THE PROPER IRRIGATION INTERVALS FOR VEGETATIVE AND FRUITING STAGES OF COTTON CULTIVAR GIZA 83

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Abstract

Three field experiments were conducted at Mallawi Agric. Res. Station, Minia Governorate during 1993-95 seasons to study the effect of irrigation intervals during vegetative and fruiting stages on growth, earliness, yield and its components of Giza 83 cotton cultivar. Four irrigation treatments after the second irrigation were used: (1) every 15 days during both vegetative and fruiting stages, (2) every 25 days during both vegetative and fruiting stages, (3) every 15 days during vegetative growth stage and every 25 days during fruiting stage and (4) every 25 days during vegetative growth stage and every 15 days during fruiting stage. The results indicated that the irrigation intervals of 15 days during vegetative and fruiting stages increased number of fruiting branches/plant, open bolls/plant, boll weight, seed cotton yield/plant and per feddan and decreased yield earliness. Lint percentage and seed index were slightly affected by irrigation treatments.

INTRODUCTION

Scheduling water application through the different stages of growth is an important factor for maximizing yield. In this connection, Girigis (1972) observed that the highest seed cotton yield/plant and per feddan were obtained from cotton plants irrigated every 15 days, while boll weight was significantly decreased by extending irrigation interval during the flowering stage. Abdel-Kader (1980) found that yield earliness was slightly affected by number of irrigations. Ali (1990) using irrigation intervals of 10, 15 and 20 days for Giza 81 cultivar, found that the irrigation every two weeks produced the highest yield components, yield/fed and lint percentage while seed index was decreased. Baslious and Abdel-Malak (1992) reported that 14 days irrigation intervals significantly increased seed cotton yield/fed and its components compared by 21 and 28 days irrigation intervals. Mohamed *et al.* (1995) obtained the highest yield by using the irrigation intervals of 10 days at vegetative

growth and every 20 days till harvesting. Makram *et al.* (1996) showed that irrigation intervals had little effect on plant growth, yield and yield components, lint percentage and seed index for Giza 75 cultivar.

Therefore, this investigation was carried out to study the effect of water frequency intervals at vegetative and fruiting stages on growth and yield of Giza 83 cotton cultivar.

MATERIALS AND METHODS

Three field experiments were carried out at Mallawi Agricultural Research Station, Minia Governorate during 1993, 1994 and 1995 seasons, using the Egyptian cotton cultivar Giza 83 (*Gossypium barbadense L.*). The experimental design was a complete randomized blocks with six replications. Four irrigation frequency treatments after the second irrigation were studied as follows:

1- Irrigation every 15 days (15-d), control.

2- Irrigation every 25 days throughout vegetative, flowering and bolling stages (25-d).

3- Irrigation every 15 days through vegetative growth till the first flower appearance and then irrigation every 25 days through flowering and bolling stages (15/25-d).

4- Irrigation every 25 days through vegetative growth till the first flower appearance and then irrigation every 15 days through flowering and bolling stages (25/15-d).

The size of each plot was 23.4 m2 (6x3.9 m) including 6 ridges, 65cm apart and 6 m long. Sowing date was done during the last week of March during the three growing seasons at hill spacing of 20 cm and leaving 2 plants/hill at thinning time. Deep canals of 130 cm were digged between plots and two outer ridges of each plot were used as a border to avoid lateral water movement between plots during irrigation. The soil types of experimental sites were clay loam and the water table was deeper than 1.25m.

Ten representative plants from the inner ridges of each plot were taken at random to record growth, yield components, lint percentage and seed index measurements, while number of plants/fed. at harvest and cotton yield/fed. in cantars

were calculated from the four inner ridges of each plot.

The maximum and minimum air temperatures as well as relative humidity in 1993, 1994 and 1995 seasons were recorded in Table 1.

Statistical analysis was done according to the procedures outlined by Snedecor and Cochran (1967). Duncan's Multiple Range Test was used for comparison between means.

RESULTS AND DISCUSSION

Final plant height was insignificantly affected by irrigation intervals through 1993, 1994 and 1995 seasons, while number of sympodia/plant was increased significantly in 1993 and 1995 seasons or insignificantly in 1994 season in favour of 15 days irrigation intervals through the whole season (Table 2). This could be due to the differences of water regimes which did not affect plant growth. At the mean time, the vegetative-fruiting organs which resembled by number of sympodia per plant was increased by narrowing the irrigation intervals. This might be due to the higher need of Giza 83 cultivar to water especially in the high temperature zone in middle Upper Egypt (Table 1).Similar results were obtained by Baslious and Abdel-Malak (1992) and Makram *et al.* (1996) .

With few exceptions, number of open bolls, yield per plant and boll weight were increased significantly or insignificantly in favour of 15 days irrigation intervals through the whole season (Table 2). These results indicated that regular closely spaced irrigations, i.e. 15 days intervals through the whole season caused a regularity in physiological processes which might be reflected in increased number of fruiting branches, boll development and maturation. On the other hand, the lowest yield components values were produced from 25/15 days intervals. This might be resulting from water shortage during the vegetative growth stage which decreased plant canopy and fruiting productivity. Also, decreased yield components by using 15/25 days could be due to the insufficient water during development and boll ripening. The same case was also realized by using 25 days intervals through the whole season, where both stages of plant growth were affected. Number of plants remained till harvest was slightly affected by water treatments for all seasons. Therefore, this factor had no effect on yield of seed cotton. However, the yield per feddan was increased significantly or insignificantly in favour of 15 day irrigation intervals following the same trend of yield components. On the other hand, the less

Table 1. Monthly averages of relative humidity and air temperature in 1993, 1994 and 1995 seasons.

Month	Relative humidity			Temperature, centigrade °C								
				1993			1994			1995		
	1993	1994	1995	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
March	61.9	63.3	72.6	5.89	23.96	14.93	8.28	23.83	16.06	9.46	25.46	17.46
April	51.1	46.8	56.6	11.09	31.19	21.14	13.04	31.64	22.34	10.54	29.72	20.13
May	50.9	44.9	49.3	16.86	33.52	25.19	15.87	34.92	25.40	15.78	33.75	24.77
June	48.8	52.0	48.2	18.68	36.04	27.36	18.65	34.44	26.55	20.38	38.73	29.56
July	56.1	56.2	59.5	19.36	35.64	27.50	19.75	35.44	27.60	20.90	35.90	28.60
August	66.3	64.1	67.0	19.35	35.68	27.52	18.76	34.81	26.79	20.20	35.20	27.70
September	66.2	65.8	65.0	17.04	34.00	25.52	18.82	35.18	27.00	18.40	36.00	27.20
October	67.2	61.9	68.5	15.17	32.19	23.68	17.52	33.70	25.61	8.00	24.30	16.15
November	71.4	71.4	73.3	10.66	26.89	18.78	9.81	34.46	22.14	9.68	23.39	16.54

Mallawi Meteorological Station.

Table 2. Effect of irrigation intervals through vegetative and fruiting stages on plant growth, yield and its components, earliness, lint percentage and seed index during 1993, 1994 and 1995 seasons.

Character	Season	Irrigation intervals during vegetative and fruiting stages			
		15-d	25-d	15/25-d	25/15-d
Final plant height (cm)	1993	101.97	113.52	108.70	108.92
	1994	95.75	90.17	91.00	92.17
	1995	135.50	123.08	132.08	123.58
Number of sympodia	1993	9.10A	7.22B	7.33AB	6.67B
per plant	1994	7.68	7.53	7.10	6.98
	1995	10.75A	8.25B	9.03B	9.38B
Number of open bolls	1993	12.52	11.38	11.73	10.47
per plant	1994	9.20A	8.62AB	8.92AB	7.93B
	1995	18.57A	14.23C	16.17BC	16.35B
Seed cotton yield	1993	25.10	22.63	22.10	19.37
per plant, (gm.)	1994	19.33A	17.97AB	18.20A	15.18B
	1995	40.78A	29.58C	34.00BC	34.56B
Boll weight (gm)	1993	2.01A	1.99AB	1.86BC	1.85C
	1994	2.11	2.07	2.02	1.93
	1995	2.20A	2.08B	2.10B	2.11B
Number of plants per	1993	47888	47361	46904	46132
fed at harves	1994	54857	53758	53241	53538
	1995	52051	51613	51692	53248
Seed cotton yield per	1993	8.79	8.33	8.74	8.35
feddan (cantar)	1994	12.14A	11.97A	11.08B	11.75AB
	1995	14.36A	13.04B	13.40B	13.22B
First pick (%)	1993	76.10	79.12	78.85	78.02
	1994	81.17	84.25	83.13	82.28
	1995	68.48	72.07	72.90	69.01
Lint percentage (%)	1993	39.62	39.06	39.31	38.85
	1994	41.57	41.33	40.64	41.37
	1995	39.42	39.35	39.14	39.25
Seed index (gm)	1993	9.70	9.20	9.00	9.80
	1994	8.78	8.70	8.77	8.72
	1995	9.27	9.11	9.15	8.92

fluctuations within the yield by water regimes could be due to the fact that indeterminate cotton varieties were less subject to water stress as compared to determinate varieties. Similar results were obtained by Ali (1990), Baslious and Abdel-Malak (1992) and Mohamed *et al.* (1995) while Makram *et al.* (1996) obtained different results for Giza 75 cultivar .

Yield earliness, as the percentage of first picking to total yield, was increased with lower number of irrigations which hastened boll maturity (Table 2). Similar results were obtained by Abdel-Kader (1980).

Lint percentage and seed index was slightly affected by water regimes treatments (Table 2). However, there was a tendency of increasing both traits in favour of 15-d intervals during the vegetative and fruiting stages. Similar results were obtained by Ali (1990), Baslious and Abdel-Malak (1992) and Makram *et al.* (1996).

In conclusion, previous results revealed that cotton cultivar Giza 83, which is grown in Upper Egypt, needs frequent water regime every two weeks through the whole season after the second irrigation in order to produce higher yield.

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أنسب فترات الرى خلال مرحلتى النمو الخضرى والثمرى لصنف القطن جيزة ٨٣

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أجريت ثلاث تجارب بمحطة البحوث الزراعية بملوى – محافظة المنيا – خلال المواسم ١٩٩٣ ، ١٩٩٤، ١٩٩٥ بغرض دراسة أنسب فترات الرى خلال مرحلتى النمو الخضرى والثمرى على النمو ، التبكير ، المحصول ، ومكوناته، تصافى الحليج ومعامل البذرة لصنف القطن جيزه ٨٣ ، وكان التصميم المستخدم هو القطاعات الكاملة العشوائية فى ستة مكررات، وكانت معاملات فترات الرى بعد الرية الثانية كما يلى :

١ – الرى كل ١٥ يوم خلال فترتى النمو الخضرى والثمرى.

٢ – الرى كل ٢٥ يوم خلال فترتى النمو الخضرى والثمرى.

٣ – الرى كل ١٥ يوم خلال فترة النمو الخضرى ثم كل ٢٥ يوم خلال فترة النمو الثمرى ابتداء من ظهور أول زهرة .

٤ – الرى كل ٢٥ يوم خلال فترة النمو الخضرى ثم كل ١٥ يوم خلال فترة النمو الثمرى ابتداء من ظهور أول زهرة.

وكانت أهم النتائج المتحصل عليها كما يلى :

١ – زاد عدد الأفرع الثمرية للنبات ، عدد اللوز السليم للنبات، وزن اللوزة، محصول النبات الواحد من القطن الزهر ومحصول القطن الزهر للفدان بانتظام الرى كل ١٥ يوم خلال مرحلتى النمو الخضرى والثمرى بعد الرية الثانية بينما أدت هذه المعاملة الى نقص النسبة المئوية لمحصول الجنية الاولى الى المحصول الكلى.

٢ – كان لتأثير معاملات الرى تاثيرا طفيفا على كل من تصافى الحليج ومعامل البذرة.