

RESPONSE OF COTTON CULTIVAR GIZA 90 NPK APPLICATION LEVELS

Ghaly, F.M.; H.A. AbdEl-Aal and F.S. Hamed
Cotton Research Institute, Agric. Res. Cent., Giza, Egypt.

ABSTRACT

The present investigation was carried out at Shandaweel Agriculture Research Station during 2005 and 2006 seasons to study the effect of NPK application levels on growth and seed cotton yield as well as its components of the Egyptian cotton cultivar Giza 90 (*Gossypium barbdense* L.). A randomized complete blocks design with four replicates was used. Nine treatments were as follows:

NPK₀ : 45 kg N + 15 kg P₂O₅ + 0 kg K₂O/ fed
NPK₁ : 45 kg N + 22.5 kg P₂O₅ + 24 kg K₂O/ fed
NPK₂ : 45 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed
NPK₃ : 60 kg N + 15 kg P₂O₅ + 0 kg K₂O/ fed
NPK₄ : 60 kg N + 22.5 kg P₂O₅ + 24 kg K₂O/ fed
NPK₅ : 60 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed
NPK₆ : 75 kg N + 15 kg P₂O₅ + 0 kg K₂O/ fed
NPK₇ : 75 kg N + 22.5 kg P₂O₅ + 24 kg K₂O/ fed
NPK₈ : 75 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed

The results of these experiments indicated that plant height at harvest, Number of fruiting branches/ plant, height of fruiting nodes, number of open bolls/ plant, boll weight, seed cotton yield/ plant and feddan were significantly increased by tested treatments in both seasons. The greatest values of these traits were obtained from the combined fertilization with 75 kg N + 30 kg P₂O₅ + 48 kg K₂O/fed.

INTRODUCTION

Fertilizers application levels is one of the most important aspects of cotton (*Gossypium babrdense*, L.) production. In Egypt, the reduction of cotton yield is the first problem facing the cotton producers. This reduction in yield is due to many factors such as fertilizers application levels and pest-control management. Many researches were done in this field but the problem was more difficult because this problem concerned with political social and economic behavior of Egyptian farmers. In this respect, Abdallah (1995), in Egypt, found that fertilizing cotton with 60 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed gave the tallest cotton plants. The same result was obtained by Abou Zaid, *et al* (1997), in Egypt, with NPK rate of 60 kg N + 22.5 kg P₂O₅ + 24 kg K₂O/ fed. Ziadah and El-Shazly (1998) stated that foliar spraying with 75 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed significantly increased plant height in both seasons. The same result was obtained by Mohsin *et al* (2004), in Pakistan, with NPK rate of 150 kg N + 75 kg P₂O₅ + 60 kg K₂O/ ha. While, the highest number of branches was obtained by Abdallah (1995), in Egypt, with the combined 60 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed and by Abou-Zeid *et al* (1997), in Egypt, at 60 kg N + 22.5 kg P₂O₅ + 24 kg K₂O/ fed. Meanwhile, Abd El-Malak *et al* (1997) in Egypt, mentioned that increasing NPK fertilizer level not only increased sympodial branches but also produced the first sympodial branch at lower node on the main stem. Makram (1988), in Egypt, reported

that number of open bolls per plant was significantly increased by increasing NPK up to 75 kg N + 15 kg P₂O₅ + 24 kg K₂O/fed. Other workers found that increasing fertilization level increased number of open bolls per plant up to 69 kg N + 15 kg P₂O₅ + 24 kg K₂O/ fed. (Ebaid, *et al.* 1988, in Egypt), and 60 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed. (AbdEl-Aal, *et al.* 1990, in Egypt, and Mohsin *et al* (2004), in Pakistan, with NPK rate of 150 kg N + 75 kg P₂O₅ + 60 kg K₂O/ ha. Radwan and AbdEl-Malak (1995) found that increased NPK rate up to 69 kg N + 30 kg P₂O₅ + 24 kg K₂O/ fed increased boll weight. The same results were obtained by Ziadah and El-Shazly (1998) in Egypt, and Mohsin *et al* (2004) in Pakistan. The highest seed cotton yield / plant obtained by Ziadah and El-Shazly (1998) at 75 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed. While, the highest seed cotton yield / fed or ha was obtained by Radwan and AbdEl-Malak (1995), in Egypt, at the level 60 kg N + 30 kg P₂O₅ + 24 kg K₂O/ fed, AbdEl-Malak, *et al* (1997), in Egypt at 60 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed, Ziadah and El-Shazly (1998) in Egypt, spraying with 75 kg N + 30 kg P₂O₅ + 48 kg K₂O/ fed and Mohsin *et al* (2004) in Pakistan, with NPK rate of 150 kg N + 75 kg P₂O₅ + 60 kg K₂O/ ha.

MATERIALS AND METHODS

Two field experiments were carried out at Shandweel Agriculture Research Station in 2005 and 2006 seasons to study the effect of NPK application levels on growth, seed cotton yield and yield components of cotton cultivar Giza 90. Cotton seeds were sown at last weeks of March in both seasons. Thinning was done at 30 days after sowing to two plants per hill. Chemicals analysis of soil are presented in table (1).

Table (1): Chemical analysis of soil sample at 0 – 30 cm depth from the surface in 2004 and 2005 seasons.

Soil characteristics	2004	2005
Texture	Loamy sand	Loam
Calcium carbonate %	1.39	1.24
Organic matter %	0.948	1.02
PH (1:2:5 suspension NPK)	7.30	7.20
Total N (ppm)	795	702
Available P (ppm)	9.9	9.4
Available K (ppm)	386	448

The experimental design was a randomized complete bolocks with four replications. NPK application levels i.e 45 kg N + 15 kg P₂O₅ + 0 kg K₂O, 45 kg N + 22.5 kg P₂O₅ + 24 kg K₂O, 45 kg N + 30 kg P₂O₅ + 48 kg K₂O, 60 kg N + 15 kg P₂O₅ + 0 kg K₂O, 60 kg N + 22.5 kg P₂O₅ + 24 kg K₂O, 60 kg N + 30 kg P₂O₅ + 48 kg K₂O, 75 kg N + 15 kg P₂O₅ + 0 kg K₂O, 75 kg N + 22.5 kg p₂o₅ + 24 kg k₂o, and 75 kg N + 30 kg p₂o₅ + 48 kg k₂o/feddan.

The area of experimental plot was 19.5 m² (5m. length and 3.9m. width) included 6 rows at 65 cm apart. Phosphorus fertilizer was added in the form of calcium superphosphate (15.50% P₂O₅) before the first irrigation in

each season. Nitrogen fertilizer was added in the form of ammonium nitrate (33.5%N). It was applied as a split application, the first was added before the second irrigation and the second was applied before the third irrigation. Potassium fertilizer was applied in the form of potassium sulphate (48%K₂O) before the fourth irrigation. The best cultural practices, i.e hard weeding or pest control were applied as recommended for cotton production in Shandweel farm. Five guarded hills were randomly chosen from the three inner rows in order to study the following characters:

A- Growth traits :

- 1- Plant height at harvest (cm).
- 2- Number of fruiting branches/plant.
- 3- Height of first fruiting node (cm).

B- Yield and yield components:

- 1- Number of open bolls/plant.
- 2- Average boll weight in grams.
- 3- Average seed cotton yield / plant in grams
- 4- Seed cotton yield in kentars/feddan : seed cotton yield/plot in kilograms was recorded and transformed to kentars/feddan{ one kentar : 157.5 kg:)

The collected data were subjected to analysis of variance outlined by Snedecor and Cochran (1967) and the mean values were compared using L.S.D at 5%.

RESULTS AND DISCUSSION

The results in table (2) show that, plant height at harvest, number of fruiting branches/plant and height of the first fruiting node were significantly increased by increasing fertilizers levels up to 75 kg N + 30 kg P₂O₅ + 48 kg K₂O/ feddan in both seasons. Such results may be attributed to the role of NPK fertilizers levels on metabolism which consequently enhance growth habits. Similar results were obtained by Abdallah (1995), AbdEl-Malak *et al* (2004).

Table (2): Effect of NPK application levels on growth traits in 2005 and 2006 seasons.

	Seasons	NPK ₀	NPK ₁	NPK ₂	NPK ₃	NPK ₄	NPK ₅	NPK ₆	NPK ₇	NPK ₈	F. test	L.S.D 5%
Plant height at harvest (cm)	2005	113.2	112.6	105.3	132.2	120.5	124.2	143.5	132.5	131.9	*	2.3
	2006	115.2	114.2	107.5	133.7	127.5	128.0	141.5	135.8	135.4	*	1.6
Number of fruiting branches/plant	2005	13.3	13.3	13.9	15.8	17.6	18.8	20.7	22.3	23.5	*	1.1
	2006	13.8	15.3	14.1	18.3	21.4	22.9	23.5	19.3	21.6	*	1.5
height of the first fruiting node	2005	5.7	6.4	6.5	7.2	6.5	6.2	7.3	7.4	7.5	*	0.5
	2006	5.3	6.8	7.1	6.6	7.0	6.2	7.5	7.2	7.3	*	0.5

B- Yield and yield components:

The results in table(3) show that number of open bolls/plant, boll weight, seed cotton yield/plant and seed cotton yield/feddan were significantly increased by increasing fertilizers levels up to 75 kg N+30 kg P₂O₅+ 48 kg K₂O/ feddan in both seasons. This result may be due to the increasing P form 15 to 30 kg P₂O₅ /fed,K from 0 to 48 kg/fed which maybe increased the efficiency of N application at the high rate 75 kg N/fed. This means that N is advisable to apply more than 60 kg N/fed. The results maybe due to the role of NPK fertilizs encouraging early growth and increasing its elongation as well as early appearance of bolls of cotton plant. Similar results were obtained by AbdEl-Aal *et al* (1990), Radwan and El-Malak (1995), Ziadah and Shazly (1998) and Mohsin *et al* (2004).

Table (3): Effect of NPK application levels on yield and its components in 2005 and 2006 seasons.

	Season	NPK ₀	NPK ₁	NPK ₂	NPK ₃	NPK ₄	NPK ₅	NPK ₆	NPK ₇	NPK ₈	F. test	L.S.D 5%
Number of open bolls/plant	2005	11.0	11.9	11.8	14.4	20.9	18.8	12.5	18.3	22.2	*	1.5
	2006	11.3	12.4	13.2	17.3	14.5	15.9	13.7	16.0	16.2	*	1.5
Boll weight (gm)	2005	1.82	2.43	2.34	2.29	2.14	2.50	2.04	2.37	2.19	*	0.25
	2006	1.85	1.92	1.69	1.86	2.04	2.05	1.75	1.55	1.85	*	0.20
Seed cotton yield (gm/plant)	2005	23.65	26.22	27.55	33.09	43.81	47.02	25.57	43.58	48.73	*	5.92
	2006	20.99	23.68	22.31	32.35	29.66	32.28	23.99	24.94	30.15	*	4.05
Seed cotton yield (kentar/fed)	2005	4.45	5.37	6.28	7.25	9.22	9.27	8.30	9.19	9.55	*	0.99
	2006	4.58	5.41	5.99	7.27	9.30	9.21	7.37	9.54	9.82	*	0.76

REFERENCES

Abdallah,Amany, M. (1995). Cotton fertigation under drip irrigation requirement.M.Sc.. Thesis, Fac. Of Agric, Cairo Univ.

Abd El- Aal, H. A., A.IYassen. and S.F, EL, Gahel. 1990). Effect of NPK on yield and some yield components of Giza 75 cotton variety Annals. Agric. Sci., Fac. Of Agric., Ain Shams Univ. 35(2): 709-722.

Abd El-Malak,K. K.,M.M, El-Razaz., and F.M Ghaly,. (1997). Effect of phosphorus levels and topping dates on yield of transplanted cotton cultivar. Giza 83. Egypt. J. Agric. Res. 75(2): 504-512.

Abou-Zaid, H.M., Abd El-Aal, S.A. and Abd El-Malak, R.R. (1997) Effect of potassium sulphate application methods and timing on growth and productivity of the cotton cultivar Giza 75. J. Agric. Res. 75 (2) : 495 – 503.

Ebaid, M. M.,H.A, Dawwam.,I.Kh, Mohamed, . andS.H, Mohamed (1988). Effect of nitrogenous and phosphatic fertilizers on Egyptian cotton. Monofiya. J. Agric. Res., 13(3): 1502-1533.

Makram, E. A. O. (1988). Effect of foliar nutrition feeding by commercial formulation of macro and micro elements on growth, yield and some fiber properties of the cotton cultivar pan 574. Annals Of Agric Sci., Ain Shams Univ. 33(2) 903-915.

- Mohsin R.; K. Hamayoon; M. J. Tahi ; Mahah Hussain; S. Shahan (2004). Effect of different combinations of NPK on growth and yield of seed cotton variety CIM-443 Sharhad. J. Agric. 20 (1) 1-4 Peshawar, Pakistan; NWFP. Agric. Univ. [C. F. Field Crop Abst., 57(8): (5799, 2004).
- Radwan, F.E. and AbdEl-Malak, K. K. (1995). Effect of N and P₂O₅ on cotton transplanting, yield and its component. Assiut . J. of Agric. Sci., 26(2): 93-104.
- Snedecor, G. W. and Cochran, W. G. (1967). Statistical methods 7thed Iowa State Univ. Press. Ames. Iowa, USA.
- Ziadah, K.A and W.M.O. El-Shazly (1998). A study on optimum thinning date and balanced fertilization for Early and late plantings of cotton Giza 77. J. Agric. Sci. Manasoura Univ., 23 (2): 657-677.

**إستجابة صنف القطن جيزة 90 لمستويات التسميد NPK
فوزى محمد غالى ، حسني عبد الباقي عبد العال و فكرى سيد حامد
معهد بحوث القطن - مركز البحوث الزراعية - الجيزة - مصر.**

أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بشندويل فى خلال الموسمين الصيفيين 2005، 2006 لدراسة تأثير مستويات التسميد NPK على النمو والمحصول ومكوناته لصنف القطن المصرى جيزة 90 ، وتم تنفيذ التجارب فى تصميم القطاعات الكاملة العشوائية فى أربعة مكررات وكانت المعاملات كما يلى:

- 1- 45 كجم ن + 15 كجم فو2 أ5 + صفر بو2 أ / فدان.
- 2- 45 كجم ن + 22.5 كجم فو2 أ5 + 24 بو2 أ / فدان.
- 3- 45 كجم ن + 30 كجم فو2 أ5 + 48 بو2 أ / فدان.
- 4- 60 كجم ن + 15 كجم فو2 أ5 + صفر بو2 أ / فدان.
- 5- 60 كجم ن + 22.5 كجم فو2 أ5 + 24 بو2 أ / فدان.
- 6- 60 كجم ن + 30 كجم فو2 أ5 + 48 بو2 أ / فدان.
- 7- 75 كجم ن + 15 كجم فو2 أ5 + صفر بو2 أ / فدان.
- 8- 75 كجم ن + 22.5 كجم فو2 أ5 + 24 بو2 أ / فدان.
- 9- 75 كجم ن + 30 كجم فو2 أ5 + 48 بو2 أ / فدان.

وكانت أهم النتائج المتحصل عليها ما يلى :

أدت زيادة معدلات التسميد NPK إلى زيادة معنوية لكل من طول النبات، وعدد الأفرع الثمرية، ارتفاع أول ثمرى، وعدد اللوز المتفتح / نبات، ومتوسط وزن اللوزة، ومحصول النبات الفردى، وكذلك محصول القطن الزهر (قنطار/فدان). وكانت أفضل المعدلات من التسميد بمعدل 75 كجم ن + 30 كجم فو2 أ5 + 48 بو2 أ / فدان.