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EFFECT OF FOLIAR APPLICATION WITH AMINOTOTAL UNDER DIFFERENT RATES FROM NITROGEN FERTILIZER ON SEED AND FIBER QUALITY OF GIZA 86 COTTON CULTIVAR.

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ABSTRACT

Two field experiments were carried out at Gemmeiza Agricultural Research Station, Gharbia Governorate during two seasons (2008 and 2009) to study the effect of four aminototal concentrations (i.e without, 1g/L, 2g/L and 3g/L) under three N rates (15, 30. and 45 Kg N/fad.) and their interaction on leaf chemical composition, seed and fiber quality of the Egyptian cotton cultivar, Giza 86. Results indicated that the differences between N rates for leaf N content, seed index, protein and oil % were significant, where, lint %, micronaire reading and pressley index were insignificant in the two seasons. Rate of N fertilizer 45 kg N/fad. gave the highest values for leaf N content, seed index, protein and oil %, while, 30 kg N/fad. gave the highest values for leaf k content in the both seasons. Foliar application of aminototal gave a significant effect on leaf N and K contents, seed index, protein and oil %, on the other hand, lint %, micronaire reading and Pressley index were insignificant in the two seasons. Foliar cotton plants with 3g/L or 2g/L concentration from aminototal gave the highest values of most studied attributes. The interaction between N rates and aminototal concentrations were significant for most studied traits except lint %, micronair reading and Pressley index in the two seasons. Also, results show that, fertilization cotton plants with 30 kg N/fad. and sprayed with 2 g/L aminototal improved the fiber and seed quality under the experiment soil conditions.

Keywords:Cotton, Nitrogen fertilizers, Amino acids, Amino total , Clay loam .

INTRODUCTION

Attainment of maximum yield of cotton and improving its seed and fiber quality is greatly dependent upon appropriate use of mineral N rate to avoid adverse effects and losses of N, air pollution caused by extensive use of mineral N fertilizer. Aminototal, as a compound Consisting of 17 kinds of free amino acids in L-amino acids form as shown in table 1. It improves the plant tolerance to stress or adverse conditions i.e high temperature, drought and salinity. Some amino acids play an important role in permitting the plant to set and retain more bolls, synthesis of some hormons i.e auxins , and stimulates photosynthesis process by increasing chlorophyll concentration. Also, amino acids act as chelating factor which helps in transport and absorption of micronutrients. In this connection **,** El- Shazly and El-Masri (2003), found that low N rate (30 Kg/fed.) significantly increased leaf K content and significantly decreased leaf N content in both seasons as compared with the medium (60Kg N/fed.) or high N (90 Kg N/fed.) rates. However, Agboma *et al*. (1997), Gorham and Jokinen (1998) **,** concluded that foliar spray of glycine betaine improved most seed and fiber quality Kuzentsov *et al*. (2002), reported that mainly arginine, proline and asparagines were severely accumulated in the cell sap of cotton plants grown under water deficit to increase the resistance system under

stress condition. Also, Namich(2003), found that glycine betaine dose and time of application had highly significant effects on total amino nitrogen in leaves, seed index, lint, oil and protein %, in cotton seeds ,where , fiber properties were insignificantly affected, further, Namich (2007), indicated that spraying cotton plants with glycine betaine with 600g/fad. under normal and drought conditions tended to increase physiological processes tend to induce the application of glycine betanie tended to have insignificant effects on fiber properties. Namich (2008) found that spraying proline solution on cotton plants seemed to increase some chemical contents of leaves and resulted insignificant increases for seed index , micronaire reading and pressly index. More, El- Menshawi (2008), studied the effect of green stime foliar application with rates, 400, 600 and 800 g/fed., showed increased the total chlorophyll , carbohydrate, total nitrogen content in cotton leaves, while, non significantly affected green stime sprayed on micronaire reading and pressley index.Finally, Ibrahim *et al.* (2009) found that application of arginine insignificantly increased lint %, micronaire reading and pressley index , while, significantly increased seed index, oil and protein percentages.

Thus, the objective of this research were to determine the optimum aminototal concentration without risking seed and fiber quality loss and to determine the optimum combination of N rate and aminototal concentrations.

MATERIALS AND METHODS

Two field experiments were carried out at Gemmeiza Agricultural Research Station, El- Gharbia Governorate, Egypt, during the two successive seasons 2008 and 2009 to study the effect of foliar spraying of aminototal at four concentrations under three rates of mineral N and their interaction on leaf N and K content, seed and fiber quality of the Egyptian cotton ((*Gossypium barbadense*, L).Giza 86 cultivar

A split plot design with 3 replicates was used.

The main plots were devoted to the mineral N rates as follows:

a1 - low rate (15 Kg N/fad.)

a2- Medium rate (30 Kg N/fad.)

a3- The recommended N rate (45 Kg N/fad.).

The sub- plots contained the aminototal concentration at :

b1 – Control (untreated), Zero.

b2- Low level (1 g/L).

b3- Medium level (2g/L).

b4- High level (3 g/L).

Table 1 : Aminototal Contents.

Aminototal contents	Concentrate (%)	Aminototal contents	Concentrate (%)
Threonine	3.05-3.56	Valine	2.8-3.1
Aspartic	3.2-3.45	Methionine	0.23-0.31
Serine	3.76-4.49	1so leucine	1.26-1.7
Glutamic	7.24-9.12	Leucine	1.98-2.8
Proline	2.23-3.5	Tyrosine	0.48-1.02
Glycine	1.87-2.43	Phenylalamine	1.03-1.78
A lanine	2.16-2.2	Lysine	1.39-2.3
Cystine	1.87-2.45	Histidine	0.42-0.9
		Arginine	5.3-6.3

The treatments of aminototal were applied as foliar spraying on cotton twice plants during squaring stage, the commen of flowering stage (80 day from sewing) and at the top of flowering (95 day from sowing) using hand operated sprayer compressed at a low volume of 200 liter / fad. Nitrogen fertilizer at the three tested rates was applied as ammonium nitrate (33.5% N) in two equal splits after thinning (36 days after planting, two plants/ hill) and before the following irrigation in both seasons. Phosphorus fertilizer was added at the rate of 22.5Kg P2O5/fad. as calcium super phosphate (15.5% P2O5) during land preparation. Potassium fertilizer was soil added at the rate of 24 Kg K2O/fad. as potassium sulphate (48% K2O) in one dose at 36 days from sowing. The plot size was 13 m2 with 5 ridges of 65 cm wide and 4 m long with hills 25 cm apart. Planting date was on 1st April and 30 the March in 2008 and 2009 seasons, respectively. The preceding crop was Egyptian clover and corn in the first and second seasons, respectively.

All other cultural practices were followed as recommended in cotton fields.

Soil analysis :

Soil analysis for the two seasons of the experimental site was carried out according to Jackson (1973). The results of analysis are shown in Table 2.

T**able 2 : Analysis of the experimental soil** :

Properties	**2008**	**2009**
pH	7.6	7.6
Texture	Clay loam	Clay loam
Ec (mmohs/cm/25°c)	1.2	1.1
Available N (ppm)	17.5	25
Available P (ppm)	16.5	13
Exchangeable K (ppm)	362	317.5
Ca CO3 %	1.2	1.9

Parameters Studied :

Leaf nutrients content :

After 115 days from planting 10 leaves were taken from the upper 4th leaf on the main stem from each sub plot for determination of :

1- Nitrogen content (%) is estimated according to the method A.O.A.C. (1975).

2- Potassium content (%) total K content was determined according to Chapman and Pratt (1961).

Total N was determined using Micro-KJeldahl method as described by Allen (1953), At harvest, five plants of guarded hills were taken at random from the second ridge of each sub plot to determine:

$$3\text{- lint \%} = \frac{\text{Weight of lint cotton}}{\text{weight of seed cotton}} \times 100$$

4- Micoronaire reading .

5- Pressley index. Fiber properties i.e. micronaire reading and pressley index were carried out at the laboratories of fiber technology research section, cotton research institute, Giza. According to the standard method of testing A.S.T.M. (1975)

6- Seed index (g).
7- Protein %.
8- Oil %. Extraction and determination of seed oil percentage and protein percentage were carried out following the method described by A.O.A.C (1975).

All the obtained data were statistically analyzed according to Gomez and Gomez (1983). The comparisons between means were further tested using LSD at 5% level.

RESULTS AND DISCUSSION

Effect of mineral N rates :

Leaf N and K contents :

Data in Table (3) show that different N rates gave a significant effect on leaf N and K contents in both seasons. With regard to leaf N content, the highest values of leaf N content were obtained from the high N level (45Kg N/fad.) followed by the medium level (30Kg N/fed.), while the lowest values were obtained from the low N level (15 Kg N/fed.). From the same table it could be noticed that the concentration of leaf N in the second season is higher than the first season. This difference may be due to that soil of the experimental site in the second season had higher N content than in the first season (17.5 and 25 ppm) as shown in Table (2). In this concern, Hamissa et *al* .(2000), El- Shazly and El**-** Masri (2003) and Ghodpage *et al*. (2009) found that the low N level significantly decreased leaf N content.

With regard to leaf K content, the highest values were obtained from the medium level of N (30Kg /fad.) followed by the high N level (45 Kg N/fad.), while the lowest values were obtained from the low N level (15 Kg N/fad.). This trend was true in both seasons. Leaf K content significantly decreased by increasing N level from 30 to 45 Kg N/fad. In this concern, El- Shazly and El- Masri (2003) found that low level of N significantly increased leaf K content.

Seed quality :

Table (4) shows that N rates significantly affected the percentages of, protein and oil in seeds in both seasons, and seed index in the second season only in favor of the high N rate. The positive effect of this rate on these two traits is mainly due to that this rate gave significant increase in leaf N content. N is constituent of all proteins and nucleic acids and hence of all protoplasm. Also, N has a role in building up plant organs through the synthesis of protein. In this concern, Darwish and Hegab (2000) found that increasing N rates up to 75Kg N/fad significantly increased seed index and seed protein content and El- Ganaini *et al.* (2005) found that increasing rates of nitrogen increasing average weight of seeds as well as crude protein and oil concentrations in seeds.

Fiber quality :

N rates gave insignificant effect on lint % , micronaire reading and pressley index in both seasons (Table 3 and4). Similar results were was obtained by El- Shazly and El- Masri (2003)

Effect of foliar application of aminototal levels

Leaf N and K contents :

Data in Table 3 show that foliar application of aminototal gave a significant effect on leaf N and K contents in both seasons, in favor of the high concentration of aminototal (3g/L), where this treatment significantly increased leaf N content by 15.08 and 14.19 % in the first and second season compared with untreated plants, respectively. With regard to leaf K content the high concentration of aminototal significantly increased leaf K content, in the first season by 31.28 and 36.00 in the second season compared with untreated plants , respectively. The positive effect of the high concentration of aminototal on leaf N and K may be due to :

Proline may be a good storage of N because of its metabolic proximity having already conversion to glutamic acid, which considered a key compound in N metabolism. Furthermore, the convertion of proline to glutamic acid, equivalents of NADPH are produced making proline already available source of energy and reducing power **(**Stewart and Lee, 1974). Proline plays role as an osomolytes for osmotic adjustment, buffering cellular redox potential (under stress conditions) , It also may cause cytoplasmic acidosis and maintaining appropriate NADP+/NADPH ratios compatible with metabolism . In this concern Namich (2003) found that glycine betaine had highly significant effect on nitrogen content in cotton leaves., More , Namich (2008) found that spraying proline solution on cotton plants had a significant increase in ions of K+ in cotton leaves.

Seed quality :

Seed index, protein and oil percentages exhibited significant differences due to variation in aminototal concentrations in both seasons (Table4). The highest values of these traits were obtained from treatments receiving the high concentration of aminototal (3g/L) followed by the medium concentration (2g/L) without any significant difference between these two concentrations with regard to seed index in both season and protein % in the first season, while the lowest values were obtained from the low concentration (1g/L) and untreated plants. The positive response of the high and medium concentrations of aminototal on these traits as compared with untreated and the low concentration is mainly attributed to that these two concentrations significantly increased leaf N and K contents in both seasons, where N plays an important role in basic physiological processes in cotton such as photosynthetic rate and accumulation of carbohydrate…etc. N is constituent of all proteins and nucleic acids and has a role in building up plant organs through the synthesis of protein. Also, K is one of most important nutrients with respect to its physiological and biochemical functions. It plays an important role in translocation of sugars , starch and protein formation.

In this concern Namich (2007) found that spraying cotton plants with glycine betaine gave a significant increase in seed index ,also,Namich (2008) found that spraying proline solution on cotton plants increased percentages of oil and protein in seed. Ibrahim *et al*. (2009) found that application of arginine significantly increased seed index, oil and protein percentages of the produced seeds.

Fiber quality :

Aminototal concentrations gave insignificant effect on lint %, Micronaire reading and pressly index in both seasons (Table 3 and4).

In this regard, Namich (2008**)** found that applications of glycine betaine gave insignificant effect on micronaire reading and pressley index in both seasons. While, Ibrahim *et al.* (2009**)** found that application of amino acid arginine significantly increased micronaire reading and pressley index in both seasons.

Effect of the interaction :

Leaf N and K contents :

The interaction between N rates and aminototal concentrations gave significant effect on leaf N and K contents in both seasons (Table 3). The highest values of leaf N content were produced from the high N rate when conjugated with the high concentration of aminototal (3g/L), while the lowest values were obtained from the low N rate when using alone, this trend was true in both seasons. With regard to leaf K content, the highest values of this trait were produced from applying the medium N rate (30 Kg N/fed.) when conjugated with the high concentration of amino total (3g/L), while the lowest values were obtained from applying the low mineral N (15 Kg N/fed.) alone without aminototal application. This trend was true in both seasons. (Table 3).

Table (3) : Effect of Nitrogen rates and aminototal concentration on N , K% lint % and micronair reading, in 2008 and 2009 seasons.

Nitrogen rates (A)	2008 Season				Mean	2009 Season				Mean
	Aminototal concentrations (B)					Aminototal concentrations (B)				
	Without	1g/L	2g/L	3g/L		Without	1g/L	2g/L	3g/L	
N%										
15 Kg N/fad.	3.02	3.09	3.14	3.22	3.09	2.97	3.12	3.18	3.28	3.14
30 Kg N/fad.	3.19	3.21	3.51	3.60	3.38	3.20	3.26	3.43	3.62	3.38
45 Kg N/fad.	3.03	3.20	3.62	3.70	3.39	3.12	3.24	3.66	3.73	3.44
Mean	3.05	3.17	3.42	3.51	3.28	3.10	3.21	3.42	3.54	3.32
L.S.D at 0.05	**A 0.04**	**B 0.03**	**AB 0.05**			**A0.03**	**B0.03**	**AB 0.05**		
K%										
15 Kg N/fad.	1.22	1.68	2.01	1.85	1.69	1.14	1.58	1.91	1.69	1.58
30 Kg N/fad.	1.62	2.23	1.92	2.55	2.08	1.42	1.99	1.84	2.43	1.92
45 Kg N/fad.	2.08	1.23	2.00	2.03	1.83	1.95	1.17	1.91	1.93	1.76
Mean	1.63	1.71	1.97	2.14	1.86	1.50	1.58	1.89	2.04	1.75
L.S.D at 0.05	**A0.02**	**B0.02**	**AB 0.04**			**A0.3**	**B0.02**	**AB0.05**		
Lint %										
15 Kg N/fad.	39.95	39.97	40.00	39.99	39.97	40.28	40.31	40.33	40.32	40.31
30 Kg N/fad.	40.07	40.09	40.13	40.10	40.09	40.35	40.37	40.39	40.37	40.37
45 Kg N/fad.	40.08	40.11	40.12	40.13	40.11	40.32	40.41	40.43	40.41	40.39
Mean	40.03	40.05	40.08	40.07	40.05	40.31	40.37	40.38	40.36	40.35
L.S.D at 0.05	**A N.S**	**B.N.S**	**AB N.S**			**AN.S**	**BN.S**	**AB NS**		
Micronaire reading										
15 Kg N/fad.	4.80	4.80	4.80	4.80	4.80	4.60	4.70	4.80	4.70	4.70
30 Kg N/fad.	4.80	4.80	4.80	4.80	4.80	4.70	4.80	4.90	4.80	4.80
45 Kg N/fad.	4.80	4.80	4.80	4.80	4.80	4.80	4.70	4.9	4.90	4.82
Mean	4.80	4.80	4.80	4.80	4.80	4.7	4.8	4.8	4.8	4.77
L.S.D at 0.05	**AN.S**	**BN.S**	**AB N.S**			**AN.S**	**BNS**	**AB NS**		

Seed quality :

The interaction between N rates and aminototal concentrations had a significant effect on seed index, protein and oil percentages in both seasons (Table 4).

Results in Table 4 show that the height values of seed index and protein percentage were produced from applying the medium N rate (30 Kg N/fad.) with the high concentration of aminototal (3g/L), but the lowest values were obtained from applying the low N rate (15 Kg N/fad.) alone. With regard to oil percentage, the highest values were obtained from applying the high N rate (45 Kg N/fed.) along with the medium or the high concentration of aminototal.

Fiber quality :

The interaction between N rates and amino total concentrations gave insignificant effect on lint % ,micronaire reading and pressley index in both seasons (Table 4), which indicates independent effect for these two factors on these two traits.

Table (4) : Effect of Nitrogen rates and aminototal concentration on Pressley index, seed index, Protein and oil% in 2008 and 2009 seasons

Nitrogen rates (A)	2008 Season				Mean	2009 Season				Mean
	Aminototal concentrations (B)					Aminototal concentrations (B)				
	Without	1g/L	2g/L	3g/L		Without	1g/L	2g/L	3g/L	
Pressley index										
15 Kg N/fad.	9.7	9.8	9.9	9.8	9.80	10.00	10.10	10.2	10.3	10.15
30 Kg N/fad.	9.9	9.9	9.8	10.30	9.97	10.2	10.2	10.3	10.3	10.25
45 Kg N/fad.	10.10	10.2	10.2	9.7	10.05	10.00	10.3	10.3	10.2	10.20
Mean	9.90	9.96	9.96	9.93	9.93	10.07	10.20	10.26	10.26	10.20
L.S.D at 0.05	**A N.S**	**BN.S**	**AB N.S**				**A N.S**	**B N.S**	**AB N.S**	
Seed index (g)										
15 Kg N/fad.	10.00	10.50	10.97	11.00	10.62	10.30	10.40	10.70	11.00	10.61
30 Kg N/fad.	10.20	10.70	11.00	11.20	10.77	10.00	10.80	11.20	11.30	10.94
45 Kg N/fad.	10.50	10.83	11.00	10.83	10.79	10.80	11.20	11.07	11.00	11.01
Mean	10.23	10.68	10.99	11.01	10.72	10.51	10.80	11.00	11.10	10.85
L.S.D at 0.05	**A N.5**	**B 0.14**	**AB 0.24**				**A 0.22**	**B0.20**	**AB 0.34**	
Protein %										
15 Kg N/fad.	21.67	21.87	21.97	22.07	21.89	21.90	22.23	22.40	22.70	22.31
30 Kg N/fad.	22.27	22.83	23.87	24.27	23.31	22.87	22.80	24.37	24.77	23.70
45 Kg N/fad.	23.07	23.53	24.00	24.03	23.66	23.83	24.23	24.27	24.23	24.14
Mean	22.33	22.74	23.28	23.46	22.95	22.87	23.09	23.68	23.90	23.38
L.S.D at 0.05	**A 0.19**	**B 0.20**	**AB 0.34**			**A 0.27**	**B 0.17**	**AB 0.30**		
Oil %										
15 Kg N/fad.	18.20	18.36	18.86	19.02	18.61	18.57	18.90	19.00	19.12	18.90
30 Kg N/fad.	18.75	19.08	19.28	19.43	19.14	18.96	19.16	19.39	19.51	19.26
45 Kg N/fad.	19.29	19.39	19.66	19.56	19.47	19.20	19.32	19.42	19.57	19.38
Mean	18.75	18.94	19.27	19.34		18.91	19.13	19.27	19.40	
L.S.D at 0.05	**A 0.05**	**B 0.06**	**AB 0.11**			**A 0.02**	**B 0.12**	**AB 0.20**		

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تأثير الرش بالأمينوتوتل تحت معدلات مختلفة من السماد الأزوتى على جودة الألياف والبذره لصنف القطن جيزة 86

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أجريت تجربتان حقليتان في محطة البحوث الزراعية بالجميزة محافظة الغربية خلال موسمي الزراعة 2008، 2009 لدراسة تأثير أربعة تركيزات من الأمينوتوتال (بدون،1جم/لتر، 2جم/لتر، 3جم/لتر) تحت ثلاثة معدلات من النيتروجين (15 كجم ن/فدان ، 30 كجم ن/فدان، 45 كجم ن /فدان) وتفاعلهم على المحتوى من النيتروجين و البوتاسيوم للورقة وصفات جودة الألياف والبذرة لصنف القطن المصرى جيزة 86.

النتائج المتحصل عليها يمكن تلخيصها كما يلي :

1-أظهرت النتائج تأثيراً معنوياً لمعدلات السماد النيتروجيني على محتوى الورقة من النيتروجين والبوتاسيوم، معامل البذرة، النسبة المئوية للبروتين والنسبة المئوية للزيت في كلا الموسمين، بينما أوضحت النتائج وجود تأثير غير معنوى على صفات النسبة المئوية للشعر، وقراءة الميكرونيرو معامل بريسلى في كلا الموسمين. أعطى معدل 45كجم ن/فدان أفضل القيم بالنسبة لمحتوى الورقة من النيتروجين، معامل البذرة، النسبة المئوية للبروتين والنسبة المئوية للزيت في كلا الموسمين. بينما أعطي معدل30 كجم ن/فدان أفضل القيم بالنسبة لمحتوى الورقة من البوتاسيوم أيضاً في كلا الموسمين. كما أوضحت النتائج أن الاختلافات بين المعدلين العالي والمتوسط لم تكن معنوية في كلا الموسمين.

2-أظهرت النتائج تأثيراً معنوياً لتركيزات الأمينوتوتال على محتوى الورقة من النيتروجين والبوتاسيوم، معامل البذرة، النسبة المئوية للبروتين والنسبة المئوية للزيت في كلا الموسمين. بينما كانت غير معنوية للنسبة المئوية للقطن الشعر وقراءة الميكرونير ومعامل بريسلى في كلا الموسمين. أدى استخدام الأمينوتوتال بتركيز 3 جرام / لتر إلى زيادة معنوية في محتوى الورقة من النيتروجين والبوتاسيوم ومعامل البذرة والنسبة المئوية للبروتين والزيت للبذرة في كلا الموسمين. كما أثبتت النتائج أن الاختلاف بين التركيزين العالي والمتوسط كانت غير معنوية في كلا الموسمين.

3-كان للتفاعل بين معدلات السماد النيتروجيني وتركيزات الأمينوتوتال تأثيراً معنوياً على معظم الصفات المدروسة، عدا النسبة المئوية للقطن الشعر وقراءة الميكرونير ومعامل بريسلى في كلا الموسمين.

4-من النتائج يتضح أن استخدام 30 كجم ن/فدان مع الرش بتركيز 2 جرام / لتر من الأمينوتوتال أدى إلى تحسين جودة صفات الألياف والبذرة تحت ظروف أرض التجربة.

قام بتحكيم البحث

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