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NH_3 LOSS UNDER AEROBIC AND UNAEROBIC CONDITION FROM THE SOILS PRACTICED WITH UREA N-FERTILIZER.

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ABSTRACT: Retention of NH_4-N by the soil and/or fertilizer is increasing the fertilizer-N use efficiency and decreasing that hazard effect of pollution. Therefore two types of soil (i.e Germain clay loam and Egyptian Calcareous) which practiced with urea had been incubated for several days under two water regimes (viz. a relatively aerobic and unaerobic condition).

Ammonia evolved had been retained by 0.01 N NaOH, and the mixture then titrated with 0.01N Sulphuric acid.

The data obtained indicated, that NH_3 Chemo loss was much more (i.e higher than 0.01 meq in the Germain soil) than that caused by the microorganism (Bio) (i.e 0.0025 meq in the Egyptian soil). And therefore, the oxygen (viz. O_2 (Aeration)) is obviously the responsible agent for loss of Amonia from the soil practiced with Urea. In other words the oxygen is that carrier with which the element is normally converting between two compounds. And the element with the oxygen is converting in taken up to more available phase.

INTRODUCTION

NH_3 Loss is a function to:

1- Atmosphere.
2- The urea fertilizer Management practices.
3- Temperature.
4- Moisture.
5- Texture, the granule size of the soil (i.e mineralitey or type of soil) in other words the aerobic and unaerobic conditions.

6- Granule size of the fertilizer.
7- Biochemical and microbiological (Flora) properties effect.

However, much NH_3 loss or little soil retention for quantities of NH_4-N is indeed decreasing the fertilizer-N use efficiency (Ali, S. 1987) and consequently causing increase of the hazard effect of the fertilizer (Ali, S. 1994).

Garcia, A.L.A.; et al.; (2011) decleared that the urea – based fertilizers may suffer significant losses of nitrogen to the atmosphere. And they due the transformation of the urea to the presence of urease produced by soil microorganisms.

Palma, R.M.; et al.; (1998) determined the amount of N loss by volatilization from urea fertilized soils under two different fertilizer application methods (Surface and Incorporated application); and also in other aime they related volatilization losses with environmental factors and bio chemical and microbiological properties, on a Vertic Argiudoll with a silty clay loam texture. The site has been in natural grass land for 8 years prior to planting with maize. Following the fertilizer application for conventional tillage and no tillage systems, the daily volatilization loss on the fertilized plots was highest during the first three days (Khalil, M.I.; et al.; 2006). Remarkedley higher losses occurred in the [no-tillage] treatments. And when the fertilizer was (Surface and incorporated) respectively the N-urea lost was [11.5% and 6.2%]. They due that to surface application of the urea stimulated urease enzyme activity, an opposites effect was observed when the urea was [incorporated]. However, multiple regression equations showed differences between the [the Surface and Incorporated applied urea] that because of the latter has no that direct exposure to the atmospheric condition.

Wargo J.; and Cothran, A.; (2006) concluded that the N release profile is dependent on soil temperature, moisture; and texture.

Khalil, M.I.; et al.; (2006) noticed that [the clay loam soil which is in the least granule size (viz. highest conditions of the aerobic, in other words the

least mineralitey) showed the greatest NH_3 loss (2.61%)] followed by the sandy loam soil (0.59%) then the silt loam (0.53%).

They added that with increasing the granule size of the urea (i.e from 0.17- 0.50%), during 45- day incubation period, they found that N_2O emission was enhanced; and nitrification and N_2O emissions observedley delayed several days. They due that to soil mineral and water.

And added that [NH_3 volatilization was decreased with (increasing the granule size of the urea) where (the NH_3 loss was the highest in the treat of the prilled urea (PU)) but in the case of larger granule treat the volatilization was the lower over 22-days].

Thind, H.S.; and Rowell, D.L.; (2000) indicated that hydro lysis was observedley most rapid in the presence of the living algae with green manure followed by the dead algae, and was the slowest in the control. And the concentration of the NH_4-N in the flood water was, however, reduced comparatively to that of presence of the living algae.

Where they due that to the algae assimilation (Im mobilization) and subsequentley to the mobilization (NH_3 Release or loss) to the dead algae.

MATERIAL AND METHOD

Deutsch clay loam* and Egyptian Calcareous* soils had been used for conduct the expirement where each practiced with 100meg N urea under an aerobic and unaerobic condition. Where two water regimes had been applied for each. However, in the aerobic 25 ml bidestilled water had been added to 150g soil (viz. to attaining 75% of available water), and 60ml (as unaerobic) to 110g soil. Namely the NH_3 lost had been assessed in that called the closed system (i.e the Model Vessel) where 20% O_2 and 80% Argon or 100% O_2 had been in it in each of the aerobic and unaerobic.

The vessel had contained a bettrrey dish involved the soil practiced with the urea and another involved Sodium hydroxide 0.01 N. then the Vessel had been incubated over neight under a regulated temperature 27-30 C°. It however had been incubated for different times 1-8 days. Ammonia volatilize (loss) had been retained by the sodium hydroxide 0.01 N. Then

the amount of loss of Amonia had been assessed by titrate the mixture (sodium hydroxide and Amonia) with 0.01 sulphuric acid.

* Where the calcareous and clay loam soil properties; the first is remarkedley rich in carbonate while loamy is more acidified sites (Ewald, J., 2000).

Noticeably, the calcareous Egyptian was brought from Borg Al Arab of the North Coast which containes more than 80% calcium carbonate.

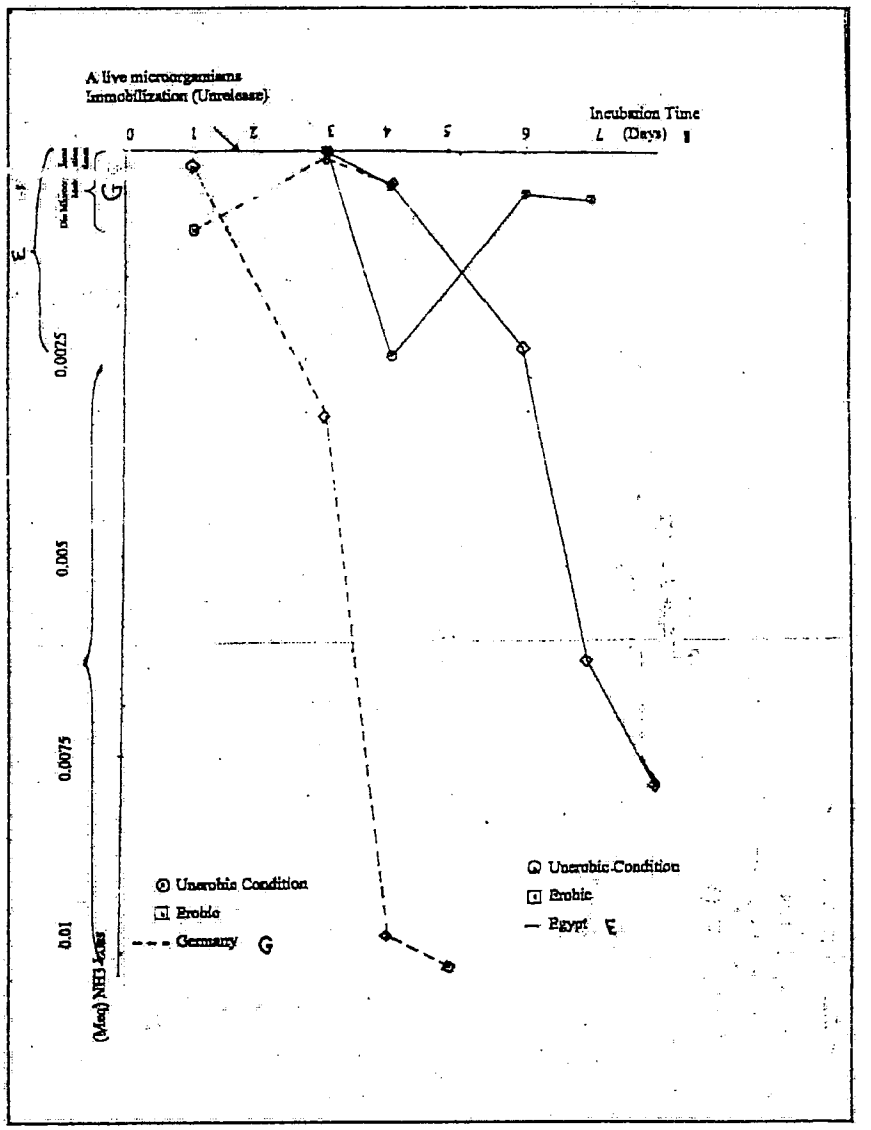
RESULT

8				7				6				5				4				3				2				1				Incubation time (day)
E		G		E		G		E		G		E		G		E		G		E		G		E		G		E		G		
c	b	c	b	c	b	c	b	c	b	c	b	c	b	c	b	c	b	c	b	c	b	c	b	c	b	c	b	c	b	c	b	
0.0078735				0.0063259	0.0005973			0.0024435	0.000543					0.0101269		0.0004072	0.0025249	0.009774	0.0003801	0.0000000	0.0000000	0.032851	0.0001086					0.0000000	0.0000000	0.0002172	0.0009774	NH_3 loss (mg•)

* mean values
G Germany E Egypt

b (bio) microorganisms
c (chemo) chemical

Figure (NH_3 loss under aerobic and unaerobic condition from Germain clay loam and Egyptian calcareous soil practiced with urea N-freti lizer).



DISCUSSION

The figure and table show generally that NH_3 loss of the Chemo (c) is much more the Bio (b) (Microorganisms). However the highest value of the Chemo is (0.01 Meq.) (as recorded in the Germain clay loam in the fifth day) while the highest of the Bio is only (0.0025) (in the Egyptian calcareous in the fourth day).

In the same hand the highest chemo NH_3 loss of the clay loam Germain (0.01 Meq.) is more than the highest of the chemo of the calcareous Egyptian (0.00633 Meq.) which was in the seventh day (Khalil, M.I.; et al.; 2006).

While the data of the Bio of the both findely are in the opposite where the highest of the Bio of the calcareous (0.0025) is higher than that of the Bio of the clay loam (0.000977) which was in the first day.

Because of the higher value of Chemo NH_3 loss (viz. the Aerobic condition) than that of the Bio (i.e the unaerobic) therefore it can conclude that generally the oxygen is major agent to NH_3 loss (Garcia, A.L.A.; et al.; 2011, Palma, R.M.; et al., 1998). In other words the oxygen is that carrier with which the element is normally converting between two compounds. And the element with the oxygen is converting in taken up to more available phase.

In the Bio (unaerobic) hand it can be found that the Die of the microorganisms is remarkabley the responsible reason to the NH_3 lost (Mobilization or the N-release); and immobilization (Assimilation or NH_3 unrelease) (with living microcrganisms) there is no any lost of the NH_3-N about (Thind, H.J.; and Rowell, D.L.; 2000).

That higher Bio lost of Egypt comparatively to that Bio of Germaney may be due to lower content of the organic matter (substrate) which normalley is few in the calcareous Egyptian soil.

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فقد الأمونيا تحت الظروف الهوائية واللاهوائية من الأراضي المعاملة باليوريا

علي سيد عبد القادر

الملخص بالعربية

تزداد كفاءة السماد النيتروجيني وينخفض مدي التلوث بازدياد قوة إمساك التربة و/أو السماد لـ ن يده – ن.

ووفقا لذلك فقد تم تحضين باستخدام مقننين مائيين (أو بصيغة أخرى ظروف نسبيا هوائية أو لا هوائية) لتربة ألمانية (طينية طمية) وأخرى مصرية (جيرية) أضيفت اليوريا لكل منهما.

تم إمساك الأمونيا الناتجة بمحلول صودا كاوية 0.01ع، ثم معايرة المخلوط نفسه بحمض كبريتيك 0.01ع بعد ذلك.

وقد أظهرت النتائج أن فقد الأمونيا الكيماوي أكثر بكثير منه في حالة فقدها عن طريق الكائنات الحية الدقيقة، فقد بلغ في الكيماوي 0.01 مليمكافئ وهو ما نجده في التربة الألمانية وكانت أعلي قيمة للفقد للكائنات الدقيقة في الأرضين 0.0025 فقط وهي التي كانت في التربة المصرية.

لذلك انتهت النتائج إلي أن الأكسجين (O_2 تهوية) لهو العامل المسؤول أساسيا عن فقد الأمونيا من الأراضي و/ أو سماد اليوريا. أو بعبارة أخرى أنه يعمل كحامل للعنصر ينتقل به العنصر من تركيب إلي آخر، فيكون العنصر بالأكسجين من بعد عدم تيسيره في امتصاصه إلي أكثر تيسيرا.