EFFECT OF VARIOUS SOURCES AND RATES OF N-FERTILIZERS ON ITS ACCUMULATION IN BOTH SOIL AND MAIZE IN NORTH SINAI

M.A.B. El-Sherief, A. A. Rahmou and E. A. Abdel Latif
Soils, Water and Environmental Res. Ins., A.R.C., Giza

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ABSTRACT: *A field trail was conducted in sandy loam soil at El-Arish, North Sinai governorate, to study the effect of three N-fertilizer sources i.e. Amm.sulphate, Amm.nitrate and Urea with five N-rates (0 , 70 , 100 , 130 and 160 Kg N fed^{-1}) on the accumulation of N-forms in both soil and maize plant under drip irrigation system in the summer season of 2006.*

The obtained data could be summarized as the following:

1-Nearly similar NH_4 –N concentration were found in the surface and subsurface soil, by adding the used N-source. .In addition, the increasing rate of applied N- fertilizer, spontoneously increased its content in the surface layer and then sharply decreased with increasing soil depth.

2-The residual soil NO_3-N content was gradually decreased with increasing either soil depth or plant age.

3 - Nitrate leaching was also affected by N- source in the order: Amm. nitrate > Amm. sulphate > Urea.

4- No_2 – N concentration in soil decreased gradually during the 1st and 2nd stages and sharbly increased in the 3th stage .

5-Higher amounts of NH_4-N were found in maize leaves, at the three stages of growth, than other N forms, i.e. NO_3-N or NO_2-N. NO_3-N content was intermediary, while concentration of NO_2-N was the least. Increasing amounts of N- forms accumulated in maize leaves by raising N –addition rates.

6- Ammonium nitrite gave the highest NO_3-N and NO_2-N concentration in maize grains, followed by urea and ammonium sulphate at harvest.

7- Increasing N-rates caused a consistent and progressive increase in NO_3-N and NO_2-N concentration in maize grains.

Key words: *Sandy loam soil –N- sources –N- rates – Maize – NH_4-N, NO_3-N and NO_2-N – North Sinai .*

INTRODUCTION

The North Sinai Governorate consistes of 6 districts i.e., EL-Arish, Raphah, EL-Shekh Zowayed, Bear EL-Abd, EL Hassena and Nekhil. It covers a land area of 2700 km^2,astrides characterized by the sahara climate, with an annual rainfall in most parts less than 200 mm / year (Ashour,1997). The total agricultural land is about 204588 feddan of sandy soils and one fourth of that area is annually cultivated with wheat under rainfall conditions. Number of population in 1999 was estimated at approximately 273370 inhabitant. The number of wells in wadi EL-Arish is about 151 wells used for drinking and agricultural irrigation (Information and Decission Support Center, Descriping North Sinai with information, 2000).

Efficient use of N- fertilizers is essential to increase the economic return of growing crops and minimize potentially negative effect of excessive use. Nitrogen fertilizer application that exceed crop requirements for maximum corn yield, can result in an accumulation of soil NH_4-N, which is volatilized (Roth and Fox, 1990). Nitrate leaching is largely influenced by the amount of mineral N within the top soil at the end of the growing season (Steenvoorden, 1989 and Roth & Fox 1990).

As a general, either soil or food contamination with the excessive addition of N- fertilizers is a major problem of the current work, particularly with a crop requires large amountes of N-fertilizer. The harmfull accumulation of NO_3-N or NO_2-N in drinking water or even some foods may cause methemoglobinemin and possible carcinogenic effect (WHO, 1994). Therefore a trail was conducted on sandy loam soil at AL Yasser, North Sinia governorate, to study the effect of application N-form different source with different rates on both soil and maize plant.

The present work aimed to study the effect of applied nitrogen sources and rates on the residual of NH_4-N, NO_3–N and NO_2–N after transformation in the soil, at three stages of plant growth and three soil depths. Moreover, the effect of nitrogen fertilization, sources and/or rates, on vegetative growth and the accumulation of NH_4, NO_3 and NO_2 - N in plant organs (leaves and grains) was also studied.

MATERIALS AND METHODS

Field experiment: A field experiment was carried out in a sandy loam soil cultivated with maize (*Zea mays L.*) c.v. single way cross 10 (SWC 10), during the summer growing season 2006 at AL Yasser district, El-Arish, North Sinai Governorate. The statistical design was a split plot with four replicates, where the main plots were the sources of Nitrogen i.e. Ammonium sulphate (AS). 20.6%N, Ammonium nitrate (AN). 33.5%N, Urea (U) 46.5% N and the sub-plots were the rates of application (0, 70 ,100, 130 and 160 Kg N fed^{-1}).

The nitrogen fertilizers were added at two equal doses, i.e., 3 and 5 weeks after sowing. super phosphate (15 % P_2O_5) was added at a rate of 30 Kg fed^{-1} before cultivation, while potassium sulphate (48%K_2O) was applied at the rate of 50 kg fed $^{-1}$ in two equal doses during nitrogen application.

The plot size was 10.5 m^2 (1/400 feddan) and each experiment unit consisted of five rows, each was 3.5 meters in length and 60 cm in width. Each treatment had four replicates. The convenient agricultural practices had been adopted, ten plants were selected randomly of each replicate at harvesting to study the growth parameters plant height, ear weight, ear height, ear length, ear diameter, stem diameter, weight of 100-grain, dry weight and grain yield.

Laboratory studies:

a- Soil analysis: Three soil samples at depths 0-30, 30-60 and 60-90 cm were collected before cultivation, data in Table (1) recorded some physical and chemical properties of the studied soil. After 35, 75 and 105 days from cultivation soil samples were collected of each treatment at the same depths and prepared for analysis: Mechanical analysis according to Piper (1950). Calcium carbonate was determined using Collins, Calcimeter, pH was in 1:2.5 soil: water suspention (Piper 1950).Available nitrogen was extracted using 1% K_2SO_4 and determined by microkjeldahl apparatus Hesse (1971). NH_4-N extract was determined colorimetrically with using Nessler method according to Jakson (1973). NO_3-N using nitrophenol disulfonic acid according to Jakson (1973). NO_2-N in soil extract was determined according to Singh (1988). Available soil phosphorus was determined by the method described by Olsen *et al.* (1954). Available potassium was extracted using 1.0 N ammonium acetate solution (pH 7) and determined by flame photometer Hesse (1971).

While, the heavy metals i.e. Fe, Mn and Zn were extracted and determined by the method described by Lindsay and Norvell (1978).

Table (1): The physical and chemical properties of AL- Yasser soil.

Soil properties	Soil layers (cm)		
	0-30	30-60	60-90
Sand %	78.2	80.1	79.0
Silt %	5.0	7.0	8.0
Clay %	14.8	12.9	12.0
Texture	sandy loam	sandy loam	sandy loam
pH (1 : 2.5)	8.3	8.1	8.1
TSS %	0.12	0.11	0.17
Organic matter %	0.01	0.01	0.01
$CaCO_3$ %	8.8	7.1	9.8
N $mgkg^{-1}$	9.2	8.0	7.5
P $mgkg^{-1}$	5.8	7.2	7.2
K $mgkg^{-1}$	100	105.0	106.0
Fe $mgkg^{-1}$	8.0	7.7	7.7
Mn $mgkg^{-1}$	3.6	3.2	2.4
Zn $mgkg^{-1}$	1.0	0.8	0.8

b- Plant analysis: Total nitrogen was estimated by (A.O.A.C., 1990). *NH_4^+, NO_3^- and NO_2^- -N analysis*: NH_4-N in plant extract was determined colorimetrically with using Nessler method according to Jakson (1973). NO_3^- and NO_2^- determined according to Singh (1988).

Statistical analysis: The statistical analysis was carried out according to the method described by Snedecor and Cochran (1989).

RESULTS & DISCUSSION

1-Effect of various N-sources and/ or rates on growth characters of corn plant grown in sandy loam soil:

Data in table (2) indicated that the effect of N-sources i.e ammonium sulphate, ammonium nitrate and urea, on the vegetative growth characters of corn plant were not significant expect for the grain yield which exhibted a significant differences, the maximum yield has been obtained with ammonium sulphate and the lowest one recorded with amonium nitrate. The grain yield with urea represented medium values.

Table (2): The effect of nitrogen sources on growth characters of Zea mays plants.

N-sources	Plant height (cm)	Ear weight (gm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	Stem diameter (cm)	Weight of 100 grain (gm)	Dry weight (g/plant)	Grain Yield (Kg/fed.)
Ammonium sulphat	155.5	80.76	88.13	13.59	2.69	1.53	17.85	678	1293.0
Ammonium nitrate	143.5	56.95	83.13	12.65	2.43	1.45	15.76	559	923.0
Urea	160.5	73.18	91.07	12.95	2.75	1.54	17.55	656	1175.6
L.S.D 0.05	NS	NS	NS	NS	NS	NS	NS	NS	9.96

Table (3) clarified the effect of five rates of nitrogen added to corn plants grown on sandy loam soil, on growth characters, grains weight and dry weight of plant.

Regarding, plant height, significant effect was obtained, while highly significant values were found by ear weight, ear height, ear length, ear diameter, stem diameter and weight of 100 grains and grain yield .On the contrary, ear length and dry weight were not significant.The height grain yield achived with 160 Kg N / fed.

Table (3): Effect of nitrogen rates on growth characters of Zea mays plants .

N-rates KgN/fed.	Plant height (cm)	Ear weight (gm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	Stem diameter (cm)	Weight of 100 grain (gm)	Dry Weight (g/plant)	Grain yield (Kg/fed.)
Control	135	38.53	76.33	8.80	1.83	1.40	13.77	485	616.4
70	147.1	63.34	82.22	13.78	2.67	1.57	17.47	676	1013.6
100	166.9	74.13	95.56	14.28	2.83	1.59	17.33	688	1194.0
130	151.6	81.95	87.22	13.83	2.57	1.48	17.63	627	1312.4
160	165.1	93.89	95.89	14.61	2.91	1.50	19.01	678	1516.6
L.S.D 0 05	14.93*	11.49**	9.10**	NS	0.22**	1.63**	0.74**	NS	17.39**

These data are in agreement with those obtained by Badawi and EL-Moursy (1997), Bader *et al* (1997), Lamloum (1997), Atta-Allah (1998), EL-Moursy *et al* (1998), EL-Sheikh (1998), Zaghloul (1999) and Hassan (1999).

2- Effect of various N-sources and / or rates on the residual NH_4-N concentration.

Data in Table (4) clearly showed that the effect of different sources of N on NH_4-N (mg/kg^{-1}), in the soil profile was insignificant, in the 3 soil layers of the three samples with the exception of the subsurface (30-60cm) layer at the 1st stage.

Data also showed that the lowest calculation of NH_4-N was found at the 1st stage of growth in the soil profile by adding any kind of N-source while, the highest NH_4-N content was obtained in the 2 nd stage followd by the 3 rd stage.

Concerning the effect of urea on the residual NH_4-N, high accumulation was found in the 2 nd followed by the 3 rd stage, while the 1 st one was the least. Moreover no marked differences between N-sources on NH_4-N concentration withen 3 soil layers were found. Data documented that higher NH_4-N concentration was accumulated in the sub surface than the surface or deep layers for each N-source, i.e. ammunium sulphate, ammunium nitrate and urea.

Table (4): Effect of various N- sources on NH_4–N content (mg kg^{-1}) among soil profile layers at three stages of maize growth .

N-sources	1st Stage (35 days after sowing))			2nd Stage(75 days after sowing))			3rd Stage(105 days after sowing))		
	Soil depths (cm)								
	0-30	30-60	60-90	0-30	30-60	60-90	0-30	30-60	60-90
	NH_4-N (mg^{-1})								
Control	6.2	8.2	6.2	13.6	15.3	17.2	6.7	9.2	8.8
Ammonium sulphat	8.5	9.8	9.0	16.1	17.7	17.9	13.8	14.3	13.4
Ammonium Nitrate	8.3	7.9	8.0	17.1	17.7	18.0	14.4	15.4	11.3
Urea	9.2	10.8	10.1	17.6	17.6	18.8	15.7	15.8	14.4
L.S.D 0.05	NS	0.48	NS	NS	NS	NS	NS	NS	NS

Table (5) showed that NH_4-N concentration significantly increased in all layers at 3 stages of corn growth compared with control, with the exception of subsurface at the 1st stage of growth and deep layer at 2nd stage and then decreased with increasing depth at three layers in 1st stage as well as surface and deep layers at 2nd stage, while in the 3rd stage higher concentration of NH_4-N were determined in the three layers at (160 kg fed^{-1}) treatment. (Jokela and Randall, 1989; and Davies *et al.*, 1995, obtained similar results).

Table (5): Effect of various N- rates on NH_4-N content ($mgkg^{-1}$), among soil profile at three different period .

Soil depths (cm) / N-rates (KgN/fed)	NH_4-N ($mgkg^{-1}$)								
	1st Stage(35 days after sowing))			2nd Stage(75 days after sowing))			3rd Stage(105 days after sowing))		
	0-30	30-60	60-90	0-30	30-60	60-90	0-30	30-60	60-90
Control	6.5	8.2	6.8	13.6	15.3	17.2	6.7	9.2	8.8
70	7.8	9.0	8.5	16.5	17.7	17.6	12.0	10.6	9.8
100	8.0	9.5	10.3	17.5	18.0	17.7	14.6	13.3	11.1
130	11.8	10.9	11.4	19.4	18.5	19.2	15.3	15.1	15.5
160	9.1	9.8	10.2	17.7	18.9	18.8	24.8	27.6	20.0
L.S.D 0.05	1.50	NS	2.00	1.16	1.65	NS	1.40	1.10	1.95

3- Effect of various N–sources and / or rates on the residual NO_3-N concentration.

Table 6 showed that NO_3-N content was the highest, not only, in the 2 nd stage, but also in the 1 st soil layer. concerning the movement of NO_3-N during the soil profile,data in Table (6) showed that all values in the surface layer, in the 1st stage,and all layers in the 3rd stage, were insignificant, excepted that the surface layer at the 2nd stage was significant, while the subsurface and deeper layers at 1st stage as well as all layer of 2nd stage were highly significant. These results are in agreement with Assubaie, (2004).

Table (6): Effect of various N- sources on NO_3–N concentration (mg kg^{-1}) among soil profile layers at three different periods.

N-sources	1st Stage(35 days after sowing))			2nd Stage(75 days after sowing))			3rd Stage(105 days after sowing))		
	Soil depths(cm)								
	0-30	30-60	60-90	0-30	30-60	60-90	0-30	30-60	60-90
Control	3.7	1.2	0.5	3.3	2.0	1.8	1.2	1.7	0.4
AS	7.4	2.2	1.4	6.8	5.5	1.9	8.8	3.3	2.3
AN	5.1	3.6	1.6	7.8	4.2	2.8	5.7	2.8	1.6
U	6.9	2.8	0.9	7.9	3.0	3.2	6.9	1.8	1.2
Mean	5.78	2.45	1.1	6.45	3.68	2.43	5.65	2.4	1.38
L.S.D 0.05	NS	0.8	0.20	0.25	1.15	0.10	NS	NS	NS

The average of NO_3-N concentration within the layer (0-30cm) was higher in the 2nd stage (6.45 mg Kg-1), than the 1st stage (5.78 mg Kg^{-1}) and the least one was at the 3rd stage (5.65 mg Kg^{-1}).

Moreover, the residual soil NO_3-N content within the three soil stages samples was gradually decreased with increasing soil depth. The former results are in harmony with results obtained by Gerown *et al.*, 1993, and Davies *et al.*, 1995.

Table 7 clearly showed that increasing additional N-fertilizer raised the NO_3-N content significantly in soil layers among corn growth stages compared with the control.

Table (7): Effect of various N- rates on NO_3-N content (mg kg^{-1}) among soil profile at three different periods.

Soil depths (cm) / N-rates (kgN/fed)	NO_3-N (mg kg^{-1})								
	1st Stage(35 days after sowing))			2nd Stage(75days after sowing))			3rd Stage(105 days after sowing))		
	0-30	30-60	60-90	0-30	30-60	60-90	0-30	30-60	60-90
0	3.7	1.2	0.5	3.3	2.0	1.8	1.2	1.7	0.4
70	5.2	2.3	2.2	5.0	2.3	1.9	3.7	2.4	1.5
100	5.5	2.5	1.4	6.4	2.8	2.7	8.6	2.6	2.0
130	9.6	4.8	1.2	7.7	4.6	3.1	11.6	3.4	1.9
160	8.1	3.7	1.4	12.5	6.1	3.8	10.3	3.2	2.8
L.S.D. 0.05	1.17	0.61	0.38	1.48	0.56	0.44	1.50	NS	0.51

Numerous workers reported NO_3 –N accumulation in agricultural soils, as a result of agricultural practice, e.g. Roth & Fox, 1990: Liang & Mackenzie, 1994: Sarvari, 1995and Davies *et al*, 1995.

Statistically, significant differences were obtained by all treatments, excepted the subsurface soil layers at the 3rd stage of corn growth. The N-fertilizer rate (130 Kg/ fed) not only gave the highest NO_3-N concentration in soil, but also was the highest at the 3 stages of corn growth followed by the 4th treatment (160 Kg N/fed), while the 2nd and 3rd treatments were the least ones.

The obtained data clarified that in each stage of growth, the surface layer contained high concentration of NO_3-N followed by the subsurface, while the least NO_3-N content was found in the deep layer (60-90cm).

4- Effect of various N-sources and / or rates on the residual NO_2-N concentration.

Table (8) identified the effect of various sources of N-fertilizers on NO_2-N concentration in 3 soil depths during 3 stages of corn growth. The statistical analysis showed insignificant effect, except, at the 2nd stage of growth, in the subsurface layer. On average, the NO_2-N concentration in the field during the 3 stages under study, indicated a nearly similar mean values by adding the various sources of N-fertilizers under study, within 3 soil layers, after 75 and 105 days from planting.

The results also, showed that NO_2-N decreased gradually during the 1st and 2nd stages and sharply increased in the 3rd stage clarified gradual decrease in the NO_2-N concentration among the soil profile, following nitrogen fertilization as amm.sulphate, amm.nitrate and urea.

Table (8): Effect of various N- sources on NO_2–N concentration (mg Kg^{-1}) among soil profile at three different periods .

Soil depths (cm) / N-rates (kgN/fed)	1st Stage			2nd Stage			3rd Stage		
	NO_2-N (mg kg^{-1})								
	0-30	30-60	60-90	0-30	30-60	60-90	0-30	30-60	60-90
Control	0.26	0.21	0.11	0.16	0.15	0.08	0.20	0.28	0.27
AS	0.40	0.22	0.19	0.26	0.18	0.14	0.52	0.44	0.46
AN	0.29	0.21	0.17	0.22	0.20	0.14	0.52	0.47	0.45
U	0.37	024	0.19	0.23	0.16	0.13	0.58	0.55	0.30
L.S.D 0.05	NS	NS	NS	NS	0.01	NS	NS	NS	NS

Statistical analysis (Table 9). showed significant relations between the increasing addition of N- fertilizers and NO_2-N concentration, in the 3 soil layers of soil profile, or at the 3 stages of corn growth, with the exception subsurface layer at the 1st stage, surface layer at the 2nd stage and deep layer at the 3rd stage .

Table (9): Effect of various N-rates on NO_2-N concentration (mg kg^{-1}).

Soil depths (cm) / N-rates (kgN/fed)	NO_2-N (mg kg^{-1})								
	1st Stage			2nd Stage			3rd Stage		
	0-30	30-60	60-90	0-30	30-60	60-90	0-30	30-60	60-90
0	0.26	0.21	0.11	0.16	0.15	0.08	0.20	0.28	0.27
70	0.28	0.22	0.19	0.23	0.15	0.12	0.33	0.38	0.30
100	0.29	0.22	0.20	0.25	0.17	0.14	0.44	0.54	0.46
130	0.48	0.25	0.23	0.26	0.19	0.16	0.82	0.67	0.47
160	0.46	0.22	0.18	0.29	0.23	0.18	0.91	0.56	0.51
Mean	0.35	0.22	0.19	0.24	0.18	0.14	0.64	0.49	0.40
L.S.D 0.05	1.18	NS	0.03	NS	0.02	0.03	0.10	0.10	NS

The lower content of NO_2 –N when ammonium type fertilizer were applied to soil surface, may be due to the oxidation of the resulted NH_4-N to NO_2-N, which represented the unstable intermediate product and finally to NO_3-N, mainly by aerobic microorganisms (De Datta and Magnage,1969) .

5-Effect of sources or rates of N-fertilizers on its forms accumulation in corn leaves at 3 stages of growth.

Data in Table 10 clarified the relations between the N-sources (i.e. ammonium sulphate, ammonium nitrate and urea) and the N-forms acumulation in corn leaves, at each stage of growth were insignificant. The N form content of NH_4-N (5044 mg Kg^{-1}) was higher than NO_3-N (50 mg Kg^{-1}) or NO_2-N (7 mg Kg^{-1}), at the 3 stages of growth. Nearly parallied amounts of N-forms (inculding NH_4 – NO_3 – NO_2- N), i.e. each stages of growth were found by adding either ammonium or amide type of N–fertilizers.

Table (10): Effect of Various N- sources on total N, NH_4, NO_3 and NO_2 –N removal (mgKg $^{-1}$) in corn leaves during season 2006.

Stages / N-sources	NH_4-N(mgKg $^{-1}$)				NO_3-N(mgKg $^{-1}$)				NO_2-N(mgKg $^{-1}$)			
	stages			Mean	stages			Mean	stages			Mean
	1	2	3		1	2	3		1	2	3	
AS	5200	6500	4100	5267	60	50	40	50.0	15	4	2.0	7
AN	5000	5800	4100	4967	60	40	30	43.3	16	4	1.0	7
U	5100	6500	4000	4900	70	60	40	56.7	15	4	2.0	7
Mean	5100	5967	4067	5044	63	50	37	50	15	4	1.7	7
L.S.D 0.05	NS	0.02	NS	NS	NS	0.001	NS	NS	NS	NS	NS	NS

Data in Table 11 showed that higher amounts of NH_4-N was found in corn leaves , at 3 stages of growth , than other N- forms i. e NO_3 –N or NO_2- N , while NO_2- N was the lowest ones. Moreover, in the formr table conflicting statistical L.S.D values was found . Concerning NH_4-N insignificant values were determined at the 1st and the 3 rd stage of growth, while at the 2 nd stage significant relation was found .But NO_3-N values were insignificant at the 2nd and 3 rd stages of growth. While NO_2-N showed only significant relation at the 2 nd stage of growth. These data clarified that the increasing addition of N-fertilizer, spontaneously, increased its content in corn leaves, at 3 stages of growth in the following order: NH_4-N ≥ NO_3-N ≥ NO_2-N. Maatouk and El Latif, 1985; El Sherbieny *et al*, 1999 and El-Sherief , 2005 obtained similar ressults.

Table (11): Effect of Various N rates on NH_4, NO_3 and NO_2 – N removel (mg Kg $^{-1}$) in corn leaves at 3 stages of growth during season 2006.

Stages / N-rates Kg/fed.	NH_4-N(mgKg $^{-1}$)				NO_3-N(mgKg $^{-1}$)				NO_2-N(mgKg $^{-1}$)			
	Stages			Mean	stages			Mean	stages			Mean
	1	2	3		1	2	3		1	2	3	
Control	4900	6000	3900	4933	40	30	20	30	10	5.0	3	6.0
70	5100	5700	4500	5100	50	40	60	50	12	12.0	6	7.0
100	5000	6100	4100	5100	50	50	50	50	11	7.0	3	7.0
130	5400	6500	3700	5066	50	60	70	60	12	6.0	3	7.0
160	5100	6900	4300	5533	50	60	70	60	15	6.0	3	8.0
Mean	5100	6240	4100	5147	48	48	54	50	12	7.2	3	7.6
L.S.D 0.05	NS	500	NS		NS	2	2		NS	1.0	NS	

6 – Effect of various N-sources and / or rates on NO_3- N and NO_2 – N accumulation in corn grains at harvest.

Data in Table 12 showed that the addition of ammonium nitrate resulted in highly amounts of either NO_3- N or NO_2- N accumulated in grains followed by urea, while the ammounium sulphate was the lowest one, in spite of the obtained values in this respect , was not significant.

Increasing the nitrogen fertilization from zero to 75 Kg / fed caused a consistant and progrissive increased in either NO_3-N or NO_2-N content in corn grains at harvest, in spite of their values were not enough to be statistically significant (Table 12).

These results clarified a noticeable increase of N-forms accumulated in soil or plant (corn leaves and grains) by raising N- addition rates. The excessive use of N – fertilizer has been appointed with pollution of soil, water and plant sources in many parts of the world (Meinardi *et al.*, 1995; Mueller *et al.*, 1995: Awatef (2001) and Sherief, 2005. Hammad *et al.* (2007) found that increasing the nitrate in the added fertilizer gradually increase the accumulation of No_3 – N and No_2 – N in spinach and Radish tissues as compared with control.

Table (12): Effect of various N sources and rates on N forms (mg Kg^{-1}) in corn grains at harvest stage.

N-sources	NO_3-N (mg Kg^{-1})	NO_2-N (mg Kg^{-1})
AS	22	2.0
AN	55	4.0
U	45	3.5
Mean	40.7	2.5
L.S.D 0.05	NS	NS

N-rates	NO_3-N (mg Kg^{-1})	NO_2-N (mg Kg^{-1})
Control	6	0.7
70	9	1.4
100	20	2.9
130	28	3.2
160	46	3.8
Mean	31.9	2.40
L.S.D 0.05	21.8	2.3

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أثر اختلاف مصادر السماد الازوتى ومعدلات اضافتة على تراكم صور الأزوت فى التربة والنبات في محافظة شمال سيناء

محمد عباس بسيونى الشريف - عادل عبده رحمو - السيد أحمد عبد الطيف

معهد بحوث الاراضى والمياة والبيئة-مركز البحوث الزراعية-الجيزة

الملخص العربى

اقيمت تجربة حقلية على ارض طميية رملية بمنطقة العريش- محافظة شمال سيناء لدراسة اثر ثلاث مصادر(سلفات الامونيوم- نترات الامونيوم- يوريا) للسماد الازوتى تحت خمسة معدلات نيتروجين (صفر ، ٧٠ ، ١٠٠ ، ١٣٠ ، ١٦٠ كجم نتروجين للفدان) على تراكم الصور الازوتية فى كلا من التربة ونبات الذرة الشامية فى موسم صيف ٢٠٠٦.

يمكن تلخيص النتائج المتحصل عليها فى الاتى:

١- وجد تركيز متشابة تقريبا للازوت الامونيومى فى الطبقة السطحية وتحت السطحية باضافة الاسمدة المستخدمة (سلفات الامونيوم-نترات الامونيوم-يوريا) . ويزداد تركيز الازوت الامونيومى معنويا فى الطبقة السطحية بزيادة معدل التسميد المضاف ثم يتناقص بحدة مع ازدياد العمق .

٢- محتوى النترات المتبقى خلال قطاع التربة يتناقص مع تزايد كلا من العمق وعمر النبات .

٣- وجد أن فقد النترات بالرشح تبعا لمصدر السماد : نترات الامونيوم > سلفات الامونيوم> اليوريا.

٤- محتوى النتريت في التربة يتناقص تدريجياً خلال المرحلة الأولى والثانية ويزداد بحدة في المرحلة الثالثة .

٥- وجدت تركيزات عالية من الازوت الامونيومى فى أوراق نبات الذرة في المراحل الثلاث من النمو عن باقى صور الازوت مثل الصورة النتراتية او النتريتية وكانت الوسيطة هى الصورة النتراتية ثم النتريتية الاخيرة ويزداد تركيز صور الازوت المتراكم فى الاوراق بزيادة معدل الاضافة .

٦- كان سماد نترات الامونيوم الأعلى فى تراكم النترات والنتريت فى الحبــوب يليـــة اليوريـــا وسلفات الامونيوم عند الحصاد .

٧- زيادة معدل اضافة الازوت تتسبب فى زيادة تركيز الازوت النتراتى والنتريتى فـــى حبـــوب الذرة .