2002 Season							2003 Season						
		Micronutrient treatments(M)							Micronutrient treatments(M)						
		F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+Zn)	Mean	F(F)	Zn(F)	Mixed(F) (Fe+Zn)	Fe(s)	Zn(s)	Mixed(s) (Fe+Zn)	Mean
Ammonia	100	11.19	11.50	11.94	10.94	11.56	11.88	11.50	11.25	11.88	11.87	11.06	11.88	11.94	11.65
	120	11.75	11.88	12.13	11.56	11.69	11.88	11.82	11.75	11.88	12.15	11.56	11.88	12.00	11.87
	140	11.88	12.19	12.19	11.56	11.88	12.00	11.95	12.00	12.00	12.24	11.88	12.19	12.00	12.05
	mean	11.61	11.86	12.09	11.35	11.71	11.92	11.76	11.67	11.92	12.09	11.50	11.98	11.98	11.86
Urea	100	10.94	10.75	11.56	10.81	10.63	11.38	11.01	10.94	10.94	11.85	10.94	11.25	11.56	11.25
	120	11.19	11.50	11.88	11.06	11.25	11.88	11.46	11.25	11.69	12.14	11.25	11.88	12.19	11.73
	140	11.88	11.88	12.25	11.56	11.56	12.06	11.87	12.00	11.88	12.27	12.00	11.88	12.19	12.04
	mean	11.34	11.38	11.90	11.14	11.15	11.77	11.45	11.40	11.50	12.09	11.40	11.67	11.98	11.67
General means of N .rate	100	11.07	11.13	11.75	10.88	11.10	11.63	11.26	11.10	11.41	11.86	11.00	11.57	11.75	11.45
	120	11.47	11.69	12.01	11.31	11.47	11.88	11.64	11.50	11.79	12.15	11.41	11.88	12.10	11.81
	140	11.88	12.04	12.22	11.56	11.72	12.03	11.91	12.00	11.94	12.26	11.94	12.04	12.10	12.04
General mean		11.48	11.62	12.00	11.25	11.43	11.85		11.54	11.71	12.09	11.45	11.54	11.98	

(S)Soil application method
(F)Foliar application method
L.S.D at 0.05 for:

		2002	2003
Sources	(S)	*	*
N. Rate	(N)	0.10	0.20
Micro element	(M)	0.15	0.16
Interaction	SN	0.14	0.28
Interaction	SM	0.21	N.S
Interaction	N M	0.25	0.28
Interaction	SNM	N.S	N.S