

EFFECT OF SOWING AND THINNING DATES ON GROWTH AND YIELD OF COTTON

El-Sayed, E.A.

Cotton Res. Inst., Agric. Res. Centre

ABSTRACT

Two field experiments were conducted at Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during 2002 and 2003 seasons to study the response of Giza 88 cotton cultivar to two sowing dates at early sowing (25th March) and late sowing (5th May) and thinning dates were at three physiological ages; i.e. when cotton plants formed the first true leaf, the second true leaf and the third true leaf. A split plot design was used with four replications. The obtained results revealed that early sowing (25 March) significantly increased number of internodes and sympodia on the main stem, number of open bolls per plant, boll weight, number of days to the first flower appearance, days to the first cracking boll, earliness percentage and seed cotton yield, per plant and feddan while the reverse trend was noticed with plant height, internode length number of monopodial branches and first sympodium position. On the other hand, earliness measurements, such as position of first sympodium, days to first flower appearance and cracking boll and earliness percentage were significantly increased when cotton plants were sown early in the season. Also, the early sowing date (25th March) produced the highest value of open bolls, boll weight, seed cotton yield /plant and feddan, while number of unopen bolls/plant, seed index and lint percentage were not significantly affected by sowing date. On the other hand, thinning date significantly affected the growth traits, earliness parameters, yield and its components in the two seasons except number of unopen bolls/plant, seed index and lint percentage. Thinning conducted when cotton plants formed the second true leaf gave the best result in the two seasons. Delaying thinning date significantly increased plant height, the internode length, position of first sympodium, days from sowing to appearance of the first flower and cracking the first boll while, the reverse trend was true for number of internodes on the main stem, number of monopodia and sympodia/plant, earliness percentage, number of open bolls/plant, boll weight, lint % and seed cotton yield/plant and feddan. The interaction had insignificant effect on all traits studied except number of unopen bolls per plant, seed index and lint percentage. Generally, best results were obtained when cotton plants were sown early (25th March) and thinned after formation of the second true leaf.

INTRODUCTION

Recently, in Egypt, sowing date of cotton was expanded about two months from mid March to mid May. So, the thinning and sowing date were critical practices during early stage of plant development specially many farmers delay these important practices more than its normal times causing a great injury to cotton plant. In addition to the growth factors specially temperature during this period was differ from moderate to hot. Time of thinning depends on sowing date and physiological stage of growth of cotton plants. In this respect Ragab (1985) and Saeed (1989) found that late sowing decreased plant height, number of fruiting branches, number of opened bolls

per plant, boll weight, seed index, lint percentage and seed cotton yield. Abd El-Aal (1997) stated that early planting increased number of opened bolls, boll weight, seed index and seed cotton yield, while decreased number of vegetative branches. Sowing date had insignificant effect on plant height, number of fruiting branches, both number and length of main stem internode, number of unopened bolls and lint %. El-Shahawy (1999) found that early sowing significantly increased plant height, number of sympodia, number of main stem internodes, number of open bolls, boll weight, lint %, seed index and seed cotton yield (Kentar/fed.), while it decreased main stem internodal length. He added that sowing date did not affect number of monopodia, nodal position of first sympodium and number of unopened bolls/plant. Also, there were significant differences in boll yield between thinning dates, the yield with thinning at 20-40 days after sowing significantly was higher than with thinning at 50 days after sowing. Abd El-Malik and Abd El-Aal (1998) found that delaying date of thinning increased position of first sympodium and days to both first open flower and boll/plant, while decreased number of both sympodia and monopodia per plant, earliness percentage, number of opened bolls/plant, while plant height was not affected by this factor. So this investigation was conducted to study the effect of sowing date and thinning date on growth, earliness, yield and yield components of cotton plant Giza 88 cultivar.

MATERIALS AND METHODS

Two field experiments were carried out at Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during the two growing seasons of 2002 and 2003, using the Egyptian cotton cultivar Giza 88. Each experiment included six treatments which were arranged in a split plot design with four replications.

The main plots were assigned to sowing dates early at (25th March) and late at (5th May). While sub-plots were allocated to thinning dates according to the physiological stages as follows:

- A. At the stage of one true leaf per plant.
- B. At the stage of two true leaves per plant.
- C. At the stage of three leaves per plant.

The preceding crop was rice (*Oryza sativa* L.) apart in the two seasons. Cotton seeds were planted in hills spaced 25 cm apart on rows 60 cm in width. The size of experimental plot was 18 m² (6m length and 3 m width). All other agricultural practices were performed as usual manner in cotton production. Chemical and physical analysis of the soil, monthly air temperature and relative humidity in both seasons are presented in Tables (1 and 2), respectively. Five guarded hills (10 plants) were randomly chosen from the three inner rows to estimate the following characters:

- A.** Growth characters: Final plant height (cm), number of main stem internodes, main stem internodal length, number of sympodia, number of monopodia and leaf area (cm²).

B. Earliness measurements: position of the first sympodium, days to both first opened flower and boll, and earliness percentage:

$$\frac{\text{Seed cotton of first picking}}{\text{Seed cotton of first picking} + \text{seed cotton of second picking}} \times 100$$

C. Seed cotton yield components: Number of opened bolls/plant, number of unopened bolls/plant, boll weight (g), lint percentage, seed index (g/100 seeds), seed cotton yield/plant (g) and seed cotton yield (kent./fed.).
The yield of seed cotton (kintar/fed.) was determined from all plants in each plot.

The data obtained were subjected to statistical analysis according to procedure outlined by Snedecor and Cochran (1981) by using L.S.D. at 5% level.

Table (1): Chemical analysis of experimental soil samples in 2002 and 2003 seasons.

Soil characteristics		2002	2003
Soil type		Clay	Clay
PH		8.65	8.23
Organic matter	%	1.92	1.79
Total SS	%	0.61	0.53
Bicarbonate	%	1.80	1.72
Chloride	%	7.22	7.42
Sulphate	%	4.33	4.75
Ca	%	1.42	1.47
Mg	%	1.35	1.37
Na	%	4.35	4.48
Available N (ppm)		12.33	11.85
Available P (ppm)		9.30	9.41
Available K (ppm)		524.00	500.00

Table (2): Monthly air temperature (°C) and relative humidity (%) during 2002 and 2003 seasons.

Months	2002				2003			
	Air temp °C		R.H. %		Air temp °C		R.H. %	
	Max.	Min.	7.30	13.30	Max.	Min.	7.30	13.30
March	23.0	9.0	71.6	51.0	20.1	7.1	80.0	52.0
April	26.0	11.2	67.0	43.0	26.4	11.2	75.0	45.5
May	30.2	13.6	71.0	39.5	32.2	15.0	84.7	54.2
June	32.3	18.4	75.0	51.6	33.5	18.7	86.2	43.7
July	34.4	21.0	83.0	52.3	32.6	19.7	84.4	52.6
Aug.	33.6	20.3	82.3	48.3	33.7	19.9	91.3	55.0
Sept.	32.0	19.8	79.0	43.8	33.0	18.0	88.3	48.9
Oct.	28.9	16.0	68.4	48.4	30.0	15.1	81.5	47.3

RESULTS AND DISCUSSION

A. Growth characters:

Data presented in Table (3) reveal the influence of sowing and thinning dates on some growth characters in 2002 and 2003 seasons.

Table (3): Some growth characters of cotton plant as affected by sowing date, thinning date and their interactions in 2002 and 2003 seasons.

Treatment characters	Seasons	Sowing dates		Sig.	L.S.D	Thinning dates			Sig.	L.S.D	Inter.
		Early	Late			A	B	C			
Plant height	2002	118.0	120.0	*	1.2	116.5	118.7	121.9	**	1.80	NS
	2003	115.0	116.0	*	0.8	113.5	115.9	116.4	**	0.13	NS
No. of internodes	2002	21.67	18.58	*	2.1	19.96	20.53	21.25	NS	-	NS
	2003	20.40	17.90	*	1.9	19.18	19.72	19.24	*	0.03	NS
Internode length (cm)	2002	6.00	7.23	*	0.9	6.47	6.54	6.88	**	0.12	NS
	2003	6.25	7.29	*	1.0	6.53	6.72	6.75	**	0.01	NS
No. of sympodia per plant	2002	15.45	9.42	*	3.1	12.24	12.61	12.05	**	0.25	NS
	2003	13.40	9.40	*	2.2	11.68	11.92	11.29	**	0.22	NS
No. of monopodia per plant	2002	0.60	0.63	*	0.01	0.64	0.63	0.60	NS	-	NS
	2003	0.50	0.56	*	0.02	0.57	0.52	0.50	NS	-	NS
Leaf area cm ²	2002	41.4	57.2	*	0.85	48.5	52.2	47.5	**	0.01	NS
	2003	42.2	53.5	*	0.92	41.2	60.0	43.2	**	0.12	NS

It is obvious that late sowing significantly increased plant height, internode length on the main stem and number of monopodia, while number of internodes of the main stem and number of sympodia per plant were decreased. The reverse trend was true for early sowing. These results may be due to that sowing cotton early fit cotton plants to full seasons in order to obtain complete heat unit requirements for good growth (Young *et al.*, 1980) which reflected in developing sympodia and lower position of first fruiting branch (Tables 3 and 4). Similar results were obtained by Hussein *et al.* (1983), George *et al.* (1988), Makram *et al.* (1994) for plant height, and Abd El-Ali, 1997 for length and number of internodes of the main stem and number of monopodia and sympodia per plant. Results in Table (3) show that the differences in plant height between thinning date treatments were highly significant in the two seasons. Plant height was increased gradually as thinning date was delayed until the formation of the third true leaf on plant.

These may be due to great competition among seedling in each hill for sunlight, moisture, nutrient and other growth factors. As the period of competition among seedlings was longer the internode length was more weekly and longer than in case of early thinning when the second true leaf was formed on the seedling (Ali, 2002). The number of internodes on the main stem and number of monopodia and sympodia per plant were markedly decreased as thinning date was delayed from the second true leaf stage through the third true leaf stage in the two seasons. The highest value of leaf area was obtained by thinning when cotton plants formed the second true leaf. Similar finding was obtained by Abd El-Malik and Abd El-Aal (1998) and Ali (2002).

Table (4): Effect of sowing date, thinning date of cotton crop and their interactions on some earliness measurements in 2002 and 2003 seasons.

Treatment Characters	Seasons	Sowing dates		Sig.	L.S.D	Thinning dates			Sig.	L.S.D	Inter.
		Early	Late			A	B	C			
Position of first sympodium	2002	5.22	8.16	*	1.85	6.72	6.92	8.20	**	1.1	NS
	2003	6.00	7.50	*	0.95	6.50	6.80	6.95	**	0.02	NS
Days to first flower appearance	2002	89.35	83.50	*	2.40	82.10	87.00	90.20	**	1.2	NS
	2003	92.20	83.70	*	3.70	83.32	88.50	92.10	**	2.5	NS
Days to first cracking boll	2002	139.50	132.20	*	3.50	130.70	133.80	140.22	**	1.3	NS
	2003	142.31	132.50	*	4.35	133.20	136.90	142.50	**	2.9	NS
Earliness Percentage	2002	60.23	49.25	*	4.38	62.00	57.35	45.20	**	3.1	NS
	2003	63.60	48.70	*	6.83	63.50	57.75	47.25	**	4.0	NS

B. Earliness measurements:

From Table (4) it is evident that sowing date had a significant effect on position of first sympodium, days to first flower appearance and first cracking boll and earliness percentage. Position of first sympodium was markedly low in case of early sowing date plantation. More, earliness parameters were markedly positive in case of late sowing time i.e. days to first flower appearance, days to first cracking boll and earliness percentage.

These results may be due to relatively high temperature of air and soil in case of late sowing which pushed the cotton plants to form excessive vegetative growth with few fruiting branches through short plant life, while in case of early sowing the heat units accumulation was slowly, that help cotton plants to form more fruiting branches and more bolls per plant. At harvest (first pick) most bolls in case of early sowing reached maturity age, in the same time fewer bolls reached maturity in case of late planting which was reflected on earliness %. These results are in agreement with those obtained by Makram *et al.* (1994) and Ali and El-Sayed (2001). With regard to thinning date, the results in Table 4 indicated that the position of the first sympodium, days from sowing date to appearance of the first flower, and days to cracking boll were increased as thinning date was delayed, while the earliness percentage was decreased by delaying the thinning date. These results may be due to the effect of long period of competition among seedling in each hill before thinning. The competition led to reduction in the metabolism process as a result of reducing the growth factors such as sunlight, moisture and nutrients in the root zone. According to these factors, the position of first sympodium was raised gradually as thinning date was delayed and consequently delayed the appearance of first flower as well as cracking first boll, while the earliness percentage was decreased by delaying the thinning date. These results were in agreement with those obtained by Abd El-Malik and Abd El-Aal (1998) and Ali, (2002).

C. Yield and its components:

Data given in Table 5 clear the effect of sowing dates, thinning dates and its interaction on yield and its components. The sowing dates had significant effect on seed cotton yield and its components except number of unopened bolls per plant, seed index and lint percentage. Sowing cotton

seeds in early date (25th March) significantly produce cotton plants with higher values of opened bolls, boll weight, seed cotton yield per plant and feddan. These results could be explained on the basis that early sowing allows longer growing seasons time to develop a heavy boll load with large seeds (Young *et al.*, 1980). Similar results were obtained by Yasseen (1986), Makram *et al.* (1994), Abd El-Malik (1998) and Ali and El-Sayed (2001). Regarding the effect of thinning dates, data presented in Table 5 cleared that the early thinning at formation of the second true leaf significantly increased number of opened bolls per plant, boll weight and seed cotton yield per plant and feddan, while number of unopened bolls/plant, seed index and lint percentage did not affect by thinning dates. These results may be due to the late formation of the first which sympodium reduced number of sympodia per plant as well as reduced number of heavy bolls per plant as a result of late thinning. Similar results were obtained by Palamo and Godoy (1981), Abd El-Malik and Abd El-Aal (1998) and Ali (2002).

D. Effect of sowing date x thinning date interaction:

The interaction had a significant effect on number of opened bolls/plant, boll weight and seed cotton yield kent. per feddan in the two seasons. Table (6) revealed that the highest yield and its components were obtained from plants sown early at the last of March and thinning when plants formed the second true leaf. The best results of late sowing were obtained when plants thinned when it formed the first true leaf. Similar results were obtained by Ali and El-Sayed (2001) and Ali (2002).

Generally, it is recommended to plant cotton seeds early in March 25th with thinning when plants formed the second true leaf and the first true leaf when cotton plants planted in May 5th.

Table (5): Effect of sowing date, thinning date and their interaction on seed cotton yield and its components in 2002 and 2003 seasons.

Treatment	Seasons	Sowing dates		Sig.	L.S.D	Thinning dates			Sig.	L.S.D	Inter.
Characters		Early	Late			A	B	C			
No. of opened bolls/plant	2002	18.20	14.80	**	2.3	16.33	18.90	14.27	**	1.95	*
	2003	17.60	14.20	**	1.8	16.20	17.50	14.00	**	2.11	*
No. of unopened bolls/plant	2002	2.32	2.80	NS	-	2.26	2.67	2.72	NS	-	NS
	2003	2.10	2.75	NS	-	2.200	2.40	2.46	NS	-	NS
Boll weight (g)	2002	2.32	1.89	*	0.20	2.10	2.22	1.99	*	0.11	*
	2003	2.25	1.98	*	0.12	2.10	2.25	2.00	*	0.10	*
Seed cotton yield/plant (g)	2002	42.22	28.86	**	4.50	34.29	41.90	27.26	**	3.1	NS
	2003	39.60	27.44	**	3.90	34.02	38.50	28.00	**	2.8	NS
Seed cotton yield/feddan (kent./fed.)	2002	10.52	7.85	**	1.90	9.20	10.11	8.20	**	0.75	*
	2003	9.95	7.30	**	1.85	9.20	9.48	7.20	**	0.12	*
Seed index	2002	10.56	10.60	NS	-	10.6	10.10	10.70	NS	-	NS
	2003	9.99	10.50	NS	-	9.89	10.60	9.95	NS	-	NS
Lint percentage	2002	38.59	39.60	NS	-	38.60	39.00	39.6	NS	-	NS
	2003	40.10	39.75	NS	-	39.20	39.90	38.75	NS	-	NS

Table (6): Some characters as significantly affected by the interaction between sowing dates and thinning dates in 2002 and 2003 seasons.

Characters	Sowing date	Thinning dates							
		2002				2003			
		Thinning dates			L.S.D.	Thinning dates			L.S.D.
		A	B	C		A	B	C	
Number of open bolls/plant	Early	17.35	23.40	13.85	2.2	17.90	19.90	16.90	0.35
	Late	15.31	14.40	14.69	0.11	15.70	16.8	11.80	0.42
Boll weight (g)	Early	2.34	2.42	2.20	0.18	2.20	2.42	2.15	0.04
	Late	1.89	2.02	1.88	0.72	1.92	2.10	1.80	0.02
Seed cotton yield kent./fed.	Early	10.11	12.52	8.93	1.70	10.94	12.60	7.80	1.85
	Late	8.29	7.70	7.56	0.12	8.56	7.95	6.85	0.09

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تأثير ميعاد الزراعة والخف على نمو ومحصول القطن

عزت عبدالسلام السيد

معهد بحوث القطن مركز البحوث الزراعية جيزه مصر

أجريت تجربتان حقليتان بمحطة البحوث الزراعية بسخا عامي ٢٠٠٢/٢٠٠٣م لدراسة تأثير مواعيد الزراعة (مبكر في ٢٥ مارس ومتأخر في الخامس من مايو) ومواعيد الخف على أساس العمر الفسيولوجي لنبات القطن وهي الخف عند بداية تكون الورقة الحقيقية الأولى- الخف عند بداية تكون الورقة الحقيقية الثانية - الخف عند بداية تكون الورقة الحقيقية الثالثة وكانت أهم النتائج المتحصل عليها هي:

١- أدت الزراعة في الميعاد المبكر (٢٥ مارس) إلى زيادة معنوية في عدد سلاميات الساق الرئيسي وعدد الأفرع الثمرية وعدد الأيام لتفتح أول زهرة وعدد الأيام لتفتح أول لوزة والنسبة المئوية للتبكير وعدد اللوز المتفتح على النبات ووزن اللوزة ومحصول النبات ومحصول الفدان بالقنطار كما أدت الزراعة المبكرة إلى نقص في ارتفاع النبات النهائي وطول السلامة وعدد الأفرع الخضرية وانخفاض موقع أول فرع ثمرى بينما لم يتأثر عدد اللوز المتفتح ومعامل البذرة والنسبة المئوية للشعر بميعاد الزراعة.

٢- أدى الخف عند بداية تكوين الورقة الحقيقية الثانية وذلك عند زراعة القطن مبكرا (٢٥ مارس) إلى زيادة معنوية في عدد الأفرع الثمرية على النبات ومساحة الأوراق وعدد اللوز المتفتح ووزن اللوزة ومحصول النبات ومحصول الفدان بالقنطار بينما أدى تأخر الخف إلى زيادة الطول النهائي للنبات وطول السلامة وموقع أول فرع ثمرى وعدد الأيام لتفتح أول زهرة وأول لوزة.

٣- كان للتفاعل بين مواعيد الزراعة ومواعيد الخف تأثيرا معنويا على عدد اللوز المتفتح على النبات ووزن اللوزة ومحصول الفدان بالقنطار.

٤- للحصول على أفضل النتائج يمكن التوصية بخف القطن في الزراعة المبكرة عند بداية تكون ثاني ورقة حقيقية بينما يخف القطن عند بداية تكون أول ورقة حقيقية في الزراعات المتأخرة