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EFFECT OF MINERAL N, ORGANIC AND BIOFERTILIZATION ON GROWTH, EARLINESS AND YIELD OF GIZA 86 EGYPTIAN COTTON CULTIVAR

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ABSTRACT: *Two field experiments were carried out in El-Gemmiza Agriculture Research Station during the two seasons 2008 and 2009 to study the effect of three levels of mineral N (30,45 and 60 kg N/fed.), three orgainc manures i.e., pigeon refuse, sheep and composte manure forms either alone or at the rate of 30 and 45 kg N/fed. or at the rate of 30 kg N/fed. combined with mineral N at the rate 30 kg N/fed. and Microbein as biofertilizer on growth, earliness, furiting characteristies and yield of Egyptian cotton cultivar; Giza 86. A randomized complete blocks design with 4 replications was used.*

Increasing mineral N level up to 60 kg N / fed. significantly increased plant height at harvest , numbers of internodes and fruiting branches/ plant, height of first fruiting node, number of days released from planting date to first flower or open boll and boll setting percentage and reduced internode length ,boll shedding percentage and earliness percentage in both seasons.

Seed yield significantly increased with increasing mineral N level up to 45 kg N/fed. in the second season but no significant increase obtained beyond the addition of 45 kg N/fed. in the first season.

The tested treatments significantly affected total number of bolls/plant, boll setting percentage and seed cotton yield per fed. In favor of applying 30 kg organic N /fed. In sheep manure or pigeon refuse forms in combined with 30 kg mineral N /fedIt is a divisible to apply 30 kg kg organic N/fed. in sheep manure or pigeon refuse forms with 30 kg mineral N /fed. as ammonium nirtate 33.5% N to obtain the best results in growth, earliness and yield and to minimize mineral N fertilizers use and enivronmental pollution for cotton variety Giza 86 under El-Gemmeiza location.

Key words: *Bio-fertilizer, Organic, Mineral, Seed cotton, Inoculation.*

INTRODUCATION

Nitrogen is the limiting element for cotton producation under local condition Egyptian soils which are deficient in organic matter and hence a vailable nitrogen (Abd El-Hadi *et al.,* 1997). The early recorded results on cotton fertilization under local conditions indicated that nitrogen is one of the most important factors that exerts marked effects on the yield and yield components of cotton (Eid and Hamissa, 1969).

Nowadays, on the way of clean agriculture with minimum pollution effects, the use of biofertilizers is recommended by several investigators to substitue the mineral fertilizes (Saber, 1993 and El- Aggory *et al*., 1996). Biofertilizers drew the attention as partial good alternative to N fertilizer application. In addition, biofertilizers have many merits i.e. supply part of plant N requirements, reduce pollution, control the vegetative growth and improve the yield potential (Ragab, 1999). The use of biofertilizer for cotton was suggested by Hamissa *et al*., (2000) who found that inoculation of cotton seeds with some biofertilizers i.e. Microbein, Rizobacterein and Nitrobein increased significantly plant height at harvest, boll weight, seed cotton yield/plant in both seasons and number of open bolls/plant and seed cotton yield/fed.

The application of organic manures i.e., pigeon refuse, sheep manure and composite manure have a great important role to lower

the excessive use of chemical fertilizers that affects negatively the environment.

Therefore, the present investigation was designed to study the possibiliy the use of mineral N, organic manures, biofertilizer alone or in combinations for satisfying N requirements of cotton plants for growth, earlines and yield of cotton cv. Giza 86, with the hope and aim of minimizing the use of mineral nitrogen for the safe of environment from the progressive pollution.

MATERIALS AND METHODS

The present investigation was carried out in Gemmeiza Agricultural Research Station, El-Gharbia Governorate during two successive seasons of 2008 and 2009, to study the effect of mineral and bioferttilization on the growth and yield of the Egyptian cotton (*Gossypium barbadense*, L.) Giza 86 cultivar. A randomized complete block design with 4 replicates was used in both seasons, where the following sixteen treatments were evaluated:-

1-Without N fertilization as a check.
2-Mineral N as ammonium nitrate (AN) at the level of 30 kg/fed.
3-Mineral N as ammonium nitrate (AN) at the level of 45 kg/fed.
4-Mineral N as ammonium nitrate (AN) at the level of 60 kg/fed.
5-Orgainc N in pigeon refuse (PR) form at the level of 30 kg/fed.
6-Orgainc N in PR form at the rate of 45 kg/fed.
7- Combination of organic N (30 kg/fed.) in PR form and mineral N (30 kg/fed.) as ammonium nitrate.
8- Organic N in sheep manure (SM) form at the rate of 30 kg/fed.
9-Organic N in SM form at the rate of 45 kg/fed.
10- Combination of orgainc N (30 kg/fed.) in SM form and 30 kg/fed. mineral N as ammonium nitrate.
11-Orgainc N in compost manure (CM) form at the rate of 30 kg/fed.
12-Orgainc N in CM form at the rate of 45 kg/fed.
13- Combination of organic N (30 kg/fed.) in CM form and 30 kg/fed. mineranl N as ammonium nitrate.
14- Seed inoculation with Micronein bio-fertilizer before sowing and 30 kg/fed. mineral N as ammonium nitrate add in two equal splits after thinning and at the next irrigation.
15- Seed inoculation with Microbein before sowing+ mixed Microbein with fine clay and covered hills after thinning +30 kg/fed mineral N as ammonium nitrate add in one dose at the next irrigation .
16- Seed inoculation with Microbein before sowing+ mixed Microbein with fine caly and covered hills after thinning and at the next irrigation.

Soil samples were taken from the experimental sites before sowing in both seasons and were subjected to analysis according to Chapman and Pratt (1978) as shown in Table (1).

Soil properties:

According to the tentative values of soil properties and available nutrient contents published by Soltanpour and Schwab (1977), data presented in Table (1) revealed that the experimental soil is clay loam in texture, alkaline in reaction with low salinity and Ca CO3 content. Concerning soil macronutrients content, the soil in the two sites were low in available N, high in available P and K. Regarding soil micronutrients content, the soils in the two sites were high in their available contents of Fe, Mn and Cu and medium to high in available Zn.

The three organic manures were analyzed before use according to Piper (1950) and Jackson (1973) and the amount used of each manure was determined according to its total nitrogen content and the tested N rates under study. Organic manures i.e. pigeon refuse, sheep and compost manures were soil incorporated after ridging before sowing. The results of manures properties are shown in Table (2).

Table (1): Soil analysis* of the experimental site in the two seasons.

Properties	2008 season		2009 season	
	0-30 cm	30-60 cm	0-30 cm	30-60 cm
Texture	Clay loam	Clay loam	Clay loam	Clay loam
pH	7.5	7.6	7.5	7.6
EC mmhos/ cm.	0.29	0.26	0.48	0.71
CaCO3 %	1.1	1.3	1.7	2.1
Cations Meq/L Ca	0.8	0.7	1.0	1.9
Mg	0.4	0.33	0.4	0.7
Na	1.4	1.5	3.5	4.4
K	0.3	0.07	0.12	0.11
Anions Meq/L CO3	-	-	-	-
HCO3	0.9	0.6	0.7	0.8
Cl	0.4	0.7	1.4	3.6
SO4	1.6	1.3	2.7	2.7
Available N (ppm)	20	15	30	20
Available P (ppm)	19	14	15	11
Available K (ppm)	404	320	354	281
Available Fe (ppm)	21.6	11.8	44.0	45.0
Available Mn (ppm)	17.4	3.1	23.0	16.0
Available Zn (ppm)	2.4	0.7	1.3	0.84
Available Cu (ppm)	4.0	3.3	3.9	3.5

*Optimizing of Fertility Laboratory of Damanhour, El- Behira Governorate

Table (2): Analysis^{+} of the used three organic manures in the two seasons

Properties	Pigeon refuse (guano) PR		Sheep manure SM		Compost manure CM	
	2008	2009	2008	2009	2008	2009
Moisture %	23	24	33	31	24	28.4
Weight of m3 (kg)	312	323	296	284	694	660
pH(1:10 organic manure: water)	7.0	6.8	7.7	8.0	7.1	7.3
Soluble total salts %	0.23	0.59	0.20	0.70	0.15	0.19
O.M. %$^{++}$	52.00	62.00	66.00	74.00	41.70	46.55
Organic carbon %	30.16	35.96	38.28	42.92	24.19	27.00
Total N %	3.57	4.48	2.50	2.9	2.00	1.80
C: N ratio	8.45:1	8.03:1	15.31:1	14.8:1	12.50:1	15.0:1
P %	3.1	2.5	4.5	4.6	0.53	0.45
K %	6.02	7.5	20.0	14.0	0.68	0.53
Ca %	7.10	3.9	17.0	5.4	3.40	3.00
Mg %	1.90	0.32	1.85	0.35	0.36	0.28
Na %	2.10	1.9	8.4	5.0	0.41	0.32
Fe (ppm)	1734	1720	1346	1300	700	411
Mn (ppm)	470	710	420	890	157	570
Zn (ppm)	400	240	230	210	40	34
Cu (ppm)	200	37	210	38	30	5

+ Optimizing of Micronutrient Fertilizers Use Project, National Research Centre, Unit of Mariut
++ Organic matter (O.M.) = Organic carbon x 1.724 (Waksman, 1952)
Compost: - Rice straw was composted according to method described by Abou El-Fadl (1960).

The Microbein bio-fertilizer used in the present study is a commercial multi-strains of N fixing bacteria produced by the General Organization for Agricultural Equalization Fund, Ministry of Agricultural. The carriers in Microbein are peatmoss, charcool and vermiculite. Mitkees *et al* (1996) reported that Microbein consistes of a mixture of P dissolving and N_2 – fixing bacteria, e.g., Azospirillum, Azotobacter, Klebseilla and Bacillus……etc.

Mineral nitrogen was applied as ammonium nitrate (33.5 %N) according to the tested N levels in two equal splits after thinning and at the next irrigation or in one dose in T_{15}.

Phosphorus was added at the level of 22.5 kg P_2O_5 /fed. as the ordinary superphosphate (15.5% P_2O_5) during seed bed preparation.

Potassium was added at the level of 24 kg K_2O /fed. as potassium sulphate (48% K_2O) in one dose with the first dose of nitrogen after thinning.

The preceding crop was Egyptian clover (berseem) and maize after in the first and second seasons, respectively.

The other cultural practices were carried out as recommended for conventional cotton sowing in the local production district

The plot size was 14 m^2, (4m x 3.5m) including 5 rows 70 cm a part. Sowing date was 1st April and 30 March in the first and second seasons, respectively where two plants were left/hill (25 cm apart) after thining.

Statistical analysis:

The statistical analysis was done according to Le Clerg *et al.,* (1966). The treatments means were compared using LSD at 0.05 and 0.01 level of probability.

The following data was recorded during the growing season and after harvest as follows:

I. Growth attributes:-

I.I. Plant height (cm) at harvest.
I.2. Number of main stem internodes/ plant
I.3. Internodes length (cm)
I.4. Number of fruiting branches /plant

II- Flowering and earliness attributes:-

II.1. First fruiting node
II.2. Days from sowing to first flower
II.3. Days from sowing to first open boll
II.4. Total number of flowers per plant
II.5. Total number of bolls per plant
II.6. Boll setting percentage
II.7. Boll shedding percentage
II.8. Earliness percentage

III-Seed cotton yield/fed.

RESULTS AND DISCUSSION

I. Growth attributes :-

Effect of the tested treatments on plant height at harvest, number of internodes per plant and internode length throughout the two seasons shown in Table (3).

The tested treatments had highly significant effect on plant height at harvest, no.of internodes/plant and internode length in the two seasons. Applying mineral N at the highest level (60 kg N/fed.), significatly increased plant height and number of internodes/plant reative to the other treatments. However, the check treatment which did not recieve any fertilizer produced plants with the shortest height and lowest number of internodes in both seasons. It was evident, also, that the longest internodes resulted from plants receiving the lowest mineral N (30 kg/fed.) while the shortest internodes resulted from plants which receiving Microbein as seed inoculation in its three bofertilization treatments in both seasons.

The increment in plant height due to the high N level is mainly attributed to the increase in number of main stem internodes and / or internode length where, N enhanced the meristematic activities and consequently, increased the cell size as manifested in internodes elongation. Similar trends were obtained by Darwish and Hegab (2000), Hamissa *et al* (2000), Shriram and Prasad (2001), El- Shazly and Darwish (2001), El- Shazly and El- Masri (2002), Khalifa (2002), El- Shazly and El- Masri (2003), Prasad and Prasad (2004) and El-Sayed and El- Menshawi (2005). However, El- Beily *et al* (2001) found that mineral N fertilizer rate had no significant effect on plant height at harvest in both seasons.

Table 3

The tested treatments significantly affected number of fruiting branches /plant in both seasons. The highest number of fruiting branches /plant was obtained by applying mineral N at the highest level (60 kg N/fed.) applying organic nitrogen in sheep manure form or pigeon refuse form at the rate of 30 kg organic N/fed. when conjugated with 30 kg mineral N/fed. where the differences among these three treatments were insignificant in both seasons. However, the lowest numbers were obtained from unfertilized plants in both seasons. This result is in close agreement with that found by Darwish and Hegab (2000), Hamissa et al (2000), El- Beily et al. (2001), Darwish (2001), Khalifa (2002), El- Shazly and El-Masri (2003) and El- Sayed and El-Menshawi (2005).

II. Flowering and earliness attributes:

II.1. The first fruiting node:-

Effect of the tested treatments on the first fruiting position in nodes and in cm throughout 2008 and 2009 season is given in Table (4)

The siginficantly higher position of the first fruiting node either expressed as number or height in cm. was initiated on the node number 8.06 and 7.86 and at the height 27.40 and 26.46 cm in the first and seconde seasons, resperctively when plants treated with the highest level of mineral N (60 kg/fed.). On the other hand, the significantly lower position of the first fruiting node was initiated on the node number 6.15 and 6.20 and at the height 20.00 and 20.27 cm a result of unfertilized plants in the first season and appling 30 kg orgainc N /fed. in sheep manure form in the secondes season, respectively.

The first fruiting node was initiated on significantly lower node 6.15 and 6.20 node or lower distance 20 and 20.27 cm in case of unfertilized plants and applying 30kg organic N/fed. in sheep manure form in the first and second seasons, respectively. While the high N level (60 kg/fed.) significantly increased the first fruiting position either in nodes or in cm in both seasons where the first fruiting node was initiated on significantly higher node 8.06 and 7.86 node or higher distance 27.4 and 26.46 cm in the first and second seasons, respectively.

II.2. Days from sowing to first flower:-

The tested treatments had highly significant eefect on the trait in question in both seasons. Unfertilized plants were the earliest followed by the low nitrogen rate either in the mineral form or organic form and the latest one was occured by applying mineral N at the high level (60 kg N/fed.) and seed inoculation with Microbein combined with addition Microbein twice as shown as in Table (4).

II.3. Days from sowing to first open boll:-

The treatments under study had highly significant effect on the trait in consideration in both seasons. Unfertilized plants were the earliest in the first season where it gave its first open boll after 128.2 days from sowing. In the second season, this treatment ranked the second after applying 30kg organic N/fed. in sheep manure form which gave its first open boll after 128.8 days from sowing. While the latest one (135.4 and 135.0 days) was obtained from plants which received the high mineral N level (60 kg/fed.) in the first and second seasons, respectively. as shown as in Table (4).

II.4. Total number of flowers/ plant:-

The tested treatments had a pronounced effect on total no. of flowers/ plant in both seasons in Table (5). The highest numbers i.e., 24.3 and 25.1 flower / plant were obtained from seed inoculation with Microbein along with Microbein addition once after thinning and 30 kg mineral N applied 15days later in the first and second seasons, respectively. However, the treatments did not significantly differ with mineral N at the levels of 30 and 45 kg/fed., orgainc N in the form of pigeon refuse at 45 kg N/fed. and combination of orgainc N in the form of pigeon refuse (30 Kg N/fed.) and mineral N at the level of 30 Kg N/fed. in the first season, where the differenaces between these treatments were not sigificant. While the lowest numbers 20.9and 21.6 flower / plant were obtained from unfertilized plants.

Table 4

Table 5

II.5. Total number of bolls/ plant:

Results pointed out the significant effect of the tested treatments on the number of total bolls set / plant in both seasons in favour of applying 30 kg organic N/ fed in pigeon refuse or sheep manure forms along with 30 kg mineral N/ fed. in both seasons. However, the lowest values were obtained from unfertilized plants in the first and second seasons, (Table 5). The lower total number of bolls/plant recoreded by the unfertilized plants is mainly attributed to the number of fruiting branches and as well the low number of flowers/plant as forementioned.

II.6. Boll setting percentage:-

Data in Table (5) showed that, the tested treatments significantly affected boll setting percentage in both seasons. The setting percentage of bolls was found to be improved considerably by applying 30 kg organic N/ fed. in sheep manure or pigeon refuse form in combination with 30 kg mineral N/ fed. Where the values were 75.8 and 74.5 % in the first season and 78.7 and 76.8% in the second season, respectively. While applying 45 kg organic N/ fed. in compost manure form and unfertilized plants produced the lowest boll setting percentages where the values were 65.3 and 66.1 in the first season and 68.6 and 65.2 in the second season, respectively. Cadena and Cothren (1995) attributed the effect of N fertilization on boll set to the increase in the number of bolls in the first two positions on the sympodia and the increase in the boll set on sympodia 6 to 10 and 11 to 15.

II.7. Boll shedding percentage:

The tested treatments exhibited highly significant differences in boll shedding percentage in both seasons as shown in Table (5). The highest shedding percentages 34.7 and 34.8% were produced from applying 45 kg organic N/ fed. in compost manure form in the first season and from unfertilized plants in the second season, respectively. While, the lowest percentages 24.2 and 21.3% were produced from applying 30 kg organic N/fed. in sheep manure form in combination with 30 kg mineral N/ fed. in ammonium nitrate fertilizer form in the first and second seasons, respectively.

II.8. Earliness percentage:

The tested treatments had a pronounced effect on earliness as exprossed in the 1st pick percentage during the two seasons of study, where superiority was found in unfertilized plots. It gave the highest percentages (75.8 and 81.3) while the lowest percentages (59 and 63.2%) were obtained from plots receiving mineral N at the highest rate (60 kg/fed) in ammonium nitrate form in the first and second seasons, respectively.

Appling sheep manure or pigeon refuse alone or in combined with mineral N each in the rate of 30 kg N/fed. significantly increased earliness percentage as compared to appling compost manure alone or in combined with mineral N each in the rate of 30 kg /fed. A reference to Table (2) shows that sheep manure and pigeon refuse had the higher contents of P and K which play an important role in plant development and gave positive effect on flowering and earliness attributes.

This result could be explained on the basis that excess application of nitrogen fertilizer caused excessive vegetative growth, which in turn increased the shedding of fruiting organs on lower fruiting branches as a result of the shading due to excessive vegetative growth as indicated by the averages of plant height in the two seasons and consequently resulted in delayed maturity. The obtained result are in agreement with those obtained by Darwish and Hegab (2000), Khalifa (2002) and El-Shazly and El- Masri (2003).

III- Seed cotton yield per feddan:-

Means of seed cotton yield in kentars per feddan as affected by the tested treatments throughout the two seasons of study are shown in Table (5).

Data showed significant differences among the tested treatments in the two seasons of study with respect to seed cotton yield per feddan, where the superiority was found in favor of applying 30 kg mineral

nitrogen/fed. in combination with 30 kg organic nitrogen/fed. in sheep manure form or in pigeon refuse form as compared to the other treatments, where these two treatments produced 10.45, 10.37, 11.12 and 10.85 kentar in the first and second seasons , respectively, while the lowest values (7.17 and 8.08 kentar) were obtained from unfertilized plots.

Concerning the effect of mineral N rates with regard to seed cotton yield / fed., the recommended N rate (45 kg N/ fed.) significantly increased the seed cotton yield per feddan by 2.82, 0.60,2.65 and 0.70 kentar over those obtained from unfertilized and low N rate (30 kg N/fed) in the first and second seasons, respectively. Seed cotton yield / fed. was insignificantly increased with increasing N level from 45 kg N to 60 kg N/ fed. in the first season, while in the second season, the 60 kg N/fed. level significantly decreased seed cotton yield by 0.53 kentar than that obtained from the recommended N rate. This result might be due to the difference in available N content in the experimental soil in the two seasons of study, where this content was higher in the second than in the first season particulary in the upper 30 cm depth (Table 1).

Thus it is clear that application of 45 kg N/ fed. could be considered as the proper level for Giza 86 cotton cultivar under the conditions of El-Gemmeiza region, where the higher yield was recorded close from this level.

The results obtained herein, confirmed the data of growth which supports the view that certain imbalance was created between the vegetative and fruiting growth.

Data in Table (1) indicate that, soil of the experimental site in the second season had higher available N content than in the first season (30 and 20 ppm). This was also clear in the content of macro and micro nutrients between the two seasons. These differences might account for the differential response to mineral, organic and bio-fertilizer addition in the two seasons.

Unfertilized treatment produced the lowest yield / fed., this result may be due to the plants of this treatment were shorter and had lower number of bolls/plant and as well lower first fruiting node position than well fertilized one with 45 kg N/fed (Table 3).

In this concern, Prasad and Prasad (1994), found that seed cotton yield was increased with increasing N level up to 54 kg / ha, with no further increase from 81 kg N/ ha. Darwish and Hegab (2000), found that increasing N level up to 75 kg N/fed. significantly increased seed cotton yield / fed. El - Beily *et al.* (2001), found that seed cotton yield / fed. was significantly affected by the different applied N levls in both seasons. The higher N level (80 kg / fed) produced the highest yield/ fed., followed by the level of 60 kg N/ fed. While, the level of 40 kg / fed. gave the lowest yield, also Shriram and Prasad (2001), Wankhade *et al.* (2001) and Khalifa (2002), found that increasing N level significantly increased seed cotton yield / fed. On the other hand, El – Shazly and Darwish (2001), found that the low N level (30 kg N/ fed.) significantly increased seed cotton yield / fed. by 12.94 and 13.56 % over the medium (45 kg N/ fed.) and high N (60 kg N/fed.) levels, respectively. Darwish (2001), found that N rates had insignificant effect on seed cotton yield / fed. in both seasons. El- Shazly and El- Masri (2002), found that the low N level (30kg N / fed.) significantly increased seed cotton yield / fed. as compared with the high N level (60 kg N / fed). El-Ganaini *et al.* (2005), Khan *et al.* (2005), Buttar *et al.* (2006), Singh and Rathore (2007), Munirathnam and Sawadhkar (2008) and Ghodpage *et al.* (2009), reported that significant increase in seed cotton yield/ fed. occurred with each increase in N level.

Regarding the effect of the organic manure forms at the two tested rates of N with regard to seed cotton yield / fed., the addition of pigeon refuse at the high rate (45 kg organic N / fed.) significantly increased seed cotton yield / fed. by 7.76, 6.48, 3.57, 7.52 and 3.25 % as compared to addition pigeon refuse at the low rate (30 kg organic N/ fed.), sheep manure at the low and high rates and compost manure at the low and high rates in the first season, respectively. In the second season, applying pigeon refuse

either at the low or high rates and sheep manure at the high rate gave the highest values of seed cotton yield per feddan, where the values were 10.06, 10.13 and 10.19 kentar, respectively.

This result could be explained as pigeon refuse manure (Table 2) had, on the average, narrower C: N ratio (8.24: 1) compared with sheep manure (15.06: 1) or compost manure (13.75: 1). This refers to an immediate N mineralization and hence release from the former than from the latters (Tisdale and Nelson, 1973). It could account for the higher contents of the former from micronutrients (Table 2) and thus a possible more active nutrient absorption. Certainly, the more heating effect of pigeon refuse on absorption of plant nutrients can not be neglected, in this respect.

In this concern, El - Basuony (2009), found that the yield was significantly increased with organic manure addition. Blaise *et al.* (2005) and Raj *et al.* (2007), found that the application of FYM significantly increased seed cotton yield. Silva *et al.* (2005) and Al -Kahal *et al.* (2007), found that organic fertilizer application increased cotton yield. However, El - Shazly and El - Masri (2002), found that the various forms of organic N (pigeon refuse, sheep manure and rabbit manure) didn't affect seed cotton yield / fed.

Respecting the effect of bio-fertilizer treatments with regard to seed cotton yield /fed., results in Table (5) indicate that seed inoculation with Microbein when combined with 30 kg mineral N/ fed. as ammonium nitrate in two equal doses gave significant increase in seed cotton yield / fed . by 0.67 and 0.38 kentar in the first season, and by 0.43 and 0.36 kentar in the second season as compared to seed inoculation with Microbein when conjugated with Microbein addition twice or when conjugated with Microbein addition once and 30 kg mineral N/fed. in one dose, respectively. This means that bio-fertilization can't be used as a complete substitute for mineral nitrogen fertilizers, but it could be applied as a supplement and complementry.

In this regard, Hamissa *et al.* (2000) and El - Shazly and Darwish (2001), found that application of bio-fertilizer significantly increased seed cotton yield / fed. Abou - Zaid *et al.* (2002), Anjum *et al.* (2005), Zohry (2005), Gebaly (2006) and Anjum *et al.* (2007) found that application of bio-fertilizer significantly increased seed cotton yield / fed.

The positive effect of Microbein when combined with mineral N may be attributed to:

The role of bio-fertilizer in increasing the plant phytohormons like IAA, GAs and CKs which promote plant growth, cell division, break the apical dominance, encourage the photosynthesis and assimilates accumulation.

The effect of Microbein in fixing nitrogen and release of phosphorous that plays an important role in plant development.

Mineral N fertilizer and Microbein might have had complemented the effect of each other. In other words, Microbein application didn't compensate the decrease of mineral N level and both were needed to maximize plant growth .

Concerning the effect of the combination between the tested organic manures and mineral nitrogen at the rate of 30 kg N/fed. with regard to seed cotton yield/fed., addition of 30 kg mineral N/ fed. as ammonium nitrate in combined with 30 kg organic N/fed. in sheep manure or pigeon refuse forms gave significant increase in seed cotton yield / fed . by about 8.37 and 7.59 % in the first season, and by about 12.06 and 9.28 % in the second season as compared to applying 30 kg mineral N / fed. as ammonium nitrate in combined with 30 kg organic N/ fed. in compost manure form, respectively, without significant difference between the two former treatments. Also, it could be noticed that these two treatments gave the highest seed cotton yield /fed. in both seasons as compared to the other treatments.

The increase in seed cotton yield / fed. due to combination between organic manures (pigeon refuse or sheep manure) and mineral N as ammonium nitrate was mainly due to the following considerations:-

Application of organic manures (pigeon refuse or sheep manure) reduce soil pH value due to the formation of organic and inorganic acids as a result of organic manure decomposition and more CO_2 evolution with increasing the metabolic activity of the root system, (El – Shouny *et al.* 2008) and consequently an increas in the availability of micro-nutrients for cotton plants (i.e. Fe, Zn, Mn and Cu)

Organic manures are important to facilitate chemical reaction processes by improving the nutrients status of the soils .

The increase in available N due to N mineralization from organic manure , the increase in available P and K due to phosphorous and potassium content of the applied organic manure (Table 2) and also the increase of P and K solubility by means of organic manure decomposition and applied P and K fertilizers, (El- Shouny *et al.,* 2008).

Application of organic manure at any rate might have had improved the soil physical and chemical properties which, markdely increase soil organic matter content, total porosity, availability of NPK and soluble Ca^{++} and SO_4^{--} (El – Shouny *et al.,* 2008). This led to suitable bed for growing and development of plant growth that was reflected on yield increase

Organic manures though are used primarily as a source of nitrogen; however, they also carry a large number of essential elements (Table 2) which are released in the available form due to the decomposition of organic matter.

Above mentioned benefits surely improved flow of assimilates and accumulated more dry weight in plant parts producing more healthy and vigorous plant, increased the bolls set on the fruiting branches / plant and consequently gave highest seed cotton yield (Tables 3,4 and 5).

These two treatments gave favorable effects on plant growth traits which surely were reflected on better growth producing high yield / feddan. In this concern, Boman *et al.* (1995), reported that in low yielding environments applied N resulted in no yield benefit, however, in high yielding environments applied N increased lint yield Sharma and Tomar (1995), found that cultivars differed in their positive response to N application and Hamissa and Abdel Salam (1999), reported that yield response to fertilizers differs according to soil productivity. Response to N was higher in low fertility soils. Similar results were obtained by Hussain *et al.* (1999), Nofal and Ziadah (2000), El – Tabbakh (2002), Liang *et al.* (2003) and (2004), Das *et al.* (2006), Khalifa (2007), Attia *et al.* (2008), El - Basuony (2009), Ghodpage *et al.* (2009) and Abd El-Aal (2010).

CONCLUSION

From the obtained results it could be concluded that:

1-Sheep manure and pigeon refuse as sources of organic manures are considered to be relatively rich nutritional sources where they contained a balances essential elemnets needed for plant growth as shown in Table 2.

2- Sheep manure and pigeon refuse can not be used as a complete substitue for mineral N fertilizers, but they could be applied as a supplement where, there is a complementary effect between the two sources. In other words the third level of mineral N can be saved through mixing organic manure at the rate of 30 kg N/fed. with 30 kg mineral N /fed.

3- Fertilization with 45 kg mineral N/fed. as ammonium nitrate or by using 30 kg mineral N/ fed. as ammonium nitrate in combination with 30 kg organic nitrogen/fed. in sheep manure form or in pigeon refuse form or by using seed inoculation with the Microbein biofertilizer in combined with 30 kg mineral N/fed. in two equal splits after thinning and 15 days later. These treatment gave the best results in growth traits, earliness and yield and hance could minimize mineral N fertilizers use and hance enviromental pollution under the conditions of El-Gemmeiza location.

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تأثير التسميد النيتروجينى المعدنى و الحيوى على النمو والتبكير و المحصول فى صنف القطن المصرى جيزة ٨٦

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الملخص العربى

أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بالجميزة محافظة الغربية خلال موسمى النمو ٢٠٠٨، ٢٠٠٩ لدراسة تأثير التسميد الازوتى المعدنى بثلاثة معدلات (٣٠، ٤٥ ، ٦٠ كجم ن/فدان)، ثلاثة مصادر من الاسمدة العضوية (زرق الحمام ، مخلفات الاعنام وسماد الكمبوست) سواء بمفردها أو عند المعدلين ٣٠ أو ٤٥ كجم ن/فدان أو عند المعدل ٣٠ كجم نيتروجين عضوى/فدان + ٣٠ كجم نيتروجين معدنى للفدان وكذا دراسة تأثير المخصب الحيوى ميكروبين وذلك على التبكير والنمو والصفات الثمرية والمحصول لصنف القطن المصرى جيزة ٨٦ وكان التصميم المستخدم فى كلا التجربتين هو القطاعات الكاملة العشوائية ذات الاربعه مكررات.

ادى زياده مستوى التسميد النيتروجينى المعدنى حتى ٦٠كجم ن /الفدان الى زياده معنويه فى طول النبات عند الحصاد وعدد السلاميات والافرع الثمريه للنبات وارتفاع عقده اول فرع ثمرى وزياده عدد الايام من الزراعه حتى ظهور اول زهره وتفتح اول لوزه والنسبه المئويه لعقد اللوز بينما ادى الى نقص طول السلاميه والنسبه المئويه للتساقط والنسبه المئويه للتبكير فى الموسمين.

زاد محصول القطن الزهر للفدان زياده معنويه فى الموسم الثانى بزياده مستوى التسميد النيتروجينى المعدنى حتى ٤٥كجم ن /الفدان بدون زياده ملحوظه عن المستوى ٦٠كجم ن /الفدان فى الموسم الاول

اعطت المعاملات المختبره تاثيرا معنويا على عدد اللوز الكلى على النبات والنسبه المئويه لعقد اللوز ومحصول القطن الزهر للفدان فى الموسمين لصالح اضافه ٣٠كجم نيتروجين عضوى /الفدان فى صوره سماد مخلفات الاغنام او زرق الحمام مع ٣٠ كجم نيتروجين معدنى /الفدان .

أعطت المعاملات المختبرة تأثيرا معنويا على محصول القطن الزهر للفدان فى الموسمين لصالح اضافة ٣٠ كجم نيتروجين عضوى /الفدان فى صورة سماد مخلفات الاغنام أو زرق الحمام مع ٣٠ كجم نيتروجين معدنى للفدان.

التوصية

من النتائج المتحصل عليها يمكن التوصية بالتسميد بمعدل ٤٥ كجم نيتروجين معدنى /الفدان فى صورة نترات امونيوم او عمل توليفه من ٣٠ كجم نيتروجين معدنى /الفدان كنترات أمونيوم مع ٣٠ كجم نيتروجين عضوى /الفدان فى صورة سماد مخلفات الاغنام او زرق الحمام او بعمل توليفة من تلقيح البذرة بالمخصب الحيوى الميكروبين عند الزراعة مع اضافة ٣٠ كجم نيتروجين معدنى /الفدان على دفعتين متساويتين عند الخف ثم بعد ١٥ يوم. وذلك لاعطاء افضل صفات نمو وتبكير مما ينعكس على أعطاء محصول عالى تحت ظروف منطقة الجميزة.

Table (3): Effect of N fertilization treatments on growth traits of cotton in 2008 and 2009 seasons

Treatments	Plant height at harvest (cm)		No. of internodes / plant		Internode length (cm)		No. of fruiting branches/ plant	
	2008	2009	2008	2009	2008	2009	2008	2009
1-Without N fertilization	132.0	138.3	17.60	18.27	7.50	7.57	12.5	12.9
2-Ammonium Nitrate (AN) (30 kg mineral N / fed.)	152.5	158.8	19.83	20.27	7.68	7.83	14.0	14.4
3-Ammonium Nitrate (AN) (45 kg mineral N / fed.)	157.5	163.8	22.43	21.80	7.02	7.52	16.0	15.6
4-Ammonium Nitrate (AN) (60 kg mineral N / fed.)	163.5	166.6	23.60	23.26	6.93	7.16	16.7	16.4
5-Pigeon Refuse (PR) (30 kg organic N / fed.)	142.5	153.8	20.94	20.66	6.80	7.44	15.0	15.0
6-Pigeon Refuse (PR) (45 kg organic N / fed.)	152.5	160.5	21.51	21.00	7.09	7.64	15.2	15.2
7-PR (30 kg N / fed.) + AN (30 kg N / fed.)	155.0	162.1	22.55	21.87	6.87	7.41	16.5	16.1
8-Sheep Manure (SM)(30 kg organic N / fed.)	140.5	153.0	20.45	19.63	6.87	7.79	14.3	14.4
9-Sheep Manure (SM) (45 kg organic N / fed.)	145.0	156.3	20.80	21.36	6.96	7.32	14.0	15.1
10-SM (30 kg N / fed.) + AN (30 kg N / fed.)	157.5	162.5	22.42	22.23	7.02	7.30	16.5	16.7
11-Compost Manure (CM)(30 kg organic N / fed.)	140.0	152.5	20.85	20.84	6.71	7.31	14.0	14.8
12-Compost Manure (CM) (45 kg organic N / fed.)	150.0	158.0	20.74	21.11	7.22	7.48	14.5	14.8
13-CM(30 kg N / fed.) + AN (30 kg N / fed.)	150.0	154.6	20.96	21.90	7.15	7.06	14.5	15.5
14-Seed Inoculation (SI)with Microbein + AN(30 kg N/fed.)	147.5	157.1	21.94	21.80	6.72	7.20	15.5	15.5
15-SI with Microbein + (MA) once + AN (30 kg N / fed.)	142.5	153.8	21.26	21.60	6.69	7.12	15.5	15.4
16-SI with Microbein + Microbein addition (MA) twice	140.0	151.3	20.55	21.30	6.80	7.10	14.0	14.6
F- test	**	**	**	**	**	*	**	**
LSD at 0.05	3.3	2.7	0.76	0.95	0.3	0.42	0.9	1.0
LSD at 0.01	4.4.	3.6	1.02	1.28	0.4	-	1.3	1.3

*and ** indicate p > 0.05 and 0.01 , respectively .

Table (4): Effect of N fertilization treatments on earliness attributes of cotton in 2008 and 2009 seasons

Treatments	The height of the first fruiting branch				Days to first flower appearance		Days to first open boll	
	in nodes		in cm					
	2008	2009	2008	2009	2008	2009	2008	2009
1-Without N fertilization	6.15	6.40	20.00	20.43	79.8	80.2	128.2	128.9
2-Ammonium Nitrate (AN) (30 kg mineral N / fed.)	6.83	6.87	22.17	22.23	82.0	81.6	130.5	130.9
3-Ammonium Nitrate (AN) (45 kg mineral N / fed.)	7.43	7.20	25.12	23.90	83.8	82.5	133.0	132.6
4-Ammonium Nitrate (AN) (60 kg mineral N / fed.)	8.06	7.86	27.40	26.46	86.1	84.5	135.4	135.0
5-Pigeon Refuse (PR) (30 kg organic N / fed.)	6.94	6.60	23.45	20.96	82.3	80.8	131.2	130.1
6-Pigeon Refuse (PR) (45 kg organic N / fed.)	7.34	6.80	23.80	22.10	83.5	81.4	132.8	130.7
7-PR (30 kg N / fed.) + AN (30 kg N / fed.)	7.05	6.70	23.60	21.36	82.8	81.1	131.7	129.6
8-Sheep Manure (SM)(30 kg organic N / fed.)	7.37	6.20	24.02	20.27	83.5	79.9	132.7	128.8
9-Sheep Manure (SM) (45 kg organic N / fed.)	7.72	7.20	24.12	23.66	84.6	82.0	134.1	130.9
10-SM (30 kg N / fed.) + AN (30 kg N / fed.)	6.92	6.53	22.95	20.70	82.5	80.2	131.6	129.5
11-Compost Manure (CM)(30 kg organic N / fed.)	7.35	7.01	24.00	23.23	83.4	82.1	132.8	132.1
12-Compost Manure (CM) (45 kg organic N/ fed.)	7.74	7.25	25.92	24.13	85.0	82.5	134.5	133.1
13-CM(30 kg N / fed.) + AN (30 kg N / fed.)	7.46	7.40	24.60	24.66	83.9	82.9	132.9	132.5
14-Seed Inoculation (SI)with Microbein + AN(30 kg N/fed.)	7.44	7.30	24.20	24.52	83.8	82.5	133.0	131.6
15-SI with Microbein + (MA) once + AN (30 kg N/ fed.)	7.51	7.44	24.42	24.97	84.0	82.9	133.9	132.8
16-SI with Microbein + Microbein addition (MA) twice	7.55	7.70	24.90	25.96	84.1	83.9	134.8	134.1
F- test	**	**	**	**	**	**	**	**
LSD at 0.05	0.34	0.31	0.81	1.4	0.8	1.32	0.8	1.2
LSD at 0.01	0.46	0.42	1.09	1.9	1.1	1.79	1.1	1.6

** indicates p > 0.01.

Table (5): Effect of N fertilization treatments on fruiting traits and seed cotton yield /fed. of cotton in 2008 and 2009 seasons

Treatments	total no. flowers / plant		total no. bolls set/plant		Boll setting %		Boll shedding %		First Picking %		Seed cotton yield/fed. (Kentar)	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
1-Without N fertilization	20.9	21.6	13.8	14.1	66.1	65.2	33.9	34.8	75.8	81.3	7.55	8.50
2-Ammonium Nitrate (AN) (30 kg mineral N / fed.)	24.3	22.0	16.6	16.0	68.2	72.7	31.8	27.3	73.4	70.2	9.89	10.55
3-Ammonium Nitrate (AN) (45 kg mineral N / fed.)	24.2	23.5	17.1	17.4	70.7	74.1	29.3	25.9	64.9	65.6	10.52	11.29
4-Ammonium Nitrate (AN) (60 kg mineral N / fed.)	23.2	23.8	16.7	17.7	71.7	74.4	28.3	25.6	59.0	63.2	10.58	10.73
5-Pigeon Refuse (PR) (30 kg organic N / fed.)	22.3	22.4	15.4	16.5	69.0	73.4	31.0	26.6	71.7	70.2	9.15	10.59
6-Pigeon Refuse (PR) (45 kg organic N / fed.)	24.1	21.9	16.3	16.0	67.6	73.2	32.4	26.8	63.2	70.9	9.86	10.66
7-PR (30 kg N / fed.) + AN (30 kg N / fed.)	24.2	23.8	18.0	18.3	74.5	76.8	25.5	23.2	72.4	74.2	10.92	11.42
8-Sheep Manure (SM)(30 kg organic N / fed.)	23.7	23.3	16.2	16.4	68.4	70.4	31.6	29.4	71.1	78.9	9.26	10.17
9-Sheep Manure (SM) (45 kg organic N / fed.)	23.1	23.4	16.7	16.5	72.2	70.5	27.8	29.5	61.6	69.3	9.52	10.73
10-SM (30 kg N / fed.) + AN (30 kg N / fed.)	23.7	22.9	18.0	18.0	75.8	78.7	24.2	21.3	72.7	76.2	11.00	11.71
11-Compost Manure (CM)(30 kg organic N / fed.)	21.0	23.7	15.3	16.5	72.6	69.3	27.4	30.7	69.8	66.1	9.17	10.03
12-Compost Manure (CM) (45 kg organic N / fed.)	23.8	24.2	15.6	16.6	65.3	68.6	34.7	31.4	61.2	66.8	9.55	10.14
13-CM(30 kg N / fed.) + AN (30 kg N / fed.)	24.0	23.4	16.5	16.9	68.8	72.1	31.2	27.9	68.7	68.9	10.15	10.45
14-Seed Inoculation (SI)with Microbein + AN(30 kg N/fed.)	22.2	23.4	15.8	17.4	71.1	74.2	28.9	25.8	69.5	68.9	10.32	10.80
15-SI with Microbein + (MA) once + AN (30 kg N / fed.)	24.3	25.1	16.3	17.8	67.2	70.7	32.8	29.3	63.9	67.1	9.92	10.42
16-SI with Microbein + Microbein addition (MA) twice	24.0	22.8	16.2	16.4	67.7	72.1	32.3	27.9	63.1	65.8	9.61	10.35
F- test	**	**	**	**	**	**	**	**	**	**	**	**
LSD at 0.05	0.7	0.8	0.7	1.5	4.6	4.1	4.6	4.1	2.8	3.8	0.24	0.38
LSD at 0.01	0.9	1.0	0.9	2.0	6.2	5.4	6.2	5.4	3.7	5.1	0.32	0.51

** indicates p > 0.01 .