Assiut J. of Agric. Sci., 39 (2) (17-32)

EVALUATION OF NINE EGYPTIAN COTTON CULTIVARS FOR DROUGHT TOLERANCE IN CLAY AND SANDY NEW RECLAIMED SOILS.*

Abd El-Raheem R. Talat, Ezzat E. Mahdy, Atif A. Ahmed and El-Saady A. Ali

Agronomy Dep. Faculty of Agric. Assiut Univ.

Abstract: Nine Egyptian cotton cultivars (*G. barbadense* L.) were evaluated for earliness, yield and yield components for two successive seasons at two contrasting environments; Assiut Univ. Exper. Farm (clay soil) and Desert Agric. Exper. Stn. at Wady El-Assiuty (sandy soil, drip irrigation). Three irrigation treatments; 80, 100 and 120% evapotranspirtaion (Et) were used. The performance of the nine cultivars for yield and its attributes except lint percentage was very low at sandy soil compared to clay soil. The effect of irrigation treatments was highly significant at both locations. The highest level of irrigation (120% Et) was the best for all yield traits. In addition, it increased days to first flower and decreased earliness index. The interaction of irrigation x cultivars was highly significant for all traits except for lint %, seed and lint indices at both locations and boll weight at the sandy soil. Dandara and Giza 83 were the best cultivars for all traits. Furthermore, they were the earliest cultivars. Drought susceptibility index indicated that Dandara and Giza 83 were tolerant to drought for seed cotton and lint yields/plant, number of bolls/plant and boll weight. The other cultivars could be considered susceptible to drought.

Key words: cotton, drought, clay, sandy.

Introduction

Development of cultivars tolerant to drought and high temperature stresses is an objective in many breeding programs, but success is limited. It requires screening the available cultivars to stress tolerance, study types of gene action controlling stress tolerance traits and selection in segregating populations. All the Egyptian cottons are selected under favourable conditions. Manal (1992) indicated that yield and number of bolls/plant of Egyptian and Upland cotton cultivars were affected by irrigation treatments. Cook and El-Zik (1993) found differential responses of six Upland cotton cultivars to irrigated and non-irrigated treatments. The cultivars differed in boll load on

*Submitted to the 2nd Conference Of Junior Scientists, Fac. of Agric. Assiut Univ. May.,6,2008.

lower sympodia with irrigation treatments (Gerik *et al.*, 1996).

Under desert condition in North Sinai (Abd El-Aziz *et al.*, 1998) and South Sinai (Afiah and Ghoneim, 1999) with drip irrigation Dandara, Giza 80, Giza 75 and Giza 83 were the best cultivars in yield and number of bolls/plant. The lint yield of dry land was reduced by 25% primarily because of 19% reduction in number of bolls (Pettigrew, 2004). Yield and yield components of five Upland cottons were affected by years, cultivars, regions and their interactions (Avgoulas *et al.*, 2005). Khafaga *et al.* (2005) found significant differences among four Egyptian cultivars under stress conditions on saline sandy soil in North Sinai for yield and yield attributes, and Giza 83 was the best. The present experiment was conducted to study the behaviour of nine Egyptian cottons for earliness, yield and yield components under three irrigation treatments under clay and sandy new reclaimed soils.

Materials and Methods

Nine Egyptian cotton cultivars (*G. barbadense* L.) were evaluated for two successive seasons of 2004 and 2005 at two contrasting environments; Assiut Univ. Exper . Farm (clay soil, Table 1) and the Desert Agric. Exper. Stn. at Wady El-Assiuty (25 km east Assiut city, sandy soil, Table 2).Three water levels, 80, 100, 120% evapotranspiration (Et) were used.

A split plot design of three replications was used .The three levels of irrigation were allocated to the main plots and the nine cotton cultivars to the split plots .At the University farm seeds were sown in rows 3 m long, 60 cm apart and 20 cm between hills within a row .The plot size was a single row. After full emergence, seedlings were thinned to two plants per hill .However; at Wady El-Assiuty where drip irrigation was used, the distance between drip hoses was 60 cm and 30 cm between drippers. Seeds were sown in hills 30 cm apart along the drip hoses .The plot size was a single row, 3 m long. After full emergence, seedlings were thinned to two plants per hill.

Planting dates:

	(L_1)Assiut Univ. Farm	(L_2)Wady El-Assiuty
Season 2004	25th March	20th March
Season 2005	30th March	23rd March

Table(1): Mechanical and chemical analysis of the clay soil in Assiut University farm.

Depth (cm)	Mechanical analysis				Chemical analysis (1:1 soil:water extract solution)			
	Sand %	Clay %	Silt %	Texture grade	pH	Organic matter %	$CaCO_3$	Ece mmhos/cm
0-30	22.70	53.00	24.30	Clay	8.20	2.82	0.88	-

Table(2): Mechanical and chemical analysis of the sandy soil in the desert of Wady El-Assiuty farm.

Depth (cm)	Mechanical analysis				Chemical analysis (1:1 soil:water extract solution)			
	Sand %	Clay %	Silt %	Texture grade	pH	Organic matter %	$CaCO_3$	Ece mmhos/cm
0-30	93.30	2.81	4.16	Sandy	7.80	0.20	7.80	0.94

Irrigation systems:

A - Assiut University Farm:

Surface irrigation was used .A motor equipped with a counter and moveable metal tubes was used to add the required irrigation water precisely.The water consumptive use (CU) for each irrigation treatment (80, 100 and 120% Et) was calculated using Israelson and Hansen (1962) equation:

CU = [(soil moisture % after irrigation – soil moisture % before irrigation)/100] x depth of root zone (60 cm) x bulk density $(1.2\ gm/cm)^2$ x cultivated area.

Soil Moisture:

Soil moisture was determined before and after each irrigation. Five samples were taken for each treatment by auger at 30 cm depth, and dried on 105°C for 24 hours.

$$Soil\ moisture\% = \frac{Weight\ before\ drying - Weight\ after\ drying}{Weight\ before\ drying} x100$$

B - Wady El-Assiuty Farm:

The drip irrigation system was used, and the quantity of applied water was calculated according to Ainer *et al.* (1999) in which the water requirement of drip irrigation for cotton under Upper

Egypt condition equals 3394.0 m^3/fed. (100% Et).

Fertilization:

At the University farm super phosphate (P_2O_5, 15.5%) was added during land preparation at the rate of 150 kg/fed. Nitrogen fertilization in the form of ammonium nitrate (33.5% N) was added at the rate of 62 kg N/fed. in two splitted doses. The first dose after thinning before the first irrigation, and the second one before the second irrigation.

At Wady El-Assiuty Farm, 75 kg N/fed. in the form of ammonium nitrate was added in 15 splitted doses started with the planting irrigation and continued to two weeks after flowering. Potassium sulfate was added at the rate of 50 kg/fed. in splitted doses two weeks before and after flowering. Micronutrients (Fe, Mn and Zn) fertilizers were added in three doses. The first was added after a month from sowing, the second and third were added two weeks before and after flowering. Each dose contained:

Fe 500 g/fed as Fe 72% Fe

Mn 250 g/fed as Nervanid-Mn 13% Mn.

Zn 250 g/fed as Nervanid-Zn 14% Zn.

The fertilizers in all cases were dissolved in irrigation water at Wady El-Assiuty Farm.

Data were recorded on 10 guarded plants in each plot. Before the first pick, 25 bolls were taken at random from each plot to calculate lint percentage, boll weight, seed and lint indices. The first pick was performed when about 60% of the bolls were opened, and the second pick at the end of the season.

The studied characters were seed cotton yield/plant; g, lint yield/plant; g, lint percentage, boll weight; g, number of bolls/plant (total seed cotton yield/boll weight), seed index; g, lint index [(weight of lint/weight of seeds in a sample) x seed index], days to first flower, and earliness index (weight of 1st pick/weight of the two picks).

Statistical Analysis:

1-At each location, separate analysis of each season and combined analysis over the two years were done according to Gomez and Gomez (1984).

2 - Drought susceptibility index (DSI):

Drought susceptibility index (DSI) was calculated according to the method of **Fischer and Maurer (1978)**.

Yield of individual genotype is determined under stress (Yd) and favorable well-watered (Yw) conditions. Average yield of all genotypes under drought (Xd) and well-watered conditions (Xw)

are used to calculate drought intensity (D) as:

$$D = 1 - \frac{Xd}{Xw}$$

The mean drought susceptibility index (S) of individual genotype was calculated as:

$$S = (1 - \frac{Yd}{Yw}) / D$$

Genotypes with average susceptibility or resistance to drought have "S" value of 1. Values of less than 1.0 indicate less susceptibility and great resistance to drought. Meanwhile, a value of S = 0 indicates maximum possible drought resistance (no effect of drought on yield).

At each location, the irrigation treatments 80% Et was considered stressed and 120% Et non-stressed environments.

4 - LSD, and Duncan's multiple range test (Duncan, 1955) were used to compare means.

Results and Discussion

Nine available Egyptian cotton cultivars (*G.barbadense* L.) were evaluated under two diverse environments for three water irrigation levels for yield ,yield attributes and earliness .

1- Seed cotton and lint yields /plant ,g.

The analysis of variance for seed cotton and lint yields/plant at Assiut University and Wady El-Assiuty Farms in the two seasons (not included) and their combined data(Tables 3 and 4)indicated highly significant effects of years, irrigation ,cultivars and irrigation x cultivars interaction .The interaction of years x cultivars was significant at both sites. These results are in accordance to those reported by Cook and El-Zik(1993);Abd El-Aziz *et al.*(1998); Afiah and Ghoneim (1999);El-Razaz *et al.*(1997)and Khafaga *et al.*(2005)

The irrigation level 120% Et gave the highest seed cotton and lint yields/plant at the two locations (Table 5). However, 80% Et level gave the lowest yields .The combined means of seed cotton yield/plant were 30.65, 41.31 and 46.69g at Assiut Farm (clay soil), and dropped greatly to 11.50, 18.53 and 19.45 g at Wady El-Assiuty Farm (sandy soil) for 80, 100 and 120% Et, levels,respectively .The same trend was observed in lint yield/plant in the two seasons at the two locations, in which 120% Et irrigation level gave the highest lint yield/plant .The quantity of water added in drip irrigation (Wady El-Assiuty) could be fairly the same as in the surface irrigation (Assiut Farm), however, the soil structure and texture varied greatly in these two contrasting environments, which could be the cause of the great difference in yielding ability.

Table(3): Combined analysis of variance for the studied characters at Assiut University Farm.

S.O.V.	D.F.	Mean squares								
		Seed cotton yield/plant, g.	Lint yield/plant, g.	Lint percentage	Number of bolls/plant	Boll weight, g.	Seed index, g.	Lint index	Days to first flower	Earliness index
Years (Y)	1	61.60**	6.08**	0.42	32.03**	0.21**	0.001	0.002	0.43	2.62
Reps/Years	4	0.48	0.20	0.83	0.31	0.006	0.41	0.09	0.38	3.21
Irrigation (I)	2	3595.82**	517.19**	29.74**	228.11**	3.19**	11.02**	9.43**	303.75**	569.90**
I x Y	2	14.84	2.12	0.42	1.21	0.08**	0.03	0.01	2.10	5.71
Error (a)	8	5.33	0.50	0.59	1.87	0.006	0.32	0.11	0.80	1.63
Cultivars(C)	8	2191.34**	321.13**	28.32**	357.28**	0.06**	3.44**	3.90**	644.17**	683.22**
Y x C	8	7.70	1.30*	3.04**	3.49*	0.007	0.34	0.30	2.92**	1.03
I x C	16	45.38**	4.73**	0.44	8.08**	0.03**	0.198	0.10	1.63**	14.47**
I x C x Y	16	6.91	0.83	0.63	2.22	0.01	0.10	0.04	0.67	0.64
Error (b)	96	3.94	0.58	1.00	1.29	0.01	0.31	0.15	0.60	1.53

*, ** Significant at 0.05 and 0.01 levels of probability, respectively.

Table(4): Combined analysis of variance for the studied characters at Wady El-Assiuty Farm.

S.O.V.	D.F.	Mean squares							
		Seed cotton yield/plant, g.	Lint yield/plant, g.	Lint percentage	Number of bolls/plant	Boll weight, g.	Seed index, g.	Lint index	Days to first flower
Years (Y)	1	273.92**	45.71**	88.27**	37.89**	0.17	14.02*	15.93**	1.50
Reps/Years	4	3.74	0.28	3.18	1.52	0.10	0.74	0.70	20.19
Irrigation (I)	2	1024.01**	138.40**	50.58**	150.70**	1.30**	54.33**	27.10**	101.69**
I x Y	2	18.10**	2.57**	1.90**	1.34	0.02	1.17	0.31	69.25*
Error (a)	8	1.03	0.15	0.24	0.37	0.02	0.67	0.27	9.79
Cultivars (C)	8	361.50**	51.24**	38.17**	60.43**	0.20**	5.40**	5.00**	770.18**
Y x C	8	37.94**	3.80**	5.05**	11.49**	0.01	0.75	0.42	72.39**
I x C	16	11.71**	1.08**	1.45	3.28**	0.01	0.55	0.14	75.37**
I x C x Y	16	2.50	0.24	0.54	0.50	0.002	0.30	0.07	74.87**
Error (b)	96	1.58	0.14	1.10	0.59	0.01	0.54	0.20	10.92

*, ** Significant at 0.05 and 0.01 levels of probability, respectively.

Table(5): Combined means of irrigation levels at the two sites .

Irrigation level Character	Univ. farm			Wady farm		
	80% Et	100%Et	120%Et	80% Et	100%Et	120%Et
Seedcotton yield/plant	30.65c	41.31b	46.69a	11.50c	18.53b	19.45a
Lint yield/plant	10.54c	14.44b	16.65a	3.87c	6.34b	6.87a
Lint %	34.20c	34.94b	35.68a	33.32c	34.48b	35.24a
No. of bolls/plant	13.90c	16.65b	17.93a	6.04b	8.93a	8.83a
Boll weight	2.14c	2.48b	2.62a	1.85c	2.05b	2.17a
Seed index	9.71c	10.15b	10.54a	7.91c	9.28b	9.88a
Lint index	5.00c	5.45b	5.84a	3.99c	4.90b	5.38a
Days to 1st flower	71.05c	73.11b	75.79a	69.05c	71.59b	73.39a
Earliness index	72.32a	68.50b	65.87c	-	-	-

a, b and c denote significant differences between irrigation levels at each site according to Duncan's multiple range test .

The cultivars varied greatly in yielding ability in the two locations. Dandara and Giza 83 cultivars ranked the first in seed cotton yield/plant in Assiut Farm (58.14 and 58.00 g, respectively). However, Giza 45 (30.20 g) and Giza 88 (30.88 g) were the lowest in yielding ability(Table6). Also, at Wady El-Assiuty, Dandara ranked the first in seed cotton yield/plant (23.90 g) followed by Giza 83 (22.87 g) and Giza 90 (18.91 g), while Giza 45 (12.15 g) and Giza 88 (12.18 g) were the lowest cultivars. The same trend was observed for lint yield/plant except that Giza 83 ranked the first followed by Dandara cultivar because lint percentage is higher in Giza 83 for both locations.

The interaction of cultivars with water levels was highly significant indicating differential responses of cultivars to gradual increase of irrigation water.

The differential responses of different cultivars to the decrease of irrigation water reflect tolerance and/or resistance to drought .This character was measured by drought susceptibility index (DSI). Dandara was the best in DSI and could be considered resistant followed with insignificant difference by Giza 83.The other seven cultivars were susceptible to drought .The results of DSI at Wady El-Assiuty confirmed these results.

The performance of cultivars in lint yield/plant (Table 6) indicated that Dandara and Giza 83 were the least affected cultivars by irrigation levels and showed the lowest DSI.Cook and El-Zik (1993) noted that lint yield under stress was lower than under irrigated conditions .Pettigrew (2004) found that moisture deficits reduced lint yield.

2- Lint percentage:

The effects of irrigation levels and cultivars on lint percentage were highly significant in both locations (Tables3 and 4). However ,the interaction effect of cultivars x irrigation was not significant .The effects of years and irrigation x years interaction were highly significant only at Wady El-Assiuty, and the years x cultivars interaction was highly significant at the two locations indicating differential responses of cultivars for lint percentage to climatic factors .The effect of irrigation level on lint percentage overall cultivars (Table 5) indicated that 120% Et gave the highest lint percentage at the two locations .Lint percentage was 34.20, 34.94 and 35.68% at Assiut Farm and 33.32, 34.48 and 35.24% at Wady El-Assiuty for 80, 100 and 120% Et, respectively.Mean lint percentage of the 9 cultivars indicated that Giza 83 ranked the first and gave

37.67% at the University Farm and 37.48% at Wady El-Assiuty (Table 6). Comparing lint percentage of the different cultivars at both locations show slight decrease at Wady El-Assiuty.This indicates a consistency of lint percentage of the different cultivars irrespective of edaphic and climatic conditions Furthermore, irrigation x cultivars interaction was not significant .It could be concluded that lint percentage is a genetic makeup character and the irrigation levels could affect the development of seed and lint in combined .Significant increase in lint percentage as the irrigation level increased was observed at the two locations .

3 - Number of bolls/plant:

The analysis of variance (Tables 3and 4) of number of bolls/plant indicated highly significant effects of irrigation levels and cultivars at both locations .Years, years x cultivars, and irrigation x cultivars were significant at both locations.These results indicate the sensitivity of number of bolls/plant to different environmental factors .These results are in line with those reported by Cook and El-Zik (1993), Abd El-Aziz *et al.* (1998), Afiah and Ghoneim (1999) and Pettigrew (2004).

The irrigation level 120% Et gave the highest number of bolls/plant at the two locations (Table5) and was higher than that of 80 % Et by 28.99 and 46.19 % at Assiut and Wady El-Assiuty , respectively. Dandara recorded the highest number of bolls/plant at the two locations followed by Giza 83 with insignificant difference, and Giza 45 and Giza 88 gave the lowest number of bolls.It is worth noting that number of bolls/plant for a cultivar at Wady El-Assiuty was fairly doubled at Assiut Farm for the same cultivar.

The cultivars responded differently to different levels of irrigation confirming the significancy of cultivars x irrigation interaction.

The sensitivity of cultivars to the quantity of irrigation water applied was measured by DSI. Dandara cultivar showed resistance to drought and ranked the first at the two locations (-0.08, 0.08) , followed with insignificant difference by Giza 83 (0.40 ,0.47).The other cultivars could be considered susceptible to drought and gave DSI which exceeded the unity.The results of number of bolls/plant go in line with those of seed cotton and lint yields in both locations.It is well known that number of bolls/plant is the main contributor to yield followed by boll weight in Egyptian cottons. Abd El-Aziz *et al.* (1998) under drip irrigation at El-Arish, North Sinai found that Giza 80, Giza 83 and Giza

85 were the best cultivars in number of bolls/plant. Afia and Ghoneim (1999) under desert conditions at Ras Sidr; Ismailia found that Giza 83 was the best Egyptian cultivar in number of bolls/plant. Gerik *et al.* (1996) indicated that water stress reduced the efficiency of boll production, and the cultivars differed in boll production in response to water stress. Pettigrew (2004) found that moisture deficits reduced lint yield by 25% because of a 19% reduction in number of bolls.

4 - Boll weight ;g:

The combined analysis (Tables 3) of boll weight at Assiut indicated highly significant effects of years, irrigation, irrigation x years, cultivars and irrigation x cultivars .However ; the interactions had no significant effects on boll weight in the combined analysis of the two seasons at Wady El-Assiuty (Table4). These results are in line with those reported by Abd El-Aziz *et al.* (1998), Af ia and Ghoneim (1999) and Avgoulas *et al.* (2005).

Mean boll weight decreased significantly with decreasing irrigation water in the two seasons and locations (Table 5). Mean boll weight was 2.14, 2.48 and 2.62 g at Assiut and 1.85, 2.05 and 2.17 g at Wady El-Assiuty for 80, 100 and 120% Et, respectively .It could be noticed that mean boll weight was lower at Wady El-Assiuty than at the University Farm .The variability in boll weight of Egyptian cotton is narrow .Giza 83, Da ndara, Giza 85 and Giza 89 tended to be the higher group in boll weight with a range from 2.40 to 2.50 g. The lowest boll weight was recorded for Giza 70 at Assiut .At Wady El-Assiuty, except for Dandara and Giza 83 which ranked the first in boll weight, the other cultivars differed in rank of mean boll weight compared to the experiment in clay soil, and Giza 85, Giza 86, Giza 88 and Giza 45 recorded the lowest mean boll weight(Table 7).

The sensitivity of boll weight of different cultivars to levels of irrigation was measured by DSI. The combined data of Assiut Farm showed that the DSI of Dandara (0.61), Giza 83 (0.57) and Giza 90 (0.92) were less than unity and could be considered drought tolerant respect boll weight .The other cultivars showed DSI which exceeded the unity and could be considered susceptible to drought. Results of Wady El-Assiuty experiments indicated insignificant irrigation x cultivars interaction .Therefore, a steady increase was obtained in boll weight of different cultivars from 80 to 120% Et, and DSI will be of no meaning.

Table(6): Combined means of seed cotton yield/plant, lint yield/plant, number of bolls/plant and lint percentage.

Cultivars	Seed cotton yield/plant,g.				Lint yield/plant,g.				No.of bolls/plant				Lint %	
	Univ.farm		Wady farm		Univ.farm		Wady farm		Univ.farm		Wady farm		Univ.farm	Wady farm
	Mean	SDI	Mean	SDI	Mean	SDI	Mean	SDI	Mean	SDI	Mean	SDI	Mean	Mean
Dandara	58.14a	0.25	23.90a	0.31	20.22b	0.32	8.29b	0.39	23.80a	-0.08	10.89a	0.08	34.81bc	34.75b
G83	58.00a	0.50	22.87b	0.55	21.84a	0.55	8.57a	0.60	23.38a	0.40	10.64a	0.47	37.67a	37.48a
G85	32.38e	1.38	13.92e	1.37	11.48e	1.34	4.82e	1.31	12.90e	1.50	7.13d	1.53	35.35bc	34.60b
G86	33.19de	1.30	13.34e	1.11	11.70e	1.30	4.69e	1.09	13.71d	1.31	6.87d	1.02	35.18bc	34.85b
G88	30.88f	1.28	12.18f	1.30	10.95f	1.23	4.22f	1.27	12.64e	1.28	6.11e	1.48	35.47b	34.44b
G89	37.34c	1.12	16.95d	1.14	12.95d	1.10	5.65d	1.13	14.74c	1.11	7.81c	1.11	34.70c	34.42b
G90	41.38b	1.12	18.91c	1.23	14.04c	1.10	6.23c	1.22	17.23b	1.22	9.22b	1.24	34.04d	32.82c
G45	30.20f	1.25	12.15f	1.23	10.09g	1.28	4.08f	1.29	12.50e	1.31	6.18e	1.28	33.23e	33.23c
G70	34.48d	1.40	14.21e	1.21	11.70e	1.37	4.68e	1.21	14.51c	1.72	6.95d	1.25	34.00d	32.58c
LSD 5%		0.314		0.280		0.289		0.254		0.435		0.367		

Means followed b the same letter are not significant according to Duncan's multiple range test .

Table(7): combined means of boll weight, seed index, lint index, days to 1st flower, and earliness index .

Cultivars	Boll weight				Seed index		Lint index		Days to 1st flower				Earliness index	
	Univ. farm		Wady farm		Univ .farm	Wady farm	Univ .farm	Wady farm	Univ.farm		Wadyfarm		Univ.farm	
	Mean	SDI	Mean	SDI	Mean	Mean	Mean	Mean	Mean	SDI	Mean	SDI	Mean	SDI
Dandara	2.43abc	0.61	2.21a	2.09	10.82a	10.15a	5.78b	5.40b	64.13g	1.57	60.44e	1.70	79.79a	1.89
G83	2.49a	0.57	2.15ab	2.05	10.68a	9.70a	6.44a	5.87a	66.45f	1.10	63.28d	1.20	76.33b	0.90
G85	2.48ab	1.20	1.92e	1.74	10.12b	8.92b	5.55bc	4.73c	75.73d	0.80	75.30b	0.74	64.10f	0.88
G86	2.35cd	1.23	1.92e	1.71	10.11b	8.60b	5.49c	4.61cd	77.21c	0.93	74.67b	0.98	65.84e	1.07
G88	2.40bc	1.23	1.98de	1.81	9.51c	8.62b	5.20de	4.57cd	78.31b	0.86	75.90b	0.91	63.20g	1.02
G89	2.50a	1.04	2.08bc	1.85	10.23b	8.53b	5.42cd	4.50cd	78.53b	0.84	75.33b	0.97	63.60fg	0.71
G90	2.39cd	0.92	2.02cd	1.92	9.84bc	8.99b	5.07e	4.40cd	66.73f	1.19	65.15d	0.93	73.93c	0.70
G45	2.38cd	1.12	1.93de	1.73	10.10b	8.93b	5.02e	4.45cd	79.51a	0.92	79.94a	0.72	65.79e	1.02
G70	2.30d	0.90	2.02cd	1.80	9.61c	8.78b	4.93e	4.28d	73.22e	1.08	72.07c	0.98	67.50d	0.71
LSD 5%		0.194		1.85C						0.185		0.225		0.282

Means followed b the same letter are not significant according to Duncan's multiple range test .

5- Seed and lint indices:

The analysis of variance of seed and lint indices (Tables 3 and 4) indicated significant or highly significant differences among irrigation levels and among cultivars in the combined analysis of the two seasons at each location. Year effect was significant only in Wady El-Assiuty experiments. The combined analysis showed insignificant effects of the interactions.

Mean seed index overall cultivars increased as the quantity of irrigation water increased from 80 to 120% Et. Seed index was 9.71, 10.15 and 10.54 g in the combined data of Assiut Farm experiments for 80, 100 and 120% Et, respectively, (Table 5). The same trend could also observed at Wady El-Assiuty with a marked decrease in seed index for each irrigation level.

Mean lint index increased significantly as the level of irrigation water increased in both seasons of the two locations .The combined data of Assiut farm experiments showed significant increase of lint index from5.00 to 5.84 g for 80 and 120% Et, respectively .The same trend was observed in the data of WadyEl-Assiuty with a marked decrease in lint index in the sandy soil .Mean seed index of the different cultivars indicated that Dandara and Giza 83 were the best in seed index either evaluated in the clay or in sandy soils.

Respect to lint index, Giza 83 showed lint index significantly higher than the others followed by Dandara at the two locations .The highest lint index cultivar is the highest in lint percentage.

6 - Days to first flower:

The combined analysis of variance of days to first flower (Tales 3 and 4) showed highly significant mean squares of irrigation, cultivars , years x cultivars and irrigation x cultivars at both locations .Mean days to first flower (Table 5) increased significantly as quantity of irrigation water increased, indicating that drought enhanced flowering. Mean days to first flower of the combined. data was 71.05, 73.11 and 75.79 at Assiut Farm and 69.05, 71.59 and 73.39 at Wady El-Assiuty for 80, 100 and 120% Et, respectively. At Assiut, Dandara was the earliest cultivar and flowered after 64.13 days , followed by Giza 83 and Giza 90(Table 7). The latest cultivar in days to flowering was Giza 45 with a difference of 15.38 and 19.5 days with Dandara at Assiut and Wady El-Assiuty , respectively .Pettigrew (2004) found that irrigation delayed cutout, the slowing of vegetative growth due to strong reproductive demand for

assimilate, an average of 6 days compared to dryland.

Dandara was the most sensitive cultivar to irrigation water at the two locations which showed DSI of 1.57 Assiut farm, and 1.70 at Wady El-Assiuty .It could be concluded that the earliest cultivars; Dandara and Giza 83 were the most affected by irrigation levels .However, the latest flowering cultivars; such as Giza 45 and Giza 88 were the least affected by irrigation levels(Table 7).

7 - Earliness index:

Earliness index was recorded only at the University farm .The effect of irrigation levels, cultivars and their interaction were statistically highly significant in combined analysis .However; the interactions of years x cultivars and irrigation x year x cultivar were not significant.

Mean earliness index decreased significantly as irrigation water increased indicating that drought enhanced earliness .Mean earliness index was 72.32, 68.50 and 65.87% for the combined data, for 80, 100 and 120% Et, respectively, (Table 5).

The earliest cultivar was Dandara which ranked the first followed by Giza 83 and Giza 90. Dandara gave earliness index of 79.79%.The late mature cultivars were Giza 88, Giza 89 and Giza 85 (Table 7). The three earliest cultivars ranged in earliness index from 73.93 to 79.79%, and the other cultivars ranged from 63.2 to 67.5% from the combined data. The three earliest cultivars; Dandara, Giza 83 and Giza 90 matched in their rank with earliness measured as days to first flower. The other cultivars differed in their rank in the two measures of earliness reflecting difference of kurtosis of their flowering curves. The early cultivar in days to first flower with high earliness index, has a leptokurtic flowering curve and is favorable, such as Dandara and Giza 83.

Mean earliness index differed significantly in response to irrigation level from cultivar to another in the two seasons. Dandara ; the earliest cultivar was sensitive and gave DSI of 1.89.However, Giza 70 gave DSI of 0.71. Dandara was the most sensitive cultivar to irrigation levels in the two measures of earliness. The other cultivars differed in their rank of DSI for days to first flower and earliness index .Earliness index is more efficient in measuring earliness than days to first flower .This could be due to that plants affected by any hazard could start to flower early .Therefore, the nine studied cultivars could be categorized according to DSI of earliness index to sensitive (Dandara), moderate (Giza 86, Giza 88 and Giza 45), and

tolerant (Giza 83, Giza 85, Giza 89, Giza 90 and Giza 70).

It could be concluded that Dandara and Giza 83 were the best cultivars in yield and its components; and earliness in clay or in sandy new reclaimed soils .Furthermore; they were the only two cultivars resistant to drought and could be used either for production or as a source for drought resistant genes in breeding programs.

References

Abd El-Aziz, M.A., A.H. Belal and T.A. El-Feky .1998. Evaluation of quality and yield in commercial Egyptian cotton varieties in north Sinai. Egypt .J. Agric. Res., 76 (1): 231-245.

Afiah, S.A.N. and E.M. Ghoneim.1999. Evaluation of some Egyptian cotton (*Gossypium barbadense* L.) varieties under desert conditions of south Siani. Annals Agric. Sci., Ain Shams Univ., Cairo, 44 (1): 201-211.

Ainer, N.G., W.I. Miseha, F.A. Abbas and H.M. Eid.1999. A new concept of rationalization of irrigation water use in Egypt. Third Conference of on-farm irrigation and agroclimatology .January 25-29, Agricultural Foreign Relation Building, Dokki, Egypt.

Avgoulas, L., K.A. Bouza, S.S. Papadopoulou, E.S. Kosmas, P.P. Makridou and D. Bilalis. 2005. Evaluation of five most commonly grown cotton cultivars (*Gossypium hirsutum* L.) under Mediterranean conditions: Productivity and fiber quality. J. Agron. & Crop Sci., 191: 1-9.

Cook, C.G. and K.M. El-Zik. 1993. Fruiting and lint yield of cotton cultivars under irrigated and non-irrigated conditions. Field Crops Res., 33: 411-421.

Duncan, D.B. 1955. Multiple Range and Multiple F test .Biometrics , 11: 1-42.

El-Razaz, M.M., E.A. Makram and L.A. Mousa. 1997. Evaluation of Egyptian cotton cultivars under drip irrigation, system in sandy soil of east delta. Arab Univ. J. Agric. Sci., Ain Shams Univ., Cairo, 5 (2): 227-235.

Fischer, R.A. and R. Maurer. 1978. Drought resistance in spring wheat cultivars. I-Grain yield response. Aust. J. Agric. Res., 29: 897-912.

Gerik, T.J., K.L. Faver, P.M. Thaxton and K.M. El-Zik. 1996. Late season water stress in cotton: 1- Plant growth, water use, and yield. Crop Sci., 36: 914-921.

Gomez, K.A. and A.A. Gomez.1984. Statistical Procedures for Agriculture Research 2nd ed. John Wiley and Sons. New York, pp. 317-333.

Israelson, O.W. and V.F. Hansen. 1962. Irrigation Principles and Practices. Jon Wiley and Sons, Inc. New York.

Khafaga, H.S., N.A.K. Rashed and A.S. Abd-Elnabe. 2005. Improvement of yield and lint characteristics of some Egyptian cotton varieties under stress conditions. J. Agric. Sci. Mansoura Univ., 30 (6): 2951-2968.

Manal, M.A. 1992 . Effect of water deficiency on rapeseed and cotton. M.Sc. Thesis, Agron. Dept., Alexandria University, Egypt.

Pettigrew, W.T. 2004. Moisture deficit effects on cotton lint yield, yield components, and boll distribution. Agron. J., 96: 377-383.

تقييم تسعة أصناف من القطن المصرى لتحمل الجفاف فى الأراضى الطينية والأراضى الرملية حديثة الاستصلاح.*

عبدالرحيم ربيعى طلعت ، عزت السيد مهدى ، عاطف أبوالوفا أحمد ، السعدى عبدالحميد على

قسم المحاصيل – كلية الزراعة – جامعة أسيوط

أجرى تقييم للمحصول ومكوناته والتبكير لتسعة أصناف من القطن المصرى تحت بيئتين متضادتين، وهما أرض طينية بمزرعة جامعة أسيوط ، وأرض رملية حديثة الاستصلاح بالوادى الأسيوطى (رى تنقيط). أستخدمت ثلاثة معاملات رى وهى عند 80 ، 100 ، 120% نتح بخر . كان أداء التسعة أصناف بالنسبة للمحصول ومكوناته منخفض جدا فى الأراضى الرملية مقارنة بالأرض الطينية عدا صفة النسبة المئوية للشعر. وكان تأثير معاملات الرى على المحصول ومكوناته معنوى جدا ، وأعطت المعاملة 120% نتح بخر أعلى قيم للمحصول ومكوناته ولكنها زادت عدد الأيام حتى تفتح أول زهرة وسببت نقص معامل التبكير . كان تفاعل الأصناف مع معاملات الرى معنوى جدا لكل الصفات عدا النسبة المئوية للشعر ودليل البذرة ودليل الشعر فى المنطقتين ووزن اللوزة فى الأرض الرملية . كانت أفضل الأصناف فى الأداء هى دندرة وجيزه 83 ، بالإضافة إلى أن هذين الصنفين هما أبكر الأصناف . وتشير نتائج دليل الحساسية للجفاف إلى أن الصنفين دندره ، جيزه 83 مقاومان للجفاف أما باقى الأصناف فيمكن اعتبارها حساسة للجفاف .

* بحث مقدم إلى المؤتمر العلمي الثاني لشباب الباحثين بكلية الزراعة جامعة أسيوط، 6 مايو 2008.