RESULTS AND DISCUSSION

IV- RESULTS AND DISCUSSION

The results obtained will discussed under these titles :

IV-1- Effect of fertilization programs on growth charcters:

IV-1-1- Effects on plant height .

IV-1-2- Effects on node number of the fruiting branch .

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IV-2- Effect of fertilization programs on yield and yield components :

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IV-5- Effect of fertilization programs on nutreints content in plant and soil :

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IV-1 Effect of fertilization programs on growth characters

IV-1-1 Effects on Plant height .

The results in Table (2) show the effect of N and P, fertilization in combination with some biofertilizers and their interactions on plant height. The statistical analysis of the obtained data shows that increasing nitrogen level up to 66 kg N/fed caused a remarkable increase in plant height in the first season only, while the effect of nitrogen was not significant in the second season.The tallest plants in the two seasons were obtained for the plots received 66 kg N/fed. The obtained results may be attributed to the stimulatory metabolic effects of nitrogen fertilization in acceleration of early vegetative growth and cumulative effect of greater dry matter production thus increasing the length of cotton plant (Sabik, 1997).These results are in a good agreement with those obtained by El-Sayed (1999), Abdel Shafy **et al.** (2001), Abou-El-Nour **et al.** (2001) and Darwish (2001).

Table (2) : Plant height as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	80.0	92 .0	93.0	92.0	80.0	95.0	88.7	102.0	110.0	113.0	112.0	104.0	119.0	110.0
	22.5	82.0	92.8	95.8	88.0	85.0	96.8	89.7	101.8	116.0	119.0	105.0	107.0	120.0	111.3
Mean		81.0	92.8	94.8	90.8	82..5	95.5	89.2	101.5	113.8	116.8	108.5	105.5	119.5	110.7
66	11.3	101.0	102.0	111.0	107.0	104.0	113.0	106.3	112.0	122.0	125.0	121.0	117.0	129.0	121.8
	22.5	101.0	103.0	105.0	102.0	101.0	106.0	103.0	111.0	116.0	120.0	115.0	113.0	121.0	116.0
Mean		101.0	102.5	102.0	104.5	102.5	109.5	104.7	111.5	119.0	122.5	118.0	115.0	125.0	118.5
P	11.3	90.5	97.0	104.5	95.5	92.0	104.0	97.5	107.0	116.0	119.0	116.5	110.5	124.0	115.5
	22.5	91.5	97.5	59.5	95.0	93.0	101.0	96.3	106.0	116.0	119.5	110.0	110.0	120.5	113.3
Biofertilizers		91.0	97.3	95.0	97.3	92.5	102.5	97.0	106.5	116.0	119.3	113.5	110.3	122.3	114.6
L.S.D 0.05	A	2.69							N.S						
	B	N.S							N.S						
	C	3.77							5.3						
	AXB	N.5							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.5							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac. =Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.=Inoculation with phosphorine .
Mix.=Inoculation with a mixture of the four biofertilizers .

Concerning the effect of phosphorus, data in Table (2) show that phosphorus application had no significant effect on plant height in the two studied seasons .The obtained results indicate that the low phosphorus level,i.e.11.3 kg P_2O_5 /fed could be considered the recommended dose in the district.These results are in harmony with those obtained by Hosny et al (1989 b) and Edmisten **et al.** (1993).

With respect to biofertilization, data in Table (2) reveal that, with exception of phosphorine inoculation, the other biofertilization treatments significantly increased cotton plant height in the two seasons when compared with control. Data Show that plants fertilized with a mixture of the four inoculates seemed to be the superior, followed by that inoculated with bacteria (Bac.), yeast, bacteria (F) and phosphorine with increases of about 12.6, 4.4, 6.9, 6.9 and 1.6% over the control treatment , respectively. This is true for the seasons. El-Khawas (1990) attributed the increase in plant height due to biofertilization to the principle mechanism that biofertilizer could benefit the plant growth through fixing gaseous nitrogen and its transfer to the plant as a direct effect on growth hormones (Gas) and (CKs) that released in root media by bacteria and affect its positively its growth and extention .The resultant could be more absorption of nutrients which caused more growth, increased nitrogenous compounds assimilation forming more growth substances, more cell division and enlargement, more forming of tissues and organs and plant elongation could be considered as a resultant of the aformentioned processes.This finding is in accordance with those obtained by Radwan (1998) and Hamissa, et al (2000).

Data in Table (2) also show that the interaction between the different variables (N, P and different combinations with biofertilizer) was not significant .

IV-1-2 Effects on node number of the fruiting branch

Data presented in Table (3) reveal that node number of first fruiting branch was insignificantly affected by nitrogen fertilizer levels. This was true for both seasons. These results are in a good agreement with those obtained by Ismail **et al.** (2000) and Abou-El-Nour **et al.** (2001).

Concerning the phosphorus fertilization, data in Table (3) show that phosphorus fertilization did not significantly affect node number of the first fruiting branch in both seasons. There was no relevance between phosphorus fertilization and node number of the first fruiting branch which was clear in both seasons. These results are in conformance with those obtained by Nagib (1990) and Abou-El-Nour **et al.** (2001). On contrast, Ibrahim **et al.** (1997) found that position of the first fruiting node was significantly affected by foliar spraying of phosphorus in both seasons .

Regarding to biofertilization, results in Table (3) show that node number of the first fruiting branch was significantly affected by biofertilization. In the two seasons, the mixture of the four inoculates yielded higher numbers of nodes on the fruiting branches as shown in Table (3). The first fruiting branch was emerged at the 10^{th} node in plants received mixture of all studied inoculants. While plants not received biofertilization yielded lower nodes of cotton stems.

Table (3): Node number of first fruiting branch as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (c)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	8.6	9.2	9.2	8.7	8.7	9.3	9.0	9.0	9.2	9.8	9.3	9. 2	9.7	9.4
	22.5	8.6	9.2	9.7	8.8	8.9	9.6	9.1	9.4	9.4	9.3	9.4	9.9	9.9	9.6
Mean		8.6	9.2	9.5	8.8	8.8	9.5	9.0	9.2	9.3	9.6	9.4	9.6	9.8	9.5
66	11.3	8.9	9.1	9.3	9.0	9.0	9.4	9.1	9.0	9.4	9.3	9.5	9.6	9.9	9.5
	22.5	8.7	9.2	9.5	9.0	9.2	9.7	9.2	9.4	9.5	9.5	9.6	9.6	9.6	9.5
Mean		8.7	9.2	9.4	9.8	9.1	9.6	9.2	9.2	9.5	9.4	9.6	9.6	9.8	9.5
P	11.3	8.8	9.2	9.3	8.9	8.9	9.4	9.1	9.3	9.6	9.8	9.7	9.7	10.1	9.7
	22.5	8.7	9.2	9.6	8.9	9.1	9.7	9.2	9.7	9.7	9.7	9.8	10.0	10.8	9.8
Biofertilizers		8.7	9.2	9.5	8.9	9.8	9.6	9.1	9.2	9.5	9.5	9.5	9.6	9.8	9.5
L.S.D 0.05	A	N.S							N.5						
	B	N.5							N.S						
	C	8.2							0.3						
	AXB	N.S							N.5						
	AXC	N.S							N.S						
	BXC	N.S							N.5						
	AXBXC	N.5							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere.
Bac.=Inoculation with Bsacillus polymyxa.
Y= Inoculation with yeast.
Ph.= Inoculation with phosphorine.
Mix.= Inoculation with a mixture of the four biofertilizers.

Data also show that all interactions for the three variables, i.e. nitrogen, phosphorus and biofertilization was not significant.

IV-1-3 Effects on Flowering date :

Data in Table (4) show that flowering date (estimated as the number of days from planting up to 50% flowering of cotton plants) did not affect by N, P and biofertilization. Some investigators found that NPK fertilizers insignificantly affected the flowering date (Radwan **and** Abd El-Malak 1995) and Said-Samia (1997).

IV-2 Effects of fertilization programs on yield and yield components

IV-2-1Effects on the number of fruiting branches per plant.

Data in Table (5) show that nitrogen fertilization did not affect the numbers of fruiting branches / plant in the first season, while the influence was significant in the second season. Increased nitrogen rate from 33 to 66 kg N/fed. significantly increased the number of ftuiting branches / plant of cotton in the second season. Increased in number of fruiting branches per plant due to increascd nitrogen level may be due to the increase in meristematic activity induced by nitrogen (Shafshak **et al.** 1983 b). These results are in agreement with those obtained by Sabik (1997) who found that nitrogen levels was affected positively the number of

Table (4) : Flowering date (days) as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	80.0	81.0	81.0	80.3	80.8	81.0	80.7	73.0	74.0	74.0	73.3	73.8	74.0	73.7
	22.5	79.5	79.8	80.8	80.3	80.5	80.8	80.3	72.5	72.8	73.8	73.3	73.5	73.8	73.3
Mean		79.8	80.4	80.9	80.3	80.7	80.9	80.5	72.8	73.4	73.9	73.2	73.6	73.9	73.5
66	11.3	80.3	81.3	81.5	80.3	81.0	82.8	81.2	73.3	74.3	74.5	73.3	74.0	75.8	74.2
	22.5	80.8	80.8	81.0	81.0	81.3	81.5	81.1	73.8	73.8	74.0	74.0	74.3	74.5	74.1
Mean		80.6	81.1	81.3	80.7	81.2	82.2	81.1	73.6	74.1	74.3	73.7	74.2	75.2	74.2
P	11.3	80.2	81.2	81.3	80.3	80.9	81.9	80.9	73.2	74.2	74.3	73.3	73.9	74.9	74.0
	22.5	80.2	80.3	80.9	80.7	80.9	81.2	80.7	73.1	73.3	73.9	73.7	73.9	74.2	73.7
Biofertilizers		80.2	80.8	81.1	80.5	81.0	81.6	80.8	73.2	73.7	74.1	73.5	73.9	74.6	73.9
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	N.S							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bsacillus polymyxa .
Y= Inoculation with yeast .
Ph..= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (5) :Number of fruiting branches as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	9.1	10.6	10.9	9.4	9.5	10.9	10.1	11.4	13.2	13.4	12.3	12.5	13.7	12.8
	22.5	10.9	11.4	11.8	11.1	11.3	12.7	11.5	11.69	13.3	13.5	12.3	12.9	14.2	13.0
Mean		10.0	11.0	11.4	10.3	10.4	11.8	10.8	11.7	13.3	13.5	12.3	12.7	14.0	12.9
66	11.3	12.3	12.6	12.8	12.4	12.4	12.9	12.6	12.3	13.6	14.1	12.9	13.5	16.3	13.8
	22.5	13.2	13.6	13.7	13.3	13.4	13.7	13.5	12.8	14.2	15.0	13.3	13.8	17.2	14.4
Mean		12.8	13.2	13.3	12.9	12.9	13.3	13.1	12.6	13.9	14.6	13.1	13.7	16.8	14.1
P	11.3	10.7	11.6	11.9	10.9	11.0	11.9	11.3	11.9	13.4	13.8	12.6	13.0	15.0	13.3
	22.5	12.1	12.5	12.6	12.2	12.4	13.2	12.5	12.4	13.8	14.3	12.8	13.4	15.7	13.7
Biofertilizers		11.4	12.1	12.4	11.6	11.7	12.6	12.0	12.2	13.6	14.1	12.7	13.2	15.4	13.5
L.S.D 0.05	A	N.S							0.56						
	B	0.6							N.S						
	C	N.S							1.28						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

fruiting branches/plant in one season only. Many investigators found that nitrogen application increased number of fruiting branches of cotton plant (Chand **et al.** 1997 El-Shahawy **et al.** 1997).

Regarding to phosphorus application, data in Table (5) show that increasing phosphorus level up to 22.5 kg P_2O_5 /fed significantly increased the number of fruiting branches per plant in the first season only. This finding is in accordance with those obtained by Salem and Roshdy (1981) and Sabik (1997).

Considering the effect of biofertilizers, data in Table (5) show that biofertilization tended to increase the number of fruiting branches .Three of biofertilizer treatments, i.e. Mix., Bac. And F significantly increased the number of fruiting branches /plant a compared to the control treatment while the two other biofertilizers (Y and Ph) slightly increased the fruiting branches per plant but the increase was not significant in the two seasons. The efficiency of biofertilizers in increasing numbers of fruiting branches could be arranged in the following descending order:

The mixture of all biofertilizers > Bacillus polymixa > inocula named F > Yeast > Phosphorine > without biofertilization. These results are line in with those obtained by Radwan (1998) who found that biofertilization increased number of fruiting branches during both seasons.

IV-2-2 Effects on the number of total bolls/ plant:

Data in Table (6) reveal that Increasing nitrogen level from 33 to 66 kg N /fed significantly increased the number

Table (6) :Number of total boll / of plant as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	10.4	12.8	12.7	12.1	12.3	13.4	12.2	7.9	8.8	10.9	9.5	9.9	13.7	10.1
	22.5	10.8	12.8	13.1	12.4	12.0	13.9	12.5	8.3	11.21	11.3	10.6	10.8	13.8	11.0
Mean		10.6	12.7	12.9	12.3	12.2	13.7	12.4	8.1	10.0	11.1	10.1	10.4	13.8	10.7
66	11.3	14.1	14.2	14.3	14.1	15.0	15.2	14.5	8.5	12.1	13.1	11.1	11.4	17.9	12.4
	22.5	15.4	15.4	15.5	15.4	15.4	15.5	15.4	9.9	12.1	15.6	13.8	13.8	18.2	14.0
Mean		14.8	14.8	14.9	14.8	15.2	15.4	15.8	9.2	12.1	14.4	12.8	12.6	18.1	13.2
P	11.3	12.3	13.4	13.5	13.1	13.7	14.3	13.4	8.2	10.8	12.0	10.3	10.7	15.8	11.3
	22.5	13.1	14.1	14.3	13.9	13.7	14.7	14.0	9.1	11.7	12.9	12.6	12.3	16.0	12.5
Biofertilizers		12.7	13.7	13.9	13.5	13.7	14.6	13.7	8.7	11.1	12.7	10.2	11.5	15.9	12.0
L.S.D 0.05	A	0.51							1.2						
	B	0.56							0.35						
	C	0.92							0.99						
	AXB	N.S							N.S						
	AXC	1.3							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

of total bolls /plant from 12.4 to 15 and from 10.7 to 13.2 for the two growth seasons , respectively. This result is mainly due to the positive effect of nitrogen on number of fruiting branches (Table ,5) as well as dry matter accumulations in the different organs of cotton plant (Shafshak **et al.** 1983 b). These results agree with those obtained by Ismail **et al.** (2000) and Abd El- Shafy **et al.** (2001).

Concerning phosphorus fertilization, data in Table (6) show that increasing phosphorus level from 11.3 to 22.5 kg P_2O_5 / fed significantly increased the numbers of total bolls /plant form 13.4 to 14.0 and form 11.3 to 12.5 for the two seasons, respectively. Similar results were obtained by Sawan (1986), Yasseen (1993) and Sabik (1997).

With regard to biofertilizers ,data in Table (6) show that, generally, all biofertilizer treatments had a significant positive effect on the numbers of bolls / plant. Different treatments could be arranged depending on their ability in increasing numbers of bolls / plant as following :

The mixture of the four biofertilizers>Bacillus polymyxa > phosphorine > bacterial inocula named F > Yeast > without biofertilizer application (control). These results agree well with those reported by Prasad and Prasad (1998) , El- Shazly and Darwish (2001) who reported that biofertilization significantly increased the numbers of bolls /cotton plant.

Data in Table (6) show that there is an interactive effect of the application of nitrogen and biofertilizers on the numbers of bolls /plant in the first season, while the other interactions did not show any significant effect on the same

character .The data for the first season indicate that the high numbers of bolls /plant was obtained for the plants received 66 kg N/fed and inoculated with mixture of the four biofertilizers, while the plants fertilized with 33kg N/fed .and not received any biofertilizer yielded the had low numbers of total bolls /plant .

IV-2- 3 Effects on the numbers of opened bolls /plant.

Concerning the influence of nitrogen levels on the numbers of opened bolls / plant data are shown in Table (7). The obtained data show that increasing nitrogen levels from 33 to 66 kg N/fed significantly increased numbers of opened bolls/plant from 7.1 to 9.2 and from 7.6 to 8.7 for 2000 and 2001 seasons, respectively. This trend might be due to the fact that nitrogen is consider as essential nutrient for controlling the new growth and preventing abscission of squares and bolls (Varma,1982) .Also ,it could be attributed to nitrogen deficiency which limits both rate and duration of flowering and may be the major factor in cut-out of cotton production (Hearn,1975) and / or to nitrogen deficiency which decreased the auxin content and markedly increased the content of inhibitors in the leaves and stems (Anisimov and Bulatova, 1982). These results are in consistence with those obtained by El-Sayed (1999) ,Darwish and Hegab (2000) and Abd El- Shafy **et al.** (2001).

With respect to phosphorus fertilization, data in Table (7) show that the numbers of opened bolls per plant was significantly increased by application of phosphorus.

Table (7) :Number of opened bolls of /plant as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	6.5	6.8	7.2	6.6	6.7	7.7	6.9	6.3	7.6	7.8	6.4	7.5	8.3	7.3
	22.5	6.6	7.6	7.7	6.8	7.0	8.3	7.3	7.3	8.5	7.9	7.5	7.7	8.7	7.9
Mean		6.6	7.2	7.5	6.7	6.9	8.0	7.1	6.8	8.1	7.9	7.0	7.6	8.5	7.6
66	11.3	8.5	8.8	8.9	8.3	8.7	9.0	8.7	7.2	8.5	8.4	7.9	8.6	10.2	6.8
	22.5	9.1	9.8	10.0	9.2	9.6	10.7	9.7	7.7	7.8	9.3	7.5	8.8	12.2	8.9
Mean		8.8	9.3	9.5	8.8	9.2	9.9	9.2	7.5	8.2	8.9	7.7	8.7	11.2	8.7
P	11.3	7.5	7.8	8.1	8.5	7.7	8.4	7.8	6.8	8.1	8.1	7.2	8.1	9.3	7.1
	22.5	7.9	8.7	8.9	8.0	8.3	9.5	8.5	7.5	8.2	8.6	7.5	8.3	10.5	8.4
Biofertilizers		7.7	8.3	8.5	7.7	8.0	8.9	8.4	7.1	8.1	8.4	7.3	8.2	9.9	8.2
L.S.D 0.05	A	0.34							0.28						
	B	0.48							N.S						
	C	0.73							0.86						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers.

Increased phosphorus level from 11.3 to 22.5 kg P_2O_5/fed increased the numbers of opened bolls per plant from 7.8 to 8.5 in the first season only , respectively . Phosphorus is known to be involved in photosynthesis and plant metabolism. Phosphorus regulates many enzymic processes and phosphorus acts as an activator of some enzymes which may affect bolls formation and stability (Epestein 1971). Similar conclusions had been reported by Ibrahim **et al.** (1997) and Abou-El-Nour **et al.** (2001).

Regarding to the biofertilization, data listed in Table (7) indicate that using biofertilization markedly increased the numbers of opened bolls / plant as compared with the control. This stimulatory effect on opened bolls was more pronounced in the plant inoculated with the mixture of the four biofertilizers and with Bacillus polymixa .The highest number of opened bolls /plant which was being 8.9 and 9.9 for the mixture of inoculants in the two seasons, respectively. While using yeast as a biofertilizer show the lowest number of opened bolls /plant when compared to the other biofertilizers. This finding is in agreement with those obtained by Radwan (1998) and Hamissa (2000).

Concerning the interactive effect, data in Table (7) did not show any significant interaction between the tested treatments on the number of opened bolls/plant in the two seasons. These results are in accordance with those obtained by El-Shazly and Darwish (2001) who found that the interaction between N fertilizer and microbein addition gave insignificant effect on numbers of open bolls /cotton plant.

IV-2-4 Effects on boll weight

From Table (8) it is clear that different levels of nitrogen, i.e. 33 and 66 kg N / fed had a significant effect on boll weight in the second season only. The highest boll weight was obtained by using 66 kg N /fed. Such results may be due to the increase in the photosynthetic activity of leaves, which in turn, account for a higher accumulation of metabolites, that directly impacting boll weight (Sawan **et al.** 1997). The same trend was obtained by El-Sayed (1999), Ismail **et al.** (2000), Wassel **et al.** (2000) who found that boll weight significantly favoured at higher nitrogen levels .

Regarding to phosphorus fertilization levels, data in Table (8) show that boll weight was not affected by phosphorus application. These results cope with those obtained by Abd El-Aal, et al (1996), El-Debaby **et al.** (1995) and Tomer **et al.** (2000).

Concerning biofertilizer treatments, data in Table (8) show that using mixture of the four biofertilizers led to a significant increase in boll weight compared to control, while the other four single biofertilizers namely F,B,Yeast and phosphorine show slightl increases of boll weight when compared with uninoculation treatment. The highest values of cotton boll weight were obtained from treatments receiving the mixture of all studied biofertilizers, while the lowest values were recorded for the untreated treatment (control) in both seasons.These results are in a agreement with those obtained by Prasad and Prasad (1998) Radwan (1998) and Hamissa **et al.** (2000).

Table (8) : Boll weight (gm) as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	2.6	2.8	2.9	2.7	2.6	2.9	2.7	2.1	2.2	2.2	2.3	2.3	2.4	2.2
	22.5	2.7	2.8	2.9	2.7	2.7	2.9	2.8	2.2	2.4	2.4	2.3	2.3	2.4	2.3
Mean		2.7	2.8	2.9	2.7	2.7	2.9	2.8	2.1	2.3	2.3	2.3	2.3	2.4	2.3
66	11.3	2.9	2.9	3.0	3.0	3.0	3.0	3.0	2.3	2.3	2.4	2.3	2.5	2.7	2.4
	22.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.5	2.5	2.3	2.3	2.5	2.7	2.5
Mean		3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.4	2.4	2.4	2.3	2.5	2.7	2.5
P	11.3	2.9	2.9	2.9	2.8	2.8	2.9	2.8	2.2	2.2	2.3	2.3	2.4	2.5	2.3
	22.5	2.9	2.9	3.0	2.9	2.9	3.0	2.9	2.3	2.4	2.4	2.3	2.4	2.5	2.4
Biofertilizers		2.9	2.9	2.9	2.9	2.8	3.0	2.9	2.3	2.3	2.4	2.3	2.4	2.5	2.4
L.S.D 0.05	A	N.S							0.09						
	B	N.S							N.S						
	C	0.12							0.11						
	AXB	N.S							N.S						
	AXC	N.S							0.61						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix. = Inoculation with a mixture of the four biofertilizers .

Boll weight was only affected by the interaction between nitrogen fertilization and biofertilizer treatments in the second season, whereas the differences were not significant in the first one as shown in Table (8). In the second season ,it could be observed that the plants fertilized with 66 kg N/fed. and treated with the mixture of the four studied biofertilizers gave the highest value of boll weight whereas the lowest boll weight was obtained when the plants received 33 kg N/fed and untreated with biofertilizers. Similar results were obtained by Hamissa **et al.** (2000).

IV-2-5 Effects on seed yield

Data in Table (9) indicate that nitrogen application had a significant positive effect on seed cotton yield in kentar per feddan in both seasons. Increasing nitrogen level from 33 to 66 kg N/ fed led to an increase in seed cotton yield from 7.4 to 9.7 and 6.6 to 7.5 kentar /fed in 2000 and 2001 seasons, respectively. It is clear that 66 kg N/fed gave the highest yield of seed cotton per feddan. The increase percentages reached 27.6 and 13.6% for the two seasons, respectively when compared the yield of plants received 66 kg N/fed to those supplied with 33kg N /fed. These results are expected since nitrogen increased cotton growth characters which in turn contributed to the increase in the amount of metabolites available for bulding seed cotton, number of total and opened bolls/ plant and boll weight as well as dry matter accumulation of different plant organs (Shafshak **et al.** 1983b). These results are in harmony with those obtained by

Table (9) :Seed cotton yield (kentar/fed) as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	6.7	7.6	7.6	7.0	7.2	8.5	7.4	5.3	6.4	6.8	5.7	6.5	7.5	6.4
	22.5	7.0	7.7	8.0	7.7	7.7	8.3	7.7	5.7	7.2	7.5	6.2	6.7	7.5	6.9
Mean		6.9	7.7	7.8	7.3	7.4	8.4	7.6	5.5	6.8	7.1	6.0	6.6	7.6	6.6
66	11.3	8.6	9.7	9.9	9.3	9.5	9.8	9.5	6.4	7.6	7.4	6.7	7.1	8.5	7.3
	22.5	9.7	9.9	10.0	9.7	9.8	10.2	9.9	6.8	8.2	8.1	7.1	7.6	8.9	7.8
Mean		9.1	9.8	10.0	9.5	9.7	10.0	9.7	6.6	7.9	7.7	6.7	7.4	8.7	7.5
P	11.3	7.6	8.7	8.8	8.1	8.4	9.2	8.5	5.9	6.0	7.1	6.2	6.8	8.0	6.8
	22.5	8.3	8.8	9.0	8.7	8.7	9.3	8.8	6.3	7.7	7.8	6.7	7.2	8.3	7.3
Biofertilizers		8.0	8.8	8.9	8.4	8.4	9.2	8.7	6.1	7.3	7.4	6.5	7.0	8.2	7.1
L.S.D 0.05	A	0.13							0.26						
	B	0.15							0.20						
	C	0.43							0.33						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Darwish and Hegab (2000), Ismail **et al.** (2000), Wassel **et al.** ((2000) and Abd El-Shafy **et al.** (2001).

Regarding phosphorus levels, data presented in Table (9) indicated that phosphorus fertilization exerted a significant effect on seed cotton yield in kentar per feddan in both seasons.Application of phosphorus fertilization at 22.5kg P_2O_5/fed led to an increase in seed yield by 3.5 and 7.4% as compared with 11.3kg P_2O_5/fed in both seasons ,respectively. This increment of seed yield /fed by using phosphorus fertilizer is mainly due to the significant increase in number of fruiting branches/plant, number of total and opened bolls and boll weight. These results are in agreement with these obtained by El-Debaby **et al.** (1995), Sabik (1997) and Tomer **et al.** (2000) .

Regarding the to biofertilizers data show that all biofertilizer treatments had significant effects on seed cotton yield in kentar/ fed in both seasons as compared to uninoculation treatment. The efficiency of biofertilizer treatments in increasing seed cotton yield was as follows:

Inoculation with mixture of four biofertilizers > inoculation with Bacillus polymyxa > inoculation with inocula named F > inoculation with phosphorine >inoculation with yeast > uninoculation (control) .The increase percentage of the biofertilizers was 15.0 ,11.3,8.8, 5.0 and 5.0, respectively for the first season, while it was 34.4, 21.3, 19.7,14.8 and 6.6 for the second season, respectively compared with the control treatment.

The effect of bacterial inocula (B and F) may be due to not only to their N-fixing proficiency but also to their ability to produce antibacterial and antifungal compounds ,growth regulators and siderophores (Pandey and Kumar,1989). Moreover, Feibo- Wu and Omar (1998) reported that the two above-mentioned inocula significantly improved nitrogen uptake, nitrogenase and dehydrogenase activity. The effect of phosphorine as biofertilizers may be due to this biofertilizer contains phosphate- solubilizing bacteria which be able to release neutral and alkaline phosphatase (Chhanker and Taraedar, 1984) and to its ability to dissolve the precipitated form of phosphate that depends on its capability in producing organic acids and /or CO_2 (Zayed,1998). The positive effect of application yeast may be due to the higher content of protein (amino acids), vitamin B and cytokinins. Also, yeast may release CO_2 which reflects on improving net phytosynthesis (Ferguson **et al.** 1987 and Idso **et al.** 1995) . Moreover, Arshad and Frankenberger (1989) attributed the effect of yeast (Sacch.cerevisiae) to its capability to produce ethylene in the rhizosphere region of plant which enhance plant root distribution. These results are in accordance with those obtained by Baisen **et al.** (1998) , Hamissa **et al.** (2000) and El-Shazly and Darwish (2001).

The interactions between any of the two variables or among the three variables did not exert any significant effect on seed cotton yield in both seasons . This means that each of these factors may be acting independently on seed cotton yield. These results are agree with those obtained by Abd El-

Ghany **et al.** (2001) who found that the interaction between N fertilizer levels and microbein biofertilizer gave insignificant effect on seed cotton yield in the first season only .In contrary Radwan (1998) found that the interaction between nitrogen fertilizer levels and biofertilization exerted a significant effect on the various studied characters during both seasons .

IV-2-6 Effects on the earliness percentage :

Data presented in Table (10) show that increasing nitrogen level from 33 to 66 kg N/fed significantly reduced the values of first picking percentage . The highest level of nitrogen, i.e. 66 kg N/fed reduced the percentage of seed cotton yield obtained at the first pick to 53.2 and 62.4 % in the two seasons, respectively. The lowest level of nitrogen (33 kg N/fed) gave the highest percentage of seed cotton obtained at the first pick (74.9 and 69.6 % for the both seasons, respectively). Generally ,the results obtained indicated that higher rates of nitrogen fertilizer could ultimately extend the period of vegetative plant growth and thus delaying the onset of fruiting stage (Ismail and Esmail,1987). The explanation of this point ,is that since the high nitrogen level resulted in larger amount of bolls per plant which require more time to get mature and the majority of these bolls were gained at the second picking . The increase in the weight of the second picking to the total weight of seed cotton yield minimized the percentage of earliness percentage. These results are in harmony with those obtained by El-Shahawy **et al.** (1997) El-Sayed (1999) and Ismail **et al.** (2000).

Table (10): Earliness percentage as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	B ac	Y	Ph.	Mix.	Mean
33	11.3	91.2	70.5	68.1	65.8	63.9	60.5	70.0	70.7	70.6	74.3	70.7	68.7	67.1	70.3
	22.5	93.3	85.1	83.4	68.2	69.7	69.4	79.9	69.6	70.3	70.4	68.5	86.8	65.4	68.8
Mean		92.3	77.8	75.8	72.0	66.8	65.0	74.9	70.2	70.4	72.3	69.6	68.7	66.2	69.6
66	11.3	55.8	53.7	53.2	47.4	39.2	40.6	48.2	80.9	74.8	78.8	68.8	71.2	71.9	72.9
	22.5	59.7	59.7	59.2	58.9	55.8	55.8	58.2	79.1	77.1	75.3	73.4	78.2	67.7	75.1
Mean		57.4	56.7	56.2	53.2	74.5	48.9	53.2	80.0	75.9	72.7	71.1	74.7	69.8	62.4
P	11.3	73.1	62.1	60.7	56.6	51.6	50.6	69.1	75.2	72.7	72.2	69.8	69.9	69.5	71.6
	22.5	76.5	72.4	71.3	68.6	62.8	62.6	69.0	74.4	73.7	72.9	70.9	73.5	66.6	72.0
Biofertilizers		74.9	67.3	66.0	62.6	57.2	56.6	64.1	75.1	73.2	72.4	70.4	71.7	68.1	66.0
L.S.D 0.05	A	3.51							2.36						
	B	4.52							N.S						
	C	9.62							2.9						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix. = Inoculation with a mixture of the four biofertilizers .

Concerning phosphorus fertilization, data in Table(10) reveal that phosphorus application significantly and positively affected first picking percentage in the first season . Earliness character measured as percentage of first pick of total yield (69.0 %) produced from plants received 22.5 kg P_2O_5 /fed while the plants fertilized with 11.3 kg P_2O_5 /fed yielded the lowest percentage of first pick (59.1 %). The same trend was obtained in the second season but the difference between the two phosphorus treatments was not significant. The same results were obtained by Mohamed **et al.** (1988), Hosny **et al.** (1989 a), Nagib (1990) and Ibrahim **et al.** (1997).

Regarding the biofertilizers, data in Table(10) show that inoculation the cotton seed by biofertilizers had a negative effect on earliness percentage in both seasons. Three biofertilization treatments reduced significantly earliness character,i.e. the mixture of biofertilizer, phosphorine and yeast, while the other two inoculants had a slight effect but insignificant on reducing earliness percentage when compared to control (without inoculation) in both seasons . This may be due to these biofertilizers might enhance the cotton growth, hence prolonged vegetative period and thus delaying development and maturity of bolls. On the contrary, El-Shazly and Darwish (2001) reported that the biofertilizer (microbein) gave insignificant effect on earliness percentage.

The interactions effect between nitrogen and phosphorus, nitrogen and biofertilizers or phosphorus and biofertilizers on earliness percentage was insignificant in both seasons. Moreover, the interaction among the three variables

insignificantly affected the earliness percentage in both seasons.

IV-3 Effect of fertilization programs on technological properties :

IV-3 1 Effects on seed index

Data presented in Table (11) show the effect of nitrogen fertilizer rates, i.e. 33 and 66 kg N/fed on cotton seed index measured as the weight of 100 seeds of cotton in gram. The differences between values of seed index obtained under the two nitrogen fertilization levels were significant in the two seasons. The nitrogen level (66 kg N/fed) gave the highest value of seed index .This result could be explained on the basis of the increase in photosynthetic activity in the leaves of cotton plant with the increase in nitrogen level (Stanev, 1976). These results coinside with those obtained by Darwish and Hegab (2000), Matbully-Amany (2000) and Abd el-Shafy **et al.** (2001).

Concerning phosphorus fertilization, data in Table (11) reveal that phosphorus application had no significant effect on seed index in both growing seasons. Although a slight increase of seed index was observed at higher phosphorus rate (22.5 kg P_2O_5/fed), however the difference between the two studied phosphorus rates, i.e. 11.3 and 22.5 P_2O_5 /fed was not significant. These results agree well with those obtained by El-Debaby **et al.** (1995), Sabik (1997) and Abd El-Aal **et al.** (2000).

Table (11) : Seed Index as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	9.0	9.9	9.8	9.3	9.5	10.3	9.6	9.3	9.6	10.0	9.0	9.4	10.1	9.6
	22.5	9.4	9.8	9.9	9.2	9.7	10.3	9.7	9.6	9.6	10.0	9.4	9.4	10.2	9.7
Mean		9.2	9.9	9.9	9.3	9.6	10.4	9.7	9.5	9.6	10.0	9.2	9.6	18.2	9.7
66	11.3	9.3	9.9	10.2	9.5	9.7	10.4	9.8	9.5	10.0	10.0	9.7	9.7	10.1	9.8
	22.5	9.3	10.0	10.1	9.6	9.8	10.4	9.8	9.6	9.8	10.0	9.8	9.9	10.1	9.8
Mean		9.3	10.0	10.1	9.6	9.8	10.4	9.8	9.6	9.9	10.0	9.8	9.8	10.1	9.8
P	11.3	9.1	9.9	10.0	9.4	9.6	10.4	9.7	9.4	9.8	10.0	9.7	9.7	10.1	9.7
	22.5	9.4	9.9	10.0	9.4	9.7	10.4	9.8	9.6	9.7	10.0	9.4	9.6	10.1	9.8
Biofertilizers		9.3	9.9	10.0	9.4	9.7	10.4	9.8	9.5	9.7	10.0	9.5	9.7	10.1	9.8
L.S.D 0.05	A	0.08							0.10						
	B	N.S							N.S						
	C	0.13							0.17						
	AXB	N.S							N.S						
	AXC	0.18							N.S						
	BXC	N.S							N.S						
	AXBXC	0.25							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Regarding biofertilization ,data in Table (11) show that all biofertilizer treatments except the yeast inoculation significantly increased the seed index in both growth seasons. Based on the statistical analysis of data obtained and on the observed overall trend ,it could be stated that using the mixture of biofertilizer treatments exerted the heavier 100-seeds. The effect of biofertilizer treatments on seed index could be descendingly ordered as follow (in both seasons) :

Mix. > Bac. > F > Ph > Y > control. These results are in agreement with those obtained by Radwan (1998) and Hamissa **et al.** (2000). On the other hand, Prasad and Prasad (1998) reported that biofertilization did not affect the weight of 100-seeds.

Concerning the interactive effect of the three variables, the obtained data reveal that the interaction between nitrogen fertilization and biofertilizers had a significant effect on seed index in the first season only. The heavier 100-seed was recorded for the plants received 66 kg N/fed and inoculated with the mixture of the four studied biofertilizers. Whereas the lowest value of seed index was observed for the plants fertilized with 33 kg N/fed and not received any biofertilizers. Similar results were obtained by Hamissa **et al.** (2000) who reported that ,the interaction between nitrogen fertilization and biofertilizer treatments significantly affected seed index.

IV-3-2 Effects on lint percentage

Data in Table (12) show that nitrogen fertilization exerted a significant positive effect on lint percentage in both growing seasons . Higher lint percentage was obtained by

Table (12) :Lint percentage as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	42.6	41.5	40.6	42.2	41.7	40.6	41.5	41.6	40.5	39.6	41.2	40.7	39.6	40.5
	22.5	42.3	41.1	40.6	42.4	40.9	40.2	41.4	42.3	40.7	40.6	41.4	40.9	40.2	41.0
Mean		42.5	41.3	40.6	42.3	41.8	40.4	41.5	42.0	40.6	40.1	41.3	40.8	39.9	40.8
66	11.3	41.8	40.7	40.4	41.5	41.3	39.8	40.9	40.8	39.7	39.4	40.5	40.3	38.8	39.9
	22.5	42.3	41.0	40.2	41.3	41.1	39.9	41.0	41.3	40.0	39.2	40.3	40.1	38.9	40.0
Mean		42.1	40.9	40.3	41.4	41.2	39.9	41.0	41.1	39.9	39.3	40.4	40.2	38.9	40.0
P	11.3	42.2	41.1	40.5	41.9	41.5	40.2	41.2	41.2	40.1	39.5	40.9	40.5	39.2	40.2
	22.5	42.3	41.1	40.4	41.9	41.0	40.1	41.2	41.8	40.4	39.9	40.9	40.5	39.6	40.5
Biofertilizers		42.3	41.1	40.5	41.9	41.5	40.2	41.3	41.6	40.3	39.7	40.9	40.5	39.4	40.4
L.S.D 0.05	A	0.23							0.26						
	B	N.S							N.S						
	C	1.03							1.2						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph. = Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

applying the low nitrogen level ,i.e. 33 kg N/fed .Increasing nitrogen level from 33 to 66 kg N/fed decreased lint percentage from 41.5 to 41.0 and from 40.8 to 40.0 in 2000 and 2001 seasons, respectively. The decrease of lint percentage by increasing nitrogen level might be attributed to the increase in average seed weight /boll (Table,8) without corresponding increase in the weight of lint/boll. These results are in agreement with those obtained by El-Okkia **et al.** (1981), Shafshak **et al.** (1983 b),El-Debaby **et al.** (1995) and Abd El-Shafy **et al.** (2001).

With regard to phosphorus fertilization, the data in Table (12) reveal that lint percentage did not affect by phosphorus fertilization level in the two growth seasons. There was no pertinence between phosphorus and lint percentage. Similar results were obtained by Abd El-Aal **et al.** (2000) Matbully- Amany (2000) and Abou-El-Nour **et al.** (2001). In- contrast, Gill **et al.** (1985) Yasseen (1993) and Sabik (1997) indicated that lint percentage increased by increaseing phosphorus fertilization levels.

With respect to biofertilization, data in Table (12) reveal that using biofertilizers namely mixture, Bac. and F. led to a significant decrease in lint percentage when compared with uninoculation treatment, whereas the other two kinds of biofertilizer, i,e. yeast and phosphorine caused a slight decrease effect on lint percentage as compared with the control. The lowest values of lint percentage (40.2 and 39.4%) were recorded for the plants inoculated with mixture of the four biofertilizers during (2000 and 2001 seasons),

respectively. While uninoculated plants show the highest values of lint percentage. The effect of biofertilizers on decrease lint percentage may be due to the effect of nitrogen on increasing seed weight /boll (Table,8) without increase in lint weight . These results are in a agreement with those obtained by El-Shazly and Darwish (2001) who found that microbein application to cotton plants significantly increased lint percentage. The same results were obtained by Hamissa **et al.** (2000).

IV-3-3 Effects on fiber properties

Data presented in Tables (13, 14, 15, 16 and 17) show clearly that nitrogen , phosphorus and biofertilization and their interaction did not significantly affect any of the studied fiber properties, namely staple length at 2.5% and at 50%, uniformity ratio (UR), fiber strength (Pressely Index) and fiber fineness (Micronair Reading) in both growing seasons. There were no relevance between any of the fertilization treatments and any of the above mentioned fiber properties. The insignificant effects of fertilization treatments on fiber properties may be explained by the fact that those characters are essentially genetically controlled and have high heritability values. These results are in line with those obtained by Ismail **et al.** (2000), Wassel **et al.** (2000) and Abou-El-Nour **et al.** (2001) for nitrogen and Ibrahim **et al.** (1997), Abd El-Aal **et al.** (2000) and Abou-El-Nour **et al.** (2001) for phosphorous fertilization.

Table (13) : Staple length (2.5 %) as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	31.2	31.0	31.6	31.2	31.4	31.3	31.3	31.6	31.6	30.8	31.8	31.4	30.8	31.3
	22.5	31.3	31.6	31.4	29.8	30.6	30.8	30.9	30.4	31.6	30.8	31.0	31.2	30.8	31.0
Mean		31.3	31.3	31.5	30.5	31.0	31.1	31.2	31.0	31.6	30.8	31.4	31.3	30.8	31.2
66	11.3	31.2	31.6	30.8	38.8	30.6	30.4	30.9	30.6	30.6	30.8	31.0	31.0	31.4	31.8
	22.5	31.4	31.8	30.8	31.4	30.4	31.2	31.2	31.4	30.2	30.0	31.4	31.2	31.6	31.0
Mean		31.3	31.7	30.8	31.1	30.5	30.8	31.1	31.1	30.4	30.4	31.2	31.1	31.5	31.8
P	11.3	31.2	31.3	31.2	31.0	31.0	30.4	31.1	31.1	31.1	30.8	31.4	31.2	31.1	31.2
	22.5	31.4	31.7	31.1	30.6	30.5	31.0	31.1	30.9	38.9	30.4	31.2	31.1	31.2	31.0
Biofertilizers		31.3	31.5	31.2	30.8	30.8	31.0	31.1	31.1	31.0	30.6	31.3	31.2	31.7	31.1
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	N.S							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix. = Inoculation with a mixture of the four biofertilizers .

Table (14) : Staple length (50 %) as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		0	F	Bac.	Y	Ph.	Mix.	Mean	0	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	15.6	15.4	15.7	15.7	15.7	15.6	15.6	15.8	15.8	15.4	15.9	15.7	15.4	15.7
	22.5	15.7	15.8	15.7	15.0	15.4	15.5	15.5	15.3	15.8	15.4	15.6	15.7	15.4	15.5
Mean		15.7	15.6	15.7	15.4	15.6	15.6	15.6	15.6	15.8	15.4	15.8	15.7	15.4	15.6
66	11.3	15.7	15.8	15.5	15.4	15.4	15.2	15.5	15.4	15.3	15.5	15.6	15.5	15.7	15.6
	22.5	15.8	15.9	15.4	15.7	15.3	15.6	15.7	15.7	15.2	15.1	15.7	15.6	15.8	15.5
Mean		15.8	15.9	15.5	15.6	15.4	15.4	15.6	15.6	15.3	15.3	15.7	15.6	15.8	15.6
P	11.3	15.7	15.6	15.6	15.6	15.6	15.4	15.6	15.6	15.6	15.5	15.8	15.6	15.6	15.7
	22.5	15.8	15.9	15.6	15.4	15.4	15.6	15.7	15.5	15.5	15.3	15.7	15.7	15.6	15.5
Biofertilizers		15.8	15.8	15.6	15.5	15.5	15.5	15.6	15.6	15.6	15.4	15.8	15.7	15.6	15.6
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	N.S							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculanI isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (15) : Uniformity ratio(UR)as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	50.0	50.3	50.0	50.5	50.1	50.2	50.2	49.8	50.1	50.0	50.2	50.2	50.1	50.1
	22.5	50.4	50.1	50.0	50.2	50.1	50.3	50.2	50.2	50.3	50.1	50.2	50.4	50.0	50.2
Mean		50.2	50.2	50.0	50.4	50.1	50.3	50.2	50.0	50.2	50.1	50.2	50.3	50.1	50.2
66	11.3	50.4	50.0	50.2	50.1	50.3	50.1	50.2	50.1	50.1	50.2	50.2	50.1	50.0	50.1
	22.5	50.2	50.1	50.1	50.2	50.2	50.1	50.2	50.2	50.2	50.1	50.1	50.1	50.2	50.2
Mean		50.3	50.1	50.2	50.2	50.3	50.1	50.2	50.2	50.2	50.2	50.2	50.1	50.1	50.2
P	11.3	50.2	50.2	50.1	50.3	50.2	50.2	50.2	50.0	50.1	50.1	50.2	50.2	50.1	50.1
	22.5	50.3	50.1	50.1	50.2	50.2	50.2	50.2	50.2	50.3	50.1	50.2	50.3	50.1	50.2
Biofertilizers		50.3	50.2	50.1	50.3	50.2	50.2	50.2	50.4	50.2	50.2	50.2	50.2	50.1	50.2
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	N.S							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix. =Inoculation with a mixture of the four biofertilizers .

Table (16) : Fiber strength (Pressly Index) as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	9.1	9.2	9.3	9.1	9.2	9.2	9.2	9.4	9.3	9.6	9.5	9.4	9.3	9.4
	22.5	9.2	9.3	9.3	9.3	9.2	9.2	9.3	9.3	9.4	9.6	9.5	9.4	9.4	9.4
Mean		9.2	9.3	9.3	9.2	9.2	9.2	9.3	9.4	9.4	9.6	9.5	9.4	9.4	9.4
66	11.3	9.4	9.1	9.3	9.2	9.1	9.2	9.2	9.3	9.5	9.4	9.3	9.4	9.4	9.4
	22.5	9.1	9.3	9.2	9.3	9.4	9.3	9.3	9.4	9.3	9.3	9.4	9.3	9.4	9.4
Mean		9.3	9.2	9.3	9.3	9.3	9.3	9.3	9.4	9.4	9.4	9.4	9.4	9.4	9.4
P	11.3	9.3	9.2	9.3	9.2	9.2	9.2	9.2	9.4	9.4	9.5	9.4	9.4	9.4	9.4
	22.5	9.2	9.3	9.3	9.3	9.3	9.3	9.3	9.4	9.4	9.5	9.5	9.4	9.4	9.4
Biofertilizers		9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.4	9.4	9.5	9.5	9.4	9.4	9.4
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	N.S							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated frnm cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (17) : Fiber fineness (Micronire Reading) as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	4.6	4.5	4.3	4.6	4.4	4.4	4.4	4.3	4.2	4.6	4.5	4.3	4.4	4.4
	22.5	4.4	4.4	4.6	4.5	4.4	4.5	4.5	4.4	4.4	4.2	4.2	4.4	4.4	4.3
Mean		4.5	4.5	4.5	4.6	4.4	4.5	4.5	4.4	4.3	4.4	4.4	4.4	4.4	4.4
66	11.3	4.6	4.3	4.3	4.5	4.4	4.4	4.4	4.5	4.3	4.2	4.5	4.4	4.2	4.3
	22.5	4.3	4.4	4.4	4.3	4.3	4.4	4.3	4.4	4.5	4.3	4.4	4.3	4.5	4.4
Mean		4.5	4.4	4.4	4.4	4.4	4.4	4.4	4.5	4.4	4.3	4.5	4.4	4.3	4.4
P	11.3	4.6	4.4	4.3	4.6	4.4	4.4	4.4	4.4	4.3	4.4	4.5	4.4	4.3	4.4
	22.5	4.4	4.4	4.5	4.4	4.4	4.5	4.4	4.4	4.5	4.3	4.3	4.4	4.5	4.4
Biofertilizers		4.5	4.5	4.5	4.5	4.4	4.5	4.5	4.5	4.4	4.4	4.5	4.4	4.4	4.4
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	N.S							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

IV-4 Effect of fertilization programs on chemical contents of cotton seed

IV-4-1Effects on oil percentage

Table (18) show the mean percentage of oil in cotton seeds as affected by nitrogen, phosphorus and biofertilization and their interactions over the two seasons, 2000 and 2001.

The obtained data reveal that the three studied variables had no significant effect on oil percentage over the two seasons. The results obtained concided with those of by, Ghourab **et al.** (1995), Wassel **et al.** (2000) and Ismail **et al.** (2000) for nitrogen fertilization and Kamal **et al.** (1974), Hegab **et al.** (1983), Sawan **et al.** (1988), Saif El-Yazel (1990), Abd El Reheem **et al.** (1991) for phosphorus application. Whereas, Radwan (1998) stated that biofertilization increased oil percentage of cotton plant.

IV-4-2 Effects on protein percntage

Data presented in Table (19) show that increasing nitrogen levels from 33 to 66 kg/fed increased protein percentage from 21.1 to 22.7 and from 21.3 to 22.6% for 2000 and 2001 seasons, respectively. This may be attributed to the favourable effect of nitrogen on seed weight and thus affected the various constituents of seeds including protein percentage (El-Hamawi, 1977). These results are in harmony with those obtained by Darwish and Hegab (2000),Wassel **et al.** (2000), Abd El Shafy **et al.** (2001) and Radwan (1998).

Table (18) :Oil percentage in seed of cotton plant as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	23.7	23.5	23.6	23.6	23.7	23.5	23.6	23.7	23.6	23.5	23.6	23.7	23.6	23.6
	22.5	23.7	23.6	23.6	23.7	23.7	23.6	23.7	23.6	23.6	23.6	23.6	23.6	23.5	23.6
Mean		23.7	23.6	23.6	23.7	23.7	23.6	23.7	23.7	23.6	23.6	23.6	23.6	23.6	23.6
66	11.3	23.6	23.7	23.6	23.5	23.7	23.6	23.6	23.7	23.7	23.6	23.6	23.6	23.6	23.6
	22.5	23.5	23.6	23.5	23.6	23.5	23.6	23.6	23.6	23.6	23.5	23.7	23.6	23.6	23.6
Mean		23.6	23.7	23.6	23.6	23.6	23.6	23.6	23.7	23.7	23.6	23.7	23.6	23.6	23.6
P	11.3	23.7	23.6	23.6	23.6	23.7	23.6	23.6	23.7	23.7	23.6	23.6	23.7	23.6	23.6
	22.5	23.6	23.6	23.6	23.7	23.6	23.6	23.7	23.6	23.6	23.6	23.7	23.6	23.6	23.6
Biofertilizers		23.7	23.7	23.6	23.7	23.7	23.6	23.7	23.7	23.7	23.6	23.7	23.6	23.6	23.6
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	N.S							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (19) :Protein percentage in seed of cotton plant as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	20.7	21.0	21.2	21.0	20.9	21.5	21.1	20.3	21.3	21.2	21.0	20.7	21.5	21.0
	22.5	20.0	21.7	21.3	21.0	20.3	22.0	21.1	20.3	21.8	22.2	21.3	20.5	23.0	21.5
Mean		20.4	21.4	21.3	21.0	20.6	21.8	21.1	20.3	21.6	21.7	21.2	20.6	22.3	21.3
66	11.3	22.0	23.0	22.8	22.5	22.5	23.5	22.7	22.0	22.5	24.0	22.5	22.2	23.5	22.8
	22.5	21.7	22.9	23.0	22.6	22.0	32.5	22.6	20.3	23.7	22.8	22.8	20.7	24.5	22.4
Mean		21.9	23.0	22.9	22.6	22.3	32.5	22.7	21.2	23.1	23.4	22.5	21.5	24.0	22.6
P	11.3	21.4	22.0	22.0	21.8	21.7	22.5	21.9	21.2	21.9	22.6	22.8	21.5	22.5	21.9
	22.5	20.9	22.3	22.2	21.8	21.2	22.8	21.9	20.3	22.8	22.5	21.9	20.6	23.8	22.0
Biofertilizers		21.2	22.2	22.1	21.8	21.5	22.7	21.9	20.8	22.4	22.6	21.9	21.1	23.2	22.0
L.S.D 0.05	A	1.10							1.24						
	B	N.S							N.S						
	C	0.51							0.81						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Concerning phosphorus fertilization,data in Table (19) reveal that protein percentage was not affected by the addition of phosphorus .Similar results were obtained by Sawan **et al.** (1988) and Sabik (1997). On the other hand Abdel Reheem **et al.** (1991) found that protein percentage significantly increased by increasing phosphorus levels.

With regard to biofertilization, the data in the same Table (19) show that biofertilizers increased protein percentage as compared with uninoculation treatment (control) The difference in protein percentage between control and those treated with mixed biofertilizer, Bac., F. as well as yeast was significant. The highest values of protein percentage were obtained by the using mixture of the four biofertilizers . Whereas, the phosphorine biofertilizer failed to exert any significant increase in protein content as compared to control .These results are in a good agreement with those obtained by Radwan (1998).

IV-5 Effect of fertilization programs on nutrients content in plant and soil

IV-5-1 Effects on plant accumulation of nutrients

Data in Tables (from 20 to 26) show the effect of nitrogen, phosphorus and some biofertilizers application on nutrients content in cotton plants.

Data reveal that nitrogen and phosphorus contents were significantly affected by nitrogen application in the two growing seasons, while K , Fe, Mn, Zn and Cu contents did

Table (20) : Nitrogen content (%) as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	3.4	4.0	4.1	3.7	3.5	4.3	3.8	3.4	4.0	4.0	3.9	3.6	4.1	3.8
	22.5	3.4	4.0	4.0	3.6	3.5	4.1	3.8	3.5	3.9	3.9	3.7	3.6	4.0	3.8
Mean		3.4	4.0	4.1	3.7	3.5	4.2	3.8	3.5	4.0	4.0	3.8	3.6	4.1	3.8
66	11.3	3.7	4.2	4.2	3.8	3.7	4.5	4.0	3.5	4.2	4.1	3.9	3.8	4.4	4.0
	22.5	3.5	4.3	4.2	3.7	3.7	4.5	4.0	3.6	4.1	4.1	3.9	3.9	4.4	4.0
Mean		3.6	4.3	4.2	3.8	3.7	4.5	4.0	3.6	4.2	4.1	3.9	3.9	4.4	4.0
P	11.3	3.6	4.1	4.2	3.7	3.6	4.4	3.9	3.5	4.1	4.1	3.9	3.8	4.3	3.9
	22.5	3.5	4.2	4.1	3.7	3.6	4.3	3.9	3.6	4.1	4.0	3.8	3.8	4.2	3.9
Biofertilizers		3.6	4.2	4.2	3.7	3.6	4.4	3.9	3.6	4.1	4.1	3.9	3.8	4.3	3.9
L.S.D 0.05	A	0.19							0.18						
	B	N.S							N.S						
	C	0.14							0.27						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix. =Inoculation with a mixture of the four biofertilizers .

Table (21) :P content (%) as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	0.18	0.19	0.19	0.20	0.21	0.21	0.20	0.17	0.18	0.19	0.20	0.20	0.23	0.20
	22.5	0.21	0.22	0.22	0.24	0.24	0.25	0.23	0.21	0.22	0.23	0.23	0.24	0.25	0.23
Mean		0.20	0.21	0.21	0.22	0.23	0.23	0.22	0.19	0.20	0.21	0.22	0.22	0.24	0.22
66	11.3	0.20	0.21	0.21	0.22	0.23	0.24	0.22	0.20	0.21	0.21	0.22	0.23	0.24	0.22
	22.5	0.28	0.21	0.21	0.28	0.28	0.28	0.24	0.20	0.21	0.22	0.27	0.28	0.29	0.25
Mean		0.20	0.21	0.21	0.25	0.26	0.26	0.23	0.28	0.21	0.22	0.25	0.26	0.27	0.24
P	11.3	0.19	0.20	0.20	0.21	0.22	0.23	0.21	0.19	0.20	0.20	0.21	0.22	0.24	0.24
	22.5	0.21	0.22	0.22	0.26	0.26	0.27	0.24	0.21	0.22	0.23	0.25	0.26	0.27	0.24
Biofertilizers		0.20	0.21	0.21	0.24	0.25	0.25	0.23	0.28	0.21	0.22	0.24	0.24	0.26	0.23
L.S.D 0.05	A	0.003							0.008						
	B	0.002							0.005						
	C	0.005							0.01						
	AXB	0.004							N.S						
	AXC	0.008							0.014						
	BXC	0.008							0.014						
	AXBXC	0.011							0.01						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (22) : K content (%) as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	2.0	2.3	1.9	1.7	2.1	2.0	2.0	1.8	1.2	2.2	1.4	2.0	1.9	1.8
	22.5	1.7	2.3	2.5	1.5	2.1	2.6	2.1	1.8	2.2	2.1	2.0	1.2	2.0	1.9
Mean		1.9	2.3	2.2	1.6	2.1	2.3	2.1	1.8	1.7	2.2	1.7	1.6	2.0	1.9
66	11.3	1.8	2.4	1.9	2.0	1.7	2.0	2.0	1.7	2.1	1.7	1.6	1.9	1.7	1.9
	22.5	1.8	2.2	2.1	2.0	1.9	2.1	2.0	1.6	1.9	2.0	1.9	1.7	2.0	1.9
Mean		1.8	2.3	2.0	2.0	1.8	2.1	2.0	1.7	2.0	1.9	1.8	1.8	1.9	1.9
P	11.3	1.9	2.4	1.9	1.9	1.9	2.0	2.0	1.0	1.7	2.0	1.5	2.0	1.8	1.8
	22.5	1.6	2.3	2.3	1.8	2.0	2.4	2.1	1.7	2.1	2.1	2.0	1.5	2.0	1.9
Biofertilizers		1.9	2.3	2.1	1.8	2.0	2.2	2.1	1.8	1.9	2.1	1.8	1.7	2.0	1.9
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.18							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (23) :Fe content (µg/g) as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	98.0	115.0	120.4	126.5	130.0	133.5	120.6	87.5	110.5	116.0	117.0	120.9	126.4	113.1
	22.5	100.6	113.2	117.2	125.0	127.5	130.0	118.9	84.7	99.3	100.5	123.9	124.8	132.9	111.0
Mean		99.3	114.1	118.8	125.8	128.8	131.8	119.8	86.1	104.9	108.3	120.7	122.9	129.7	112.1
66	11.3	95.0	96.0	100.5	119.7	121.3	125.0	109.6	91.6	107.8	102.3	110.3	119.3	122.4	109.0
	22.5	90.3	110.5	115.0	109.5	110.0	117.0	108.7	92.9	95.8	101.4	111.5	112.4	115.1	104.9
Mean		92.7	103.3	107.8	114.6	115.7	121.0	109.2	92.3	101.8	101.9	110.9	115.9	118.8	107.0
P	11.3	96.5	112.8	117.7	123.1	125.7	129.3	117.5	89.6	109.2	109.9	113.9	120.1	124.4	111.1
	22.5	95.5	104.6	108.9	117.3	118.8	123.5	111.4	88.8	97.6	101.0	117.7	118.6	124.0	108.0
Biofertilizers		96.0	108.7	113.3	120.2	122.3	126.4	114.5	89.2	103.4	105.1	115.8	119.4	124.3	109.6
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	9.08							7.07						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (24) MN content(µg/g)as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	125.0	135.0	133.0	140.0	144.0	150.0	137.8	127.5	136.0	138.5	143.0	148.0	154.0	141.2
	22.5	130.0	134.0	136.0	142.0	143.0	147.0	138.7	125.0	126.0	130.0	136.5	140.5	141.0	133.2
Mean		127.5	134.5	134.5	141.0	143.5	148.5	138.3	126.3	131.0	134.3	139.8	144.3	147.5	137.2
66	11.3	132.0	135.0	137.0	144.0	148.0	155.0	141.8	129.0	130.5	132.5	138.5	139.5	149.5	136.6
	22.5	128.0	133.0	135.0	141.0	145.0	148.0	138.3	129.0	129.0	133.0	137.0	139.3	140.5	134.6
Mean		130.0	134.0	136.0	142.5	146.5	151.5	140.1	129.0	129.8	132.8	137.8	139.4	145.0	135.6
P	11.3	128.5	135.0	135.0	142.0	146.0	152.5	139.8	128.3	133.3	135.5	140.8	143.8	151.8	138.9
	22.5	129.0	133.5	135.5	141.5	144.0	147.0	138.5	127.0	127.5	131.5	136.8	139.9	140.8	133.9
Biofertilizers		128.8	134.3	135.3	141.8	145.0	148.0	139.2	127.7	130.4	133.6	138.8	141.9	136.3	136.4
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	4.28							10.7						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (25) : Zn content (µg/g) as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	66.0	67.0	70.0	73.0	77.0	78.0	71.8	68.0	68.0	69.0	74.5	80.0	80.0	73.3
	22.5	63.0	70.0	71.0	76.0	79.0	80.0	73.2	60.0	73.0	77.0	78.0	81.5	82.0	75.3
Mean		64.5	68.5	70.5	74.5	78.0	79.0	72.5	64.0	70.5	73.0	76.3	80.8	81.0	74.3
66	11.3	60.0	65.0	67.0	70.0	72.0	74.0	68.0	62.5	66.0	71.0	72.0	75.0	78.0	70.8
	22.5	62.0	68.0	67.0	72.0	75.0	77.0	70.2	61.8	65.0	65.0	68.7	78.5	81.5	70.1
Mean		61.0	66.5	67.0	71.0	73.5	75.5	69.1	62.2	65.5	68.0	70.4	76.8	79.8	70.5
P	11.3	63.0	66.0	68.5	71.5	74.5	76.0	69.9	65.8	67.0	70.0	73.3	77.5	79.0	72.1
	22.5	62.5	69.0	69.0	74.0	77.0	78.5	71.7	60.9	69.0	71.0	73.4	80.0	81.8	72.7
Biofertilizers		62.6	67.5	68.8	72.8	75.8	77.3	70.8	63.1	68.0	70.5	73.4	78.8	80.4	72.4
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	4.5							1.7						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine
Mix.= Inoculation with a mixture of the four biofertilizers

Table (26) : Cu content (µg/g) as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	11.3	12.5	12.2	13.3	13.4	14.2	12.8	12.3	13.0	12.8	13.5	13.4	14.5	13.3
	22.5	12.1	12.5	12.8	13.3	13.7	14.5	13.2	12.7	13.0	13.1	14.0	13.7	14.8	13.6
Mean		11.7	12.5	12.5	13.3	13.6	14.4	13.0	12.5	13.0	13.0	13.8	13.6	14.7	13.5
66	11.3	11.7	12.0	12.7	13.5	13.8	14.3	13.0	12.0	13.7	13.7	14.3	14.7	15.0	13.9
	22.5	12.0	12.7	13.0	13.5	14.1	14.5	13.3	12.2	13.0	13.5	14.0	14.0	15.0	13.6
Mean		11.9	12.4	12.9	13.5	14.0	14.4	13.2	12.2	13.4	13.6	14.2	14.4	15.0	13.8
P	11.3	11.5	12.3	12.5	13.4	13.6	14.3	12.9	12.2	13.4	13.3	13.9	14.1	14.6	13.6
	22.5	12.1	12.6	12.9	13.4	13.9	14.5	13.2	12.5	13.0	13.3	14.0	13.9	14.9	13.6
Biofertilizers		11.8	12.5	12.7	13.4	13.8	14.4	13.1	12.3	13.2	13.3	14.0	14.0	14.9	13.7
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.9							0.9						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

not affected by it.The highest values for N and P contents were occurred in plants fertilized with 66 kg N/fed. On the other hand, plants received 33 kg N/fed exerted the lowest N and P contents. These results are in accordance with those obtained by Hiremath and Hunsigi (1995), Sawan **et al.** (1997) and Khalil (1998) for nitrogen content and Halevy **et al.** (1987) and Vireshwar (1988) for phosphorus content.

Regarding the phosphorus application, data in the previous Tables (20-26) show that increasing phosphorus levels significantly increased the phosphorus content only in cotton plant, while the other nutrients were not affected. These results are in a agreement with those obtained by Abadir (1987) and Sawan **et al.** (1997) who found that P content and uptake increased with increasing P application.

Concerning the effect of biofertilization data show that biofertilization treatments singnificantly increased all studied macro and micronutrients with an exception of potassium content during the second season. These nutrients increased by using biofertilizers as compared with the control. In general, it seems that all biofertilizer treatments enhanced the nutrients taken up by cotton plant. The highest values for of nutrients contents were recorded for the cotton plants received the mixture of the four biofertilizers,while plants not received biofertilizers exerted the lowest nutrients content . Feibo- Wu and Omar (1998) attributed the effect of Bacillus polymyxa and other inoculants on enhancement nitrogen uptake and consequently improve of nitrogenase and dehydrogenase activities. On the other hand Arshad and

Frankenberger (1989) referred the effect of yeast on the basis of its capability to produce ethylene in the rhizosphere of plant which enhances plant roots distribution, which consequently improved the nutrients uptake. Moreover, Sobh, et al (2000) attributed the positive effect of phosphorine inoculation on the accumulation of P by cotton plant to the ability of plants to absorb their P-requirements which furnished by phosphorus solubilizing bacteria contained in phosphorine and its effect in increasing the availability of other nutrients for cotton plants . Similar results were obtained by Prathibha **et al.** (1995) for nitrogen and phosphorus in cotton plant; Feibo, Wu and Omar (1998) for nitrogen Radwan (1998) for nitrogen and phosphorus in cotton plant; Hamissa **et al.** (2000) for nitrogen and potassium and Sobh **et al.** (2000) for phosporus and other nutrients in cotton plant.

With regard to the interactive effects of the studied variables, the obtained data reveal that the interaction between any two of three studied variables or among them on nutrient contents were insignificant in the both growing seasons, except for phosphorus concentration. In genrl, plants fertilized with the high levels of the two mineral fertilizers (66kg N/fed. and 22.5kg P_2O_5/fed.) and inocunlated with the mixture of the four biofertilizers recorded the highest value of phosphorus content in plant . On the other hand the plants received low levels of nitrogen and phosphorus ,i.e.33 and 11.3 kg N and P_2O_5/fed , respectively and not received without biofertilizers showed the lowest value of phosphorus content .

IV-5-2 Effects on soil available nutrients

Data presented in tables (from 27-47) show the inflnence of nitrogen and phosphorus levels as well as biofertilizers application on some soil available nutrients ,i.e. N, P, K, Fe, Mn, Zn and Cu at the three growth stages of cotton plant (at 45 ,60 and 75 days after planting).

Concerning the effect of nitrogen fertilization, the obtained results indicate that nitrogen rates exhibited significantly effect positive on soil available nitrogen at the studied three stages. The highest soil available nitrogen was recorded for the plots fertilized with the high nitrogen fertilizer level (66 kg N/fed) , while plants supplied with low nitrogen level showed the lowest yield of soil available nitrogen values at the studied stages .It is logically to noticed that the values of soil available nitrogen at 45 days from sowing (after application of the first dose of nitrogen fertilizer) were greater than the initial soil available nitrogen before planting (Table ,1) .Also ,soil available nitrogen at 60 days (after added the second nitrogen fertilizer dose) was higher than at the first stage (at 45 days), then it decreased at 75 days after planting (15 days later the second stage). On the other hand, the other soil availble nutrients , i.e. P, K, Fe, Mn, Zn and Cu were not significantly affected by nitrogen fertilization in both seasons. Similer results arc obtained by Ike (1987) who found that nitrogen fertilization did not affect the nutrients distribution in any soil depth.

Table (27) :Soil available N (µg/g) after 45 days as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	12.5	18.2	18.8	13.0	13.3	20.0	16.0	12.0	18.0	18.6	12.8	12.8	19.6	15.6
	22.5	12.5	18.1	18.6	13.2	13.5	20.1	16.0	12.2	18.2	18.2	12.6	12.6	20.1	15.7
Mean		12.5	18.2	18.7	13.1	13.4	20.1	16.0	12.1	18.1	18.4	12.7	12.7	19.9	15.7
66	11.3	14.0	19.8	20.1	15.0	15.5	20.0	17.7	13.7	19.5	20.0	15.0	15.0	21.5	17.5
	22.5	14.1	19.7	20.2	15.2	15.3	21.6	17.7	13.6	19.5	20.2	15.0	15.3	21.2	17.5
Mean		14.1	19.8	20.2	15.1	15.4	21.8	17.7	13.7	19.5	20.1	15.0	15.2	21.4	17.5
P	11.3	13.3	19.0	19.5	14.0	14.4	21.0	16.9	12.9	18.8	19.3	13.9	13.9	20.6	16.6
	22.5	13.3	18.9	19.4	14.2	14.4	20.9	16.9	12.9	18.9	19.2	13.8	14.0	20.7	16.6
Biofertilizers		13.3	19.0	19.5	14.1	14.4	21.0	16.9	12.9	18.9	19.3	13.9	14.0	20.7	16.6
L.S.D 0.05	A	0.98							1.63						
	B	N.S							N.S						
	C	1.05							1.32						
	AXB	N.S							N.S						
	AXC	1.48							1.87						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (28) : Soil available N (µg/g) after 60 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	13.6	18.8	19.9	15.5	15.0	20.8	17.2	12.5	17.5	18.0	16.5	15.0	20.0	16.6
	22.5	13.5	18.4	20.3	15.4	15.3	20.7	17.3	12.6	17.1	17.8	16.6	15.1	19.6	16.5
Mean		13.6	18.6	19.9	15.5	15.2	20.8	17.3	12.3	17.8	17.9	16.6	15.1	19.8	16.6
66	11.3	15.0	20.0	20.5	16.0	16.0	21.6	18.2	14.3	19.0	19.5	18.0	17.5	21.5	18.6
	22.5	15.0	19.8	21.3	16.3	15.8	21.3	18.2	14.3	19.3	19.3	17.8	18.3	21.5	18.5
Mean		15.0	19.9	20.9	16.2	15.9	21.5	18.2	14.3	19.2	19.4	17.9	17.9	21.5	18.6
P	11.3	14.2	19.4	20.0	15.8	15.5	20.2	17.7	13.4	18.3	18.8	17.3	16.3	28.8	17.6
	22.5	14.3	19.1	20.8	15.9	15.6	21.0	17.8	13.5	18.2	18.6	17.2	16.7	20.6	17.5
Biofertilizers		14.3	19.3	20.4	15.9	15.6	21.6	17.8	13.5	18.3	18.7	17.3	16.5	20.7	817.6
L.S.D 0.05	A	0.51							0.71						
	B	N.S							N.S						
	C	1.54							1.10						
	AXB	N.S							N.S						
	AXC	1.02							0.98						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (29) : Soil available N (µg/g) after 75 days as affected by application of N,P and biofertilizers (C)

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	12.7	18.6	18.9	13.5	13.5	20.3	16.3	12.3	18.0	18.2	13.3	13.1	20.0	15.8
	22.5	12.8	18.4	18.6	14.0	13.1	20.2	16.2	12.5	18.2	18.0	13.0	13.2	20.3	15.9
Mean		12.8	18.5	18.8	13.8	13.3	20.3	16.3	12.4	18.1	18.1	13.2	13.2	20.2	15.9
66	11.3	14.1	19.9	20.1	15.0	15.3	22.5	17.8	13.9	19.5	20.1	14.8	15.0	21.6	17.5
	22.5	14.3	20.0	20.1	15.1	15.4	22.6	17.9	13.6	19.7	19.8	14.6	15.1	21.7	17.4
Mean		14.2	20.0	20.1	15.1	15.4	22.6	17.9	13.8	19.6	20.0	14.7	15.1	21.7	17.5
P	11.3	13.4	19.3	19.5	14.3	14.4	21.4	17.1	13.1	18.8	19.2	14.1	14.1	20.8	16.7
	22.5	13.6	19.2	19.4	14.6	14.3	21.4	17.1	13.1	19.0	18.9	13.8	14.2	21.0	16.7
Biofertilizers		13.5	19.3	19.5	14.5	14.4	21.4	17.1	13.1	19.9	19.1	14.0	14.2	20.9	16.7
L.S.D 0.05	A	0.75							0.39						
	B	N.S							N.S						
	C	1.11							1.30						
	AXB	N.S							N.S						
	AXC	1.57							1.84						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (30) : Soil available P (µg/g) after 45 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	16.8	18.9	19.0	19.2	19.4	20.7	19.3	15.7	16.2	15.8	16.1	16.4	16.5	16.1
	22.5	20.5	21.1	22.1	22.2	22.5	23.0	21.9	18.8	19.0	19.0	19.3	19.5	20.7	19.4
Mean		19.6	20.0	20.6	20.7	21.0	21.9	20.6	17.3	17.6	17.4	17.7	18.0	18.6	17.8
66	11.3	19.0	19.2	19.1	19.5	20.1	21.1	19.7	15.5	16.8	16.8	17.0	17.0	17.2	16.7
	22.5	22.2	22.4	22.3	22.5	22.6	23.5	22.6	19.0	19.2	19.1	19.7	20.2	21.1	19.7
Mean		20.6	20.8	20.7	21.0	21.4	22.3	21.2	17.3	18.0	18.0	18.4	18.6	19.2	18.2
P	11.3	18.8	19.1	19.1	19.4	19.6	20.9	19.5	15.6	16.5	16.3	16.6	16.7	16.9	16.4
	22.5	21.4	21.8	22.2	22.4	22.6	23.3	22.3	18.9	19.1	19.1	19.5	19.9	20.9	19.6
Biofertilizers		20.1	20.4	20.7	20.9	21.2	22.1	20.9	17.3	17.8	17.7	18.1	18.3	18.9	18.0
L.S.D 0.05	A	N.S							N.S						
	B	0.66							0.56						
	C	N.S							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (31) : Soil available P (µg/g) after 60 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	17.4	17.6	17.7	17.9	18.2	19.0	18.0	14.8	15.2	14.9	15.3	15.8	16.0	15.3
	22.5	19.6	20.0	20.9	21.1	21.6	21.9	20.9	18.0	18.3	18.1	18.5	19.0	19.5	18.6
Mean		18.5	18.8	19.3	19.5	19.9	20.5	19.5	16.4	16.8	16.5	16.9	17.4	17.8	17.0
66	11.3	17.8	18.2	18.0	18.4	19.2	20.0	18.6	14.4	15.8	15.6	15.8	16.0	16.3	15.7
	22.5	20.8	21.3	21.4	21.5	21.8	22.1	21.5	18.1	18.3	18.2	18.6	19.3	20.2	18.8
Mean		19.3	19.8	19.7	20.0	20.5	21.1	20.1	16.3	17.1	16.9	17.2	17.7	18.3	17.3
P	11.3	17.6	17.9	17.9	18.2	18.7	19.5	18.3	14.6	15.5	15.3	15.6	15.9	16.2	15.5
	22.5	20.2	20.7	21.2	21.3	21.7	22.0	21.2	18.1	18.3	18.2	18.6	19.2	19.9	18.7
Biofertilizers		18.9	19.3	19.5	19.8	20.2	20.6	19.8	16.4	17.0	16.7	17.1	17.6	18.1	17.2
L.S.D 0.05	A	N.S							N.S						
	B	0.65							0.58						
	C	0.99							0.85						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (32) : Soil available P (µg/g) after 75 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (c)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	16.3	16.6	16.7	16.8	17.1	17.7	16.9	13.8	14.1	14.0	14.1	14.6	15.1	14.3
	22.5	18.3	18.8	19.4	19.5	20.1	20.5	19.4	17.1	17.2	17.3	17.4	17.8	18.1	17.5
Mean		17.3	17.7	18.2	18.2	18.6	19.1	18.2	15.5	15.7	15.7	15.8	16.2	16.6	15.9
66	11.3	16.4	16.8	16.6	17.0	17.8	18.5	17.2	13.8	14.4	14.6	14.8	15.2	15.5	14.7
	22.5	19.4	19.9	20.0	20.1	20.4	20.7	20.1	17.3	17.7	17.5	17.8	18.4	19.4	18.0
Mean		17.9	18.4	18.3	18.6	19.1	19.6	18.7	15.6	16.0	16.1	16.3	16.8	17.5	16.4
P	11.3	16.4	16.7	16.7	16.9	17.5	18.1	17.1	13.8	14.3	14.3	14.5	14.9	15.3	14.5
	22.5	18.9	19.4	19.4	19.8	20.3	20.6	19.8	17.2	17.4	17.4	17.6	18.1	18.8	17.8
Biofertilizers		17.6	18.1	18.1	18.4	18.9	19.4	18.5	15.6	15.9	15.9	16.1	16.5	17.1	16.2
L.S.D 0.05	A	N.S							N.S						
	B	0.71							0.35						
	C	0.87							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inocutation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (33) : Soil available K (µg/g) after 45 days as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	440.0	389.5	379.9	398.6	352.9	359.0	385.8	443.3	388.0	384.4	401.9	357.5	365.9	390.2
	22.5	357.2	379.5	375.2	409.2	352.3	445.3	386.5	360.7	383.8	378.5	415.8	360.0	449.6	391.4
Mean		398.6	382.0	377.6	403.9	352.6	402.2	386.2	402.0	385.9	381.5	408.9	358.8	407.8	390.8
66	11.3	366.0	398.3	326.7	369.2	364.5	378.3	368.7	363.3	335.2	405.0	367.0	370.9	395.0	372.7
	22.5	413.1	417.7	420.2	367.3	372.4	409.2	400.1	417.0	421.3	426.0	371.5	365.9	417.4	403.2
Mean		389.6	408.0	373.5	368.5	368.5	398.3	384.4	390.2	378.3	415.5	369.3	368.4	406.2	388.0
P	11.3	403.0	391.4	353.3	383.9	358.7	373.2	377.3	403.3	361.6	394.7	384.5	364.2	380.5	381.5
	22.5	385.2	398.6	397.7	388.5	362.4	427.3	393.3	388.9	402.6	402.3	393.7	363.0	433.5	397.3
Biofertilizers		394.1	395.0	375.6	386.2	360.6	400.3	385.3	396.1	382.1	398.5	389.1	363.6	407.0	389.4
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	N.S							31.4						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							62.28						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (34) : Soil available K (µg/g) after 60 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	429.3	390.0	409.5	415.3	401.6	416.9	410.4	420.2	379.8	400.3	408.2	392.9	407.1	401.4
	22.5	389.2	410.5	393.9	390.2	370.5	501.0	409.2	383.7	388.3	402.5	385.5	361.4	489.2	401.8
Mean		409.3	400.3	401.7	402.8	386.1	459.0	409.8	402.0	384.1	401.4	396.9	377.2	448.2	401.6
66	11.3	398.5	381.0	365.0	335.9	445.5	418.3	390.7	392.2	372.0	353.3	325.3	437.2	403.9	380.7
	22.5	362.8	407.0	418.9	375.4	440.5	479.0	413.9	356.1	399.6	411.0	361.8	536.3	464.8	421.6
Mean		380.7	394.0	392.0	355.7	443.0	448.7	402.3	374.2	385.8	382.2	343.6	486.8	434.4	401.2
P	11.3	413.9	385.5	387.3	375.6	423.6	417.6	400.6	406.2	375.9	376.8	366.8	415.1	405.5	391.1
	22.5	376.0	408.8	406.4	382.8	405.5	490.0	411.6	369.9	394.0	406.8	373.7	448.9	477.0	414.7
Biofertilizers		395.0	397.2	396.9	379.3	414.6	453.9	406.1	388.1	385.0	391.8	370.3	432.0	441.3	401.4
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	32.39							N.S						
	AXB	N.5							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four binfertilizers .

Table (35) : Soil available K (µg/g) after 75 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	420.5	380.0	340.9	345.3	380.0	492.6	393.2	416.7	326.0	372.0	331.7	372.8	486.4	384.3
	22.5	349.5	350.0	325.9	330.6	351.0	365.3	345.4	343.7	342.2	313.7	316.1	346.2	350.8	335.5
Mean		385.0	365.0	333.4	338.0	365.5	429.0	368.8	380.2	334.1	342.9	323.9	359.5	418.6	359.9
66	11.3	373.0	378.5	315.5	354.9	325.3	353.0	350.0	366.3	369.6	289.6	349.0	318.6	337.7	282.2
	22.5	325.0	420.5	365.9	320.6	389.7	448.2	378.3	316.5	408.9	353.0	305.9	375.9	435.1	365.9
Mean		349.0	399.5	340.7	337.8	357.5	400.6	364.2	314.4	389.3	321.3	327.5	374.3	386.4	352.2
P	11.3	396.8	379.2	328.2	350.1	352.7	422.8	371.7	391.5	347.8	330.8	340.4	345.7	412.1	361.4
	22.5	337.3	385.3	345.9	325.6	370.4	406.8	361.9	330.1	375.6	333.4	311.0	361.1	393.0	350.7
Biofertilizers		367.0	382.3	337.1	337.9	361.5	414.8	366.5	360.8	361.7	332.1	325.7	353.4	402.5	356.1
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	32.96							25.1						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (36) : Soil available Fe(µg/g) after 45 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	7.5	8.2	8.5	8.9	9.3	9.3	8.6	7.2	7.9	7.2	8.2	8.6	9.5	8.1
	22.5	8.0	8.3	8.3	8.6	8.8	10.5	8.8	7.5	7.9	8.0	8.4	10.0	10.1	8.7
Mean		7.9	8.3	8.4	8.9	9.1	9.9	8.7	7.4	7.9	7.6	8.3	9.3	9.8	8.4
66	11.3	7.5	8.3	9.8	9.5	9.5	18.8	9.0	7.1	7.7	8.4	8.9	9.0	10.5	8.6
	22.5	7.5	8.0	8.3	9.5	8.9	9.5	8.6	7.6	7.8	8.3	8.4	8.5	8.5	8.2
Mean		7.5	8.2	8.7	9.5	9.2	9.8	8.8	7.4	7.8	8.4	8.7	8.8	9.5	8.4
P	11.3	7.5	8.3	8.8	9.2	9.4	9.7	8.8	7.2	7.8	7.8	8.6	8.8	10.8	8.4
	22.5	7.8	8.2	8.3	9.1	8.9	10.8	8.7	7.6	7.9	8.2	8.4	9.3	9.3	8.5
Biofertilizers		7.7	8.3	8.6	9.2	9.7	9.9	8.8	7.4	7.9	8.8	8.5	9.1	9.7	8.5
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	8.64							0.69						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (37) : Soil available Fe (µg/g) after 60 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Onc.	Y	Ph.	Mix.	Mean
33	11.3	8.0	8.7	9.0	9.7	10.2	10.3	9.3	11.1	11.2	12.0	12.0	13.0	13.1	12.1
	22.5	8.1	8.9	8.8	9.4	9.6	11.0	9.3	11.5	12.0	12.0	12.4	12.9	13.0	12.3
Mean		8.1	8.8	8.9	9.6	9.9	10.7	9.3	11.3	11.6	12.0	12.2	13.0	13.1	12.2
66	11.3	8.2	8.8	9.5	10.2	10.3	11.0	9.7	11.0	11.7	12.0	13.4	13.5	13.6	12.5
	22.5	8.3	9.1	9.4	10.3	10.6	11.2	9.8	11.4	11.7	11.9	12.0	12.1	12.2	11.9
Mean		8.3	9.0	9.5	10.3	10.5	11.1	9.8	11.2	11.7	12.0	12.7	12.8	12.9	12.2
P	11.3	8.1	8.8	9.3	10.0	10.3	10.7	9.5	11.1	11.6	12.0	12.7	13.3	13.4	12.3
	22.5	8.2	9.0	9.1	9.9	10.1	11.1	9.6	11.5	11.9	12.0	12.2	12.5	12.6	12.1
Biofertilizers		8.4	8.9	9.2	10.0	10.2	10.9	9.6	11.3	11.7	12.0	12.5	12.9	13.0	12.2
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.43							0.57						
	AXO	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (38) : Soil available Fe (µg/g) after 75 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	8.5	9.2	9.5	10.5	11.0	11.2	10.0	6.3	9.7	9.6	11.3	11.7	11.7	10.1
	22.5	8.1	9.5	9.2	10.1	10.4	11.5	9.8	7.6	9.0	8.7	9.2	11.0	11.6	9.5
Mean		8.3	9.4	9.4	10.3	10.7	11.4	9.9	7.0	9.4	9.2	10.3	11.4	11.7	9.8
66	11.3	8.3	8.7	9.5	10.3	10.5	11.4	9.8	8.0	8.4	9.6	9.8	10.0	10.3	9.4
	22.5	8.5	9.7	10.0	10.3	11.6	12.4	10.6	8.5	9.3	9.5	10.8	11.1	11.3	10.1
Mean		8.4	9.2	9.8	10.8	11.1	11.9	10.2	8.3	8.8	9.6	10.3	10.6	10.8	9.8
P	11.3	8.4	9.0	9.5	10.4	10.8	11.3	9. 9	7.2	9.1	9.6	10.6	10.9	11.0	9.8
	22.5	8.3	8.6	9.6	10.7	11.0	12.0	9.2	8.1	9.2	9.1	10.0	11.1	11.5	9.8
Biofertilizers		8.4	8.8	9.6	10.6	10.9	11.7	9.6	7.7	9.2	9.4	10.3	11.0	11.3	9.8
L.S.D at 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.77							0.74						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (39) : Soil available Mn (µg/g) after 45 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	9.0	10.5	11.0	11.8	12.5	13.8	11.4	8.8	9.8	9.8	10.4	12.8	13.6	10.7
	22.5	8.8	9.5	10.0	11.0	11.5	12.8	10.6	8.1	8.6	8.8	10.9	11.1	11.2	9.8
Mean		8.9	10.0	10.5	11.4	12.0	13.3	11.0	8.1	9.2	9.3	10.7	12.0	12.4	10.3
66	11.3	8.5	10.5	11.3	12.7	13.5	14.1	11.8	7.8	9.3	9.2	10.4	12.6	13.3	10.4
	22.5	9.5	10.7	11.5	12.0	13.0	13.8	11.8	8.5	11.1	10.2	11.1	12.2	12.6	11.0
Mean		9.0	10.6	11.4	12.4	13.3	14.0	11.8	8.2	10.2	9.7	10.8	12.4	13.0	10.7
P	11.3	8.8	10.5	11.2	12.3	13.0	14.0	11.6	7.9	9.6	9.5	10.4	12.7	13.5	10.6
	22.5	9.2	10.0	10.8	11.5	12.3	13.3	11.2	8.3	9.9	9.5	11.0	11.7	11.9	10.4
Biofertilizers		9.0	10.3	11.0	11.9	12.7	13.7	11.4	8.2	9.7	9.5	10.8	12.2	12.7	10.5
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.9							0.7						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (40) : Soil available Mn (µg/g) after 60days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	10.0	11.5	12.2	13.1	13.7	14.6	12.5	12.8	13.5	13.7	13.7	13.8	14.5	13.7
	22.5	9.7	10.8	11.4	12.3	13.1	14.4	11.9	12.4	13.9	13.3	14.8	15.0	15.4	14.1
Mean		9.9	11.2	11.8	12.7	13.4	14.5	12.2	12.6	13.7	13.5	14.3	14.4	15.0	13.9
66	11.3	10.0	11.8	12.0	13.2	14.0	14.4	12.6	12.1	12.3	12.2	12.8	15.5	16.1	13.5
	22.5	9.8	11.1	12.0	12.9	13.6	14.4	12.3	13.4	13.4	13.6	13.7	14.1	14.3	13.8
Mean		9.9	11.5	12.0	13.1	13.8	14.4	12.5	12.8	12.9	12.9	13.3	14.8	15.2	13.7
P	11.3	10.0	11.7	12.1	13.2	13.7	14.5	12.5	12.5	12.9	13.0	13.3	14.7	15.3	13.6
	22.5	9.7	11.0	11.7	12.6	13.4	14.4	12.2	12.9	13.7	13.5	14.3	14.6	14.9	14.0
Biofertilizers		9.9	11.4	11.9	12.9	13.6	14.5	12.4	12.7	13.3	13.2	13.8	14.6	15.1	13.0
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.4							0.1						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (41) : Soil available Mn (µg/g) after 75days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	11.0	12.5	13.3	14.5	14.9	15.5	13.6	10.0	12.1	11.6	12.3	12.4	12.5	11.8
	22.5	10.7	12.0	12.7	13.5	14.7	16.0	13.3	9.9	10.8	10.9	11.1	12.5	14.2	11.6
Mean		10.9	12.3	13.0	14.0	14.0	15.0	13.5	10.0	11.5	11.3	11.7	12.5	13.4	11.7
66	11.3	11.5	13.0	12.7	13.8	14.5	14.7	13.4	10.9	12.4	11.6	12.5	12.7	12.7	12.1
	22.5	10.0	11.5	12.5	13.8	14.3	15.1	12.9	9.6	9.6	13.1	13.1	13.3	13.6	12.1
Mean		10.8	12.3	12.6	13.8	14.4	14.9	13.1	10.3	11.0	12.4	12.8	13.0	13.2	12.1
P	11.3	11.3	12.8	13.0	14.2	14.7	15.1	13.5	10.5	12.3	11.6	12.4	12.6	12.6	12.0
	22.5	10.4	11.0	12.6	13.7	14.5	15.6	13.1	9.8	10.2	12.0	12.1	12.9	13.9	11.8
Biofertilizers		10.9	12.3	12.0	13.9	14.6	15.4	13.3	10.2	11.3	11.9	12.3	12.8	13.3	11.9
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	1.2							0.7						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (42) : Soil available Zn (µg/g) after 45days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	1.5	1.6	1.6	1.7	1.7	1.8	1.7	1.6	1.6	1.6	1.6	1.8	2.0	1.7
	22.5	1.4	1.4	1.4	1.6	1.6	1.6	1.5	1.6	1.7	1.8	1.8	2.0	2.1	1.8
Mean		1.5	1.5	1.5	1.7	1.7	1.7	1.6	1.6	1.7	1.7	1.7	1.9	2.1	1.8
66	11.3	1.2	1.3	1.2	1.4	1.4	1.5	1.3	1.4	1.4	1.4	1.4	1.4	1.6	1.4
	22.5	1.3	1.4	1.3	1.5	1.6	1.6	1.5	1.4	1.5	1.4	1.6	1.8	1.8	1.6
Mean		1.3	1.4	1.3	1.5	1.5	1.6	1.4	1.4	1.5	1.4	1.5	1.6	1.7	1.5
P	11.3	1.4	1.5	1.4	1.6	1.6	1.7	1.5	1.5	1.5	1.5	1.5	1.6	1.8	1.6
	22.5	1.4	1.4	1.4	1.6	1.6	1.6	1.5	1.5	1.6	1.6	1.7	1.9	2.0	1.7
Biofertilizers		1.4	1.5	1.4	1.6	1.6	1.7	1.5	1.5	1.6	1.6	1.6	1.8	1.9	1.7
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.09							N.S						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (43) : Soil available Zn (µg/g) after 60days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	V	Ph.	Mix.	Mean	O	F	Oac.	Y	Ph.	Mix.	Mean
33	11.3	1.3	1.3	1.3	1.4	1.4	1.6	1.4	1.4	1.4	1.4	1.4	1.4	1.7	1.5
	22.5	1.4	1.4	1.5	1.6	1.6	1.7	1.5	1.3	1.3	1.4	1.5	1.5	1.5	1.4
Mean		1.4	1.4	1.4	1.5	1.5	1.7	1.5	1.4	1.4	1.4	1.5	1.5	1.6	1.5
66	11.3	1.4	1.5	1.5	1.6	1.6	1.6	1.5	1.4	1.4	1.4	1.4	1.5	1.6	1.5
	22.5	1.3	1.4	1.3	1.5	1.5	1.7	1.5	1.3	1.4	1.4	1.5	1.5	1.6	1.5
Mean		1.4	1.5	1.4	1.6	1.6	1.7	1.5	1.4	1.4	1.4	1.5	1.5	1.6	1.5
P	11.3	1.4	1.4	1.4	1.5	1.5	1.6	1.5	1.4	1.4	1.4	1.4	1.5	1.7	1.5
	22.5	1.4	1.4	1.4	1.6	1.6	1.7	1.5	1.3	1.4	1.4	1.5	1.5	1.6	1.5
Biofertilizers		1.4	1.5	1.4	1.6	1.6	1.7	1.5	1.4	1.4	1.4	1.5	1.5	1.6	1.5
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.s						
	C	0.1							0.08						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculaot isolated from cottoo rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculatioo with yeast .
Ph.= Inoculatinn with phnsphnrine .
Mix.= Inoculatioo with a mixture of the four biofertilizers .

Table (44) : Soil available Zn (µg/g) after 75days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	1.4	1.5	1.5	1.6	1.6	1.6	1.5	1.3	1.4	1.4	1.4	1.6	1.7	1.5
	22.5	1.3	1.3	1.4	1.5	1.6	1.7	1.5	1.2	1.2	1.3	1.4	1.4	1.5	1.3
Mean		1.4	1.4	1.5	1.6	1.6	1.7	1.5	1.3	1.3	1.4	1.4	1.5	1.6	1.4
66	11.3	1.3	1.4	1.4	1.5	1.6	1.6	1.5	1.2	1.2	1.2	1.3	1.3	1.5	1.3
	22.5	1.2	1.3	1.3	1.4	1.5	1.5	1.4	1.2	1.2	1.2	1.4	1.4	1.4	1.3
Mean		1.3	1.4	1.4	1.5	1.6	1.6	1.5	1.2	1.2	1.2	1.4	1.4	1.5	1.3
P	11.3	1.4	1.5	1.5	1.6	1.6	1.6	1.5	1.3	1.3	1.3	1.4	1.5	1.6	1.4
	22.5	1.3	1.3	1.4	1.5	1.6	1.6	1.5	1.2	1.2	1.3	1.4	1.4	1.5	1.3
Biofertilizers		1.4	1.4	1.5	1.6	1.6	1.7	1.5	1.3	1.3	1.3	1.4	1.5	1.6	1.4
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.09							0.09						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without blofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (45) : Soil available Cu (µg/g) after 45days as affected by application of N,P and biofertilizers

N kg/fed (A)	P_2O_5 kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	0.6	0.6	0.7	0.7	0.8	0.9	0.7	1.0	1.0	1.1	1.1	1.2	1.3	1.1
	22.5	0.5	0.6	0.6	0.7	0.8	0.9	0.7	0.9	1.0	1.1	1.1	1.2	1.3	1.1
Mean		0.6	0.6	0.7	0.7	0.8	0.9	0.7	1.0	1.0	1.1	1.1	1.2	1.3	1.1
66	11.3	0.5	0.6	0.7	0.7	0.8	0.8	0.7	0.9	1.0	1.1	1.1	1.2	1.2	1.1
	22.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	1.1	1.1	1.1	1.2	1.2	1.2	1.2
Mean		0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.1	1.1	1.2	1.2	1.2	1.3
P	11.3	0.6	0.6	0.7	0.7	0.8	0.9	0.7	1.0	1.0	1.1	1.1	1.2	1.3	1.1
	22.5	0.6	0.7	0.7	0.8	0.8	0.9	0.8	1.0	1.1	1.1	1.2	1.2	1.3	1.2
Biofertilizers		0.6	0.7	0.7	0.8	0.8	0.9	0.8	1.0	1.1	1.1	1.2	1.2	1.3	1.2
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.04							0.08						
	AXB	N.S							N.S						
	AXC	0.05							N.S						
	BXC	N.S							N.S						
	AXBXC	0.08							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (46) : Soil available Cu (µg/g) after 60days as affected by N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	0.5	0.6	0.7	0.7	0.8	0.8	0.7	0.8	0.9	0.9	0.9	1.1	1.1	1.0
	22.5	0.7	0.7	0.7	0.8	0.8	0.9	0.8	0.9	n.9	1.0	1.0	1.1	1.1.	1.0
Mean		0.6	0.7	0.7	0.8	0.8	0.9	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.0
66	11.3	0.8	0.9	0.8	0.9	0.9	1.0	0.9	8.9	1.0	1.0	1.0	1.0	1.1	1.0
	22.5	n.8	0.9	0.8	0.9	0.9	1.0	0.9	0.9	0.9	1.n	1.0	1.0	1.1	1.0
Mean		0.8	0.9	0.8	0.9	0.9	1.0	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.0
P	11.3	0.7	0.8	0.8	0.8	0.9	0.9	n.8	0.9	1.0	1.0	1.0	1.1	1.1	1.0
	22.5	0.8	0.8	0.8	0.9	0.9	1.0	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.0
Biofertilizers		0.7	0.8	0.8	0.9	0.9	1.0	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.0
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.04							0.06						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with baeterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Table (47) : Soil available Cu (µg/g) after 75 days as affected by application of N,P and biofertilizers

N kg/fed (A)	$P(P_2O_5)$ kg/fed (B)	Biofertilizers (C)													
		Season 2000							Season 2001						
		O	F	Bac.	Y	Ph.	Mix.	Mean	O	F	Bac.	Y	Ph.	Mix.	Mean
33	11.3	0.6	0.8	0.9	0.9	1.0	1.0	0.9	1.0	1.2	1.3	1.3	1.4	1.4	1.3
	22.5	0.7	0.8	0.8	0.9	0.9	1.0	0.9	1.1	1.2	1.2	1.3	1.3	1.4	1.3
Mean		0.7	0.8	0.9	0.9	1.0	1.0	0.9	1.1	1.2	1.3	1.3	1.4	1.4	1.3
66	11.3	0.7	0.7	0.8	0.8	0.9	0.9	0.8	1.1	1.1	1.2	1.2	1.3	1.3	1.2
	22.5	0.6	0.7	0.7	0.9	0.9	1.1	0.8	1.0	1.1	1.2	1.3	1.3	1.5	1.2
Mean		0.7	0.7	0.8	0.9	0.9	1.0	0.8	1.1	1.1	1.2	1.3	1.3	1.4	1.2
P	11.3	0.7	0.8	0.9	0.9	1.0	1.0	0.9	1.1	1.2	1.3	1.3	1.4	1.4	1.3
	22.5	0.7	0.8	0.8	0.9	0.9	1.1	0.9	1.1	1.2	1.2	1.3	1.3	1.5	1.3
Biofertilizers		0.7	0.8	0.9	0.9	1.0	1.0	0.9	1.	1.2	1.3	1.3	1.4	1.4	1.3
L.S.D 0.05	A	N.S							N.S						
	B	N.S							N.S						
	C	0.04							0.2						
	AXB	N.S							N.S						
	AXC	N.S							N.S						
	BXC	N.S							N.S						
	AXBXC	N.S							N.S						

O= without biofertilizers
F=Inoculation with bacterial inoculant isolated from cotton rhizosphere .
Bac.=Inoculation with Bacillus polymyxa .
Y= Inoculation with yeast .
Ph.= Inoculation with phosphorine .
Mix.= Inoculation with a mixture of the four biofertilizers .

Regarding mineral phosphorus fertilization, the data obtained in the previous Tables reveal that, phosphorus fertilization positively affected the soil available phosphours at the three studied stages (at 45, 60 and 75 days after sowing). Soil available phosphorus decreased gradually with time. This may be due to the effect of alkaline soil pH which enhanced the precipitation of the soluble forms of soil phosphorus to the insoluble ones and as a result the P uptake significantly decreased with time. These results are in accordane with those obtained by Foaad (2002) in his study on corn and faba bean who found also that soil available nutrients, i. e. N, K, Fe, Mn, Zn, and Cu were not significantly affected by phosphorus.

Considering biofertilization, data obtained reveral that, in general, all biofertilizer treatments significantly increased all the studied soil nutrients at 45, 60 and 75 days after sowing as compared with the control (without biofertilization), except for the soil available P. It is worthily to mention that using the mixture of the four biofertilizers gave the highest yield of soil available nutrients than the single biofortilizers or without biofertilization. In this concern the effect of the different kinds of biofertilizers on the soil available nutrients may be due not only to their N-fixing proficiency for some biofertilizers but also to the effect of CO_2 and/or organic acids originated from microbial metabolism. On the other hand, Foaad (2002) who found that the biofertilization did not affect the soil available nutrients .

Regarding the interaction affect among the three variables, data obtained show a significant effect on soil available nitrogen. The highest values of soil available nitrogen were recorded for the plots fertilized with 66 kg N/fed and received the mixture of biofertilizer. On the other hand, the plots received 33 kg N/fed and not treated with biofertilization gave the lowest values of soil available nitrogen.