THE RESPONSE OF EGYPTIAN COTTON CULTIVARS TO DRIP IRRIGATION BY TREATED SEWAGE WATER IN THE SANDY SOILS OF THE NORTHERN COAST OF EGYPT

E. A.Makram and M. A. El – Ghandour
Cotton Res. Inst., Agric. Res. Centre
Giza, Egypt

Abstract

Field experiment was carried out at the farm of Aida hotel, northern coast, Merci Matroh governorate, Egypt, in order to evaluate the growth and yield of eight Egyptian cotton cultivars (*Gossypium banbadense L.*) were grown in sandy soil and under drip irrigation system by using treated sewage water which provided from Aida hotel. The experiment design was randomized complete blocks with four replications. Each plot resembled by one bed of 30 m long x 1.45 m width, where cotton planted on both sides of the bed in hills spaced 20 cm and leaving two plants/ hill at thinning time. Sowing date was on March 31, 1992. The cotton cultivars under study were extra – long staple (Giza 45, Giza 70, Giza 76 and Giza 77), besides long staple varieties (Giza 75, Giza 80, Giza 81 and Dandara). The data obtained revealed that the Egyptian cotton cultivars varied greatly with respect to plant growth, yield components and the yield of seed cotton, while lint % and seed index were slightly affected. The highest yield was produced from Giza 80 followed by Giza 45, while the lowest yield was obtained by Giza 76. Generally, the yield of seed cotton was relatively low due to low plant stand at harvest, besides avoiding to use pesticides through the growing season.

Introduction

Recently there is a great need to plant cotton in the new reclamation lands in order to increase the procduction of grain crops in the Delta region of Egypt. Therefore, the planning to grow, cotton in sandy soils needs suitable method of irrigation and fertilization in order to produce higher yields. Also, it is important to choose the best variety or varieties which proved to be adapted with this new environmental conditions.

In this connection, Radin *et al.* (1992) cleared that drip irrigation often increased the cotton yield and water use efficiency. Plaut *et al* (1988) obtained maximal yield of lint by using drip irrigation of small quantities of water by high frequencies.

In Egypt, Makram *et al.* (1996) found that drip irrigation produced higher yields for extra - long staple varieties, i.e, Giza 77 and Giza 45 besides a long staple variety Giza 81.El- Razaz *et al* (1997). reported that under drip irrigation in sandy soils in east of Egypt, cotton cultivars did not differ in plant growth, but the yield increased in favour of extra – long staple varieties.

Therefore, this investigation was carried out to study the growth behavior, yield productivity of eight Egyptian cotton cultivars under drip irrigation system in the sandy soil of the northern coast of Egypt by using treated sewage water.

Materials and Methods

Field experiment was carried out at the farm of Aida hotel, situated in the northen coast of Egypt, Merci Matroh govervarate, kilo 77 west of Alexandria city, during 1992 season. The Egyptian cotton cultivars under study were of two catogeries; extra – long staple varieties (Giza's 45, 70, 76 and 77) and long staple varieties (Giza's 75, 80, 81 and Dandara).

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:602-604 (2001)
National Cotton Council, Memphis TN

The experiment design was complete randomized blocks with four replications. Each plot was 30 m long X 1.45 m width. Sowing was on both sides of beds in hills spaced 20 cm and leaving two plants / hill at thinning time after 40 days of sowing, where theoretical number of plants at planting was 138832 / ha. Sowing date was on March 31.

After land preparation the soil was blended by the following fertilizers down to the depth of 30 cm from the soil sunface; 59.5 m^3 organic manure, 1190 kg calcium superphosphate (15.5%P_2O_5), 952 kg potassium sulphate (48 % K_2O) , 1071 kg ammonium sulphate (15.5 % N)/ ha^{-1}. Drip irrigation lines were installed on the middle of the beds resembled by one line for each bed with drippers spaced 50 cm with nominal flow rate 2.3/hr^{-1} . Treated sewage water provided from Aida hotel used for drip irrigation (Table 1). Cotton seeds were soaked in water for eight hours just before planting at the rate of 6 seeds / hole. Therefore, drip irrigation was applied after one week from sowing to intiate the seedling to emerge. After 12 days from sowing and for 20 days later, drip irrigation practiced daily for ¼ hour for each side of the bed. This period proceeded by two weeks of fertigation programme consisted of ammonium nitrate +K- Mag (20% K : 10% Mg : 20% S) at the ratio 1:3 and concentration ½ gm/L and at the rate of 1 hr/day $^{-1}$ of irrigation. Then drip irrigation stopped for 12 days to encourage the roots development. Drip irrigation and fertigation were continued later till the end of the season at different rates, concentrations and ratios according to evapo-transpiration records and vegetative and fruiting balance of the cotton plants. It was also applied 250 kg/ha^{-1} calcium nitrate (15%N) as soil application before flowering.

Foliar feeding was also added by Kristalon (19-6-20) by the rate 1 gm/L+ Irral (20% N- 8% P_2O_5 – 16% K_2O– 3% S- 1% Mg- 1% Mn- 1% Cu – 0.5% B and 0.03% Fe) at the rate of 1.5 gm/L, besides celiated Zn, Fe, Mn at the rate of 25 gm/ha^{-1}. The time of application was after 98 and 116 days from sowing. The cotton produced in this study was free from pesticides where the pheromones were used against leaf and boll worms. The characters studied were growth characters, yield components, yield of seed cotton, lint percentage and seed index. Statistical analysis was carried out according to procedure outlined by Snedecor and Cochran (1967) by using L.S.D. at 0.05 probability.

Results and Discussion

Data present in (Table 2) revealed that final plant height, number of nodes per plant, internode length and number of sympodia / plant were significantly affected by the cotton varieties under study. The tallest plants were obtained by Giza 45, Giza 70 and Dandara, medium for Giza 76, Giza 81 and Giza 75, while it was shorter for Giza 77. The lowest mean of node number was pronounced by Dandara, lower for Giza 77 and approximately medium for the rest of the varieties. The means of internode length fluctuated among varieties between longer ones for Giza 45, Giza 77 and Giza 75, shorter for Dandara and medium for the other varieties. The number of sympodia/plant was relatively high for Giza 76, and Giza 75, lower for Dandara and Giza 77, while it was medium for the other varieties.

However, these results of the behavior of plant growth for cotton varieties could be due to the new environment which differ than that adapted to it in other locations. Similer results were obtained by Makram *et al*. (1997) while El-Razaz *et al* showed that the vegetative growth cotton varieties did not affect by drip irrigation in sandy soils.

Regarding the yield components (Table 3) were siglinficantly affected by cotton cultivars. Number of open bolls / plant increased in favour of Giza 80. Weighed bolls were associated with Giza 81, Giza 80, Giza 77 and Giza 45 as compared to the rest of the varieties. Therefore, the yield/plant pronounced the final result of both factors, where Giza 80 produced the highest yield/plant.

In this connection, it should be mentioned that plant stand at harvest varied significantly among cotton varieties. Giza 45, Giza 75 and Dandara had the highest plant stand, medium means for Giza 77, Giza 81, while it was relatively low for Giza 80, Giza 76 and Giza 70. However, the higbest yield of seed cotton was obtained from Giza 80, followed by Giza 45, Giza 75 and Dandara, while the lowest yield produced from Giza 76 (Table 4). These results could be attributed to different capability of cotton varieties to adapt under the new environmental conditions. These results are in disagreement with those obtained by Makram *et al* (1996) and El- Razaz *et al* (1997).

However, it was planning to produce high yields under previous conditions, but a cause to relatively lower plant stant at harvest, besides untreating the cotton plants by pesticides might be the main reasons of decreasing the cotton yield. This conclusion seems to be reasonable with that obtained by Plaut *et al* (1988) and Radin *et al* (1992).

Lint percentage and sees index were insignificantly affected among cotton varieties under study. Contradictory results obtaind by El- Razaz *et al* (1997).

References

El- Razaz, M.M., E.A. Makram and I.A. Mousa. 1997. Evaluation of Egyptian cotton cultivars under drip irrigation system in sandy soils of east Delta. Arab Univ. J. Agric. Sci., 5.227-235.

Makram, E.A., M.A. El- Ghandour and A.A. Hosny. 1996. Yield response to drip irrigation in sandy soils for Egyptian cotton cultivars. Proceeding of the 5th International Conference on Desent Development. 836-843.

Plaut, Z., A. Carmi and A. Grava. 1988. Cotton growth and production under drip irrigation restricted soil wetting. Irrigation Sci., Isreal, 9. 143-156.

Radin, J.R., L.L. Reaves, J.R. Mauney and O. F. French. 1992. Yield enhansment in cotton frequent irrigations during fruiting, Agron. J., 84.551-556.

Snedecor, G.W. and W.G. Cochran. 1967. Statistical methods. 6th Ed., Iowa state press, Ames, Iowa, U.S.A.

Table 1. Physical and chemical properties of the treated sewage water .

Property	E.C.		pH	SAR		R.S.C
Physical	1.05		7.9	4.6		0.05
				p.p.m		
Nutritional	N	P	K	Zn	Fe	Mn	Cu
Elements	20	1	14	0.03	2.9	0.06	-
				Meq/L		
Anions &	$Co3^{--}$	CL^{-}	$So4^{--}$	Na^{+}	K^{+}	Ca^{++}	Mg^{++}
cations	4.5	3.4	2.6	6.5	0.1	2.4	1.6

Table 2. Mean vegetative growth characters for Egyptian cotton cultivars under drip irrigation.

Varieties	Plant height (cm)	No. of nodes/ plant	Intenrode length (cm)	No. of sympodia/ plant
Giza 45	130	20	6.6	8.7
Giza 70	114	22	5.3	8.7
Giza 76	117	21	5.7	9.1
Giza 77	107	17	6.3	7.9
Giza 75	113	19	6.1	9.0
Giza 80	123	21	5.8	8.6
Giza 81	116	20	5.7	8.7
Dandara	123	25	4.9	7.5
L.S.D. 5%	17	4	1.6	1.2

Table 3. Mean yield components of Egyptian cotton cultivars under drip irrigation.

Varieties	No. open bolls plant	Boll weight (gm)	Seed cotton yield/ plant	No plants at harvest (1000)
Giza 45	10.3	2.74	28.2	97.2
Giza 70	11.6	2.49	28.9	83.1
Giza 76	11.1	2.45	27.2	84.2
Giza 77	9.9	2.75	27.3	92.0
Giza 75	10.2	2.73	27.9	95.3
Giza 80	13.0	2.75	35.7	86.1
Giza 81	9.2	2.88	26.5	92.0
Dandara	11.3	2.42	27.4	95.8
L.S.D. 5%	1.8	0.35	3.2	5.3

Table 4. Mean seed cotton yield,% lint and seed character for Egyptian cotton cultivars under drip irrigation.

Varieties	% plant stand at harvest	Seed cotton yield kg/ha	Lint percentage	Seed Index (gm)
Giza 45	70	2736	36.7	10.7
Giza 70	60	2399	39.1	10.4
Giza 76	60	2287	39.9	10.2
Giza 77	66	2511	40.9	10.1
Giza 75	69	2661	40.5	11.3
Giza 80	62	3074	41.7	10.4
Giza 81	66	2437	41.4	10.8
Dandara	69	2624	40.8	10.9
L.S.D. 5%	9	675	NS	NS