A COMPARATIVE STUDY OF TRANSPLANTING AND DIRECT SEEDING OF COTTON

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Abstract

Two years trial was carried out at Sids Agricultural Research Station, Beni-Suef Governorate, Egypt, to investigate and compare normal direct seeding with transplanting cotton plants, under three hill spacing (20, 25 and 30 cm) and potassium fertilizer rates of 0, 24, and 48 kg K_2O/feddan using Giza 80 cotton cultivar during 1995 and 1996 seasons.

Plant height at harvest was significantly greater in favour of direct late sowing when compared only with transplanting at 20cm between hills. Node number of first fruiting branch was significantly higher for direct late sowing as compared with transplanting cotton at 20 cm between hills.Number of total and open bolls/plant was lower for direct late seeding than all transplanting treatments. Number of plants/fed was significantly higher for direct early and late sowing as compared with transplanting at 20cm between hills. The highest seed cotton yield/fed was produced by normal early sowing which was significantly than all treatments. While the differences between direct late sowing and all transplanting treatments were insignificant on this trait. Potassium (K_2O) levels had no significant effect on all traits under study except the number of total and open bolls/plant which were significantly decreased by raising potassium levels.

INTRODUCTION

Planting date is considered to be one of the most important factors affecting growth and yield of cotton. This depends mainly on weather conditions prevailing; such as temperature, light, relative humidity, and other climactic factors. Sowing dates recommended by the Ministry of Agriculture fall between the middle of February in Upper Egypt until end of March in Delta. Cotton growers tend to delay the date of sowing cotton, aiming to gain a full-season of winter crops before growing cotton. The result is a significant decrease in yield for delaying planting date in comparison with earlier sown plants (Hussein *et al.* 1983 and El-Hariry, 1986). Plant density is one of many factors that affect growth and yield. In cotton fields, there is a tendency to use higher number of plants per feddan to compensate plant loss and to ensure higher yield. Many workers discussed the effect of Plant population on different cot-

ton plant growth attributes and its yield. The actual plant number per feddan at harvest increased as the original number increased. Also, each increase in the distance between cotton hills was accompained by decrease in seed cotton yield per feddan (Yasseen, 1994 and Hamed 1995). El-Gahel *et al.* (1993) and Hamed (1995), reported that the application of potassium had no significant effect on average seed cotton yield per feddam. While, Abd El-Aal et al. (1990), found that the potassium fertilizer tended to decrease seed cotton yield when applied at a rate of 48 kg K2O/feddan as compared with that of 24 kg K_2O/feddan. On the other hand, cotton transplanting is kenoum to has many advantages including: (1) Allowing delayed cultivation which enables farmers to obtain two cuts of berseem or a full winter crop, and (2) savins in planting seed and cost of cultural practices such as hoeing , pest control at seedling stage and irrigation.

Thus, the objective of this work was to study the effect of hill spacing and potassium fertilizer levels on transplanted cotton plants compared with normal direct early and late seeding, on growth, yield and yield components of cotton variety Giza 80.

MATERIALS AND METHODS

Two field experiments were performed at Sids Agricultural Research Station for two growing seasons (1995 and 1996).

Table 1. Mechanical and chemical analysis of the upper 50 cm of soil in 1995 and 1996 season.

Mechanical analysis			Chemical analysis		
Soil content	1995	1996	Soil content	1995	1996
Clay %	52.18	58.70	Available N (ppm)	32.0	27.9
Silt %	26.02	24.98	Available P (ppm)	22.2	18.5
Sand %	20.71	15.23	Available K (ppm)	203.07	227.0
Organic matter%	2.35	2.04	pH	7.6	7.8
Calcium carbonate %	2.93	2.70	EC (mmhos/cm/25^{o}C)	0.8	1.0
Texture	Clay	Clay			

The soil texture of the experimental fields was clay. The chemical and mechanical analysis of the soil are given in Table (1)

The variables under study were arranged in a split-plot design with four replications. Hill spacing were allotted to the main plots and fertilizers levels to the sub-plots, as follows:

A. Hill spacing :

Direct early and late sowing at 20 cm between hills to obtain 64610 plant/feddan, transplanting at 20cm between hills to obtain 64610 plant/feddan, at 25 cm between hills to obtain 51688 plant/feddan, and at 30 cm between hills to obtain 43074 plant/feddan.

B. Potassium fertilizer levels:

Without potassium fertililzer, 24 kg K2O/feddan, and 48 kg K2O/feddan.

Potassium fertilizer was used in the form of potassium sulphate (48% K2O). The fertilizers were added before the first irrigation in each season.

The seeds were planted in both the two permanent fields at the direct early sowing date as well as nursery on 30th March, while the direct late sowing as well as the cotton seedling transplanting in the permanent field were done on 1st May in the first season and in 10th May in the second season. Plot size was 19.5 m^2 and each plot was six ridges, 5m long and 65 cm apart. All other cultural treatments were done as usual in cotton plantation.

Ten plants were labeled at random in each plot for determination of growth attributes and yield components, while, the seed cotton yield was estimated from the four inner rows of each plot. Hand picking started in both transplanting and direct seeding plots when about 50-60% of the bolls were opened. The seed cotton yield (kg/plot) was converted into kentar/feddan.

The traits under study included.

A. Growth attributes:

Plant height at harvest (cm) was measured from the two cotyledonary nodes to the terminal bud, number of fruiting branches/plant, and node number of first fruiting branch. Nodes were counted from the cotyledons node (=0) to the first floral node on the main stem.

B. Yield and its components:

Total number of bolls/plant, number of open bolls/plant, boll weight (seed cotton), number of plants/feddan at harvest, seed cotton yield/feddan, seed index (mean weight of 100 seeds, g) were recorded as mean from 500 seeds in every

plot, and lint percentage.

Data obtained were statistically analyzed as outlined by Snedecor and Cochran (1981). Means compared by L.S.D. at 5% level.

RESULTS AND DISCUSSION

A. Growth characters:

1. Plant height at harvest

Table 2, show that no significant differences in final plant height at harves were observed between the two direct seeding and transplanted cotton plants except transplanting seedling at 20 cm between hills in the second season and the combined analysis. The tallest plants were recorded in the direct seeding plots, whereas, the shortest one were obtained from transplanting plots at 20 cm between hills. Similar results were reported by Hamed (1995), Abd El-Hadi and Yasseen (1997) and Yasseen and Abd El-Hadi (1997). However, El-Agroudy and Iman (1994) and Yasseen et al. (1995), stated that plant height was significantly greater in favour of transplanting when compared with seed planting. Also, El-Zaree (1981) reported that plant height did not follow a definite trend in this respect.

Data in Table 2 indicate that plant height tended to increase by increasing the distance between hills. This trend might be due to the less competition between plants on nutrient elements and edaphic factors in case of low plant density which resulted in plants with vigorous vegetative growth.

These results are supported by the results of Hamed (1995) and Wassel et al. (1995). While, Yasseen et al. (1990), stated that plant height was increased by increasing plant population.

With regard to potassium fertilization levels, Table 3, show that the effect of potassium on plant height was not significant in both seasons and the combined analysis. Similar results were reported by Darwish (1991) and El-Gahel et al. (1993).

The interaction effect between hill spacing and potassium levels on plant height at harvest showed a significant effect only in 1996 season.

Table 2. Effect of hill on spacing on growth, yield and yield components in 1995 and 1996 seasons and the combined analysis.

Character	D.E.S* 20 cm	D.L.S.** 20 cm	Transplanting 20 cm	Transplanting 25 cm	Transplanting 30 cm	L.S.D at 5%
			1995 season			
Plant height at harvest (cm)	132.93	137.99	126.90	130.44	132.46	N.S.
No. of fruiting branches/plant	15.13	14.15	14.86	15.71	14.62	N.S.
Node number of first fruiting branch	10.92	11.54	11.20	11.12	10.83	N.S.
Total number of bolls/plant	15.61	13.92	19.22	21.22	19.68	4.47
Number of open bolls/plant	13.77	11.45	15.44	17.31	18.73	2.93
Seed cotton weight/boll (g)	2.67	2.69	2.69	2.68	2.66	N.S.
No. of plants fed. (X1000)	61.212	60.455	44.466	39.218	35.054	7.18
Seed cotton yield/fed (Kentar)	13.89	11.86	11.75	11.21	11.60	1.56
Seed index	10.83	10.76	10.46	10.87	10.58	N.S.
Lint percentage	39.32	39.07	39.42	39.31	39.66	N.S.
			1996 season			
Plant height at harvest (cm)	125.81	128.13	103.93	122.48	121.59	13.22
No. of fruiting branches/plant	13.18	13.78	13.54	15.57	15.60	1.09
Node number of first fruiting branch	9.31	9.48	9.30	9.01	8.98	0.42
Total number of bolls/plant	16.03	14.02	16.98	18.34	19.06	1.32
Number of open bolls/plant	15.12	11.97	15.03	17.35	17.77	1.38
Seed cotton weight/boll (g)	2.73	2.82	2.87	2.73	2.78	N.S.
No. of plants fed. (X1000)	55.013	51.829	43.658	39.227	36.689	3.63
Seed cotton yield/fed (Kentar)	14.13	12.56	12.47	11.78	11.73	1.49
Seed index	11.59	11.61	11.56	11.45	11.66	N.S.
Lint percentage	39.60	39.48	40.24	39.85	40.20	0.55
			Combined			
Plant height at harvest (cm)	129.37	133.06	115.42	126.46	127.03	8.03
No. of fruiting branches/plant	14.16	13.97	14.20	15.64	15.11	1.02
Node number of first fruiting branch	10.12	10.51	10.25	10.07	9.90	0.21
Total number of bolls/plant	15.82	13.97	18.10	19.78	19.37	1.84
Number of open bolls/plant	14.45	11.71	15.24	17.33	18.25	1.28
Seed cotton weight/boll (g)	2.70	2.76	2.77	2.71	2.72	N.S.
No. of plants fed. (X1000)	58.113	59.142	44.062	39.222	35.871	3.18
Seed cotton yield/fed (Kentar)	14.01	12.21	12.11	11.49	11.67	1.45
Seed index	11.21	11.19	11.01	11.16	11.12	N.S.
Lint percentage	39.46	39.27	39.83	39.58	39.93	0.30

* Direct early sowing ** Direct late sowing

Table 3. Effect of potassium fertilizer levels on growth, yield and yield components in 1995 and 1996 seasons and the combined analysis.

Character	Without potassium	24 kg potassium	48 kg. potassium	L.S.D. at 5%
		1995 season		
Plant height at harvest (cm)	129.64	132.58	134.19	N.S.
No. of fruiting branches/plant	14.78	14.98	14.92	N.S.
Node number of first fruiting branch	11.02	11.21	11.13	N.S.
Total number of bolls/plant	20.01	16.76	17.00	2.46
Number of open bolls/plant	17.00	14.34	14.69	0.77
Seed cotton weight/boll (g)	2.57	2.72	2.72	N.S.
No. of plants fed. (X1000)	46.835	48.367	49.041	N.S.
Seed cotton yield/fed (Kentar)	12.40	12.11	11.67	N.S.
Seed index	10.83	10.74	10.63	N.S.
Lint percentage	39.20	39.59	39.28	0.25
		1996 season		
Plant height at harvest (cm)	125.18	117.68	118.30	N.S.
No. of fruiting branches/plant	14.56	14.12	14.32	N.S.
Node number of first fruiting branch	9.23	9.35	9.07	N.S.
Total number of bolls/plant	17.01	16.42	17.23	N.S.
Number of open bolls/plant	16.10	15.25	14.99	N.S.
Seed cotton weight/boll (g)	2.78	2.8 4	2.74	N.S.
No. of plants fed. (X1000)	45.302	47.865	46.283	N.S.
Seed cotton yield/fed (Kentar)	12.49	13.00	12.13	N.S.
Seed index	11.61	11.58	11.53	N.S.
Lint percentage	39.88	40.33	39.41	
		Combined		
Plant height at harvest (cm)	127.41	125.13	126.25	N.S.
No. of fruiting branches/plant	14.67	14.55	14.62	N.S.
Node number of first fruiting branch	10.13	10.28	10.10	N.S.
Total number of bolls/plant	18.51	16.61	17.12	1.32
Number of open bolls/plant	16.55	14.80	14.84	0.99
Seed cotton weight/boll (g)	2.68	2.78	2.73	N.S.
No. of plants fed. (X1000)	46.062	48.116	47.662	N.S.
Seed cotton yield/fed (Kentar)	12.45	12.56	11.90	N.S.
Seed index	11.22	11.16	11.08	N.S.
Lint percentage	39.54	39.96	39.35	N.S.

2. Number of fruiting branches/plant:

Data in Table 2 indicate that the average number of fruiting braches/plant was significantly affected by distance between hills in 1996 season and the combined analysis. The results showed that number of fruiting branches per plant increased significantly by transplanting seedling as compared with normal direct seeding. This result might be due to the lower actual population density in case of transplanting as compared with direct sowing, while no significant effect was found between direct seeding and transplanting at 20 cm between hills. El-Shazily (1992), Yasseen (1993), El-Agroudy and Iman (1994) and Yasseen and Abd El-Hadi (1997) reported similar results. On the other hand, El-Sayed (1992) demonstrated that number of fruiting branches/plant was significantly affected by various planting methods in favour of normal direct seeding. However, El-Zaree (1981) and Hamed (1995), who concluded that this trait increased insignificantly by transplanting as compared with seed planting.

Regarding the hill spacing, within transplanting, the data revealed that number of fruiting braches/plant decreased significantly at 20 cm between hills than 25 cm and insignificantly when trasplanting at 30 cm between hills. Yasseen (1994), reported that this trait increased significant by increasing hill spacing within transplanted plants, while, Hamed (1995), found that it tended to be increased slightly by increasing hill spacing.

Potassium treatment did not affect significantly the number of fruiting branches/plant (Table3). This trend could be seen in both seasons and the combined analysis. Similar results wrer obtained by Hamed (1995). While, Adb El-Aal et al. (1990) and Darwish (1991), found that application of 48 kg K_2O/feddan had a great effect on number of fruiting branches/plant.

From Table (4), it is also clear that these are significant effect due to the interaction between hill spacing and potassium levels on numbr of fruitined branches/plant in the two seasons and the combined analysis. The highest values were obtained from the combined analysis, from transplanting at 25 cm between hills and without application of potassium, while the lower values were obtained from transplanting at 20 cm between hills and application of 24 K_2O per feddan.

Table 4. Effect of interaction between hill spacing and potassium fertilizer levels on number of fruiting branches/plant and seed index in 1995 and 1996 seasons and the combined analysis.

Treatments	1995 Season			1996 Season			Combined		
	Without K_2O	24 kg K_2O	48 kg K_2O	Without K_2O	24 kg K_2O	48 kg K_2O	Without K_2O	24 kg K_2O	48 kg K_2O
	Number of ruiting branches/plant								
Direct early sowing at 20cm	15.97	13.78	15.61	13.56	12.91	12.99	14.77	13.35	14.31
Direct late sowing at 20cm	11.95	16.78	13.73	15.13	13.88	12.35	13.54	15.33	13.04
Traansplanting at 20 cm	15.68	13.63	15.28	12.18	12.33	16.13	13.93	12.98	15.70
Traansplanting at 25 cm	16.15	14.43	16.55	15.75	15.90	15.05	15.95	15.16	15.80
Traansplanting at 30 cm	14.15	16.28	13.43	16.18	15.58	15.08	15.16	15.93	14.25
L.S.D. at 5% level		2.28			2.25			1.56	
	Seed index								
Direct early sowing at 20cm	11.23	11.07	10.58	11.51	11.56	11.70	11.70	11.32	11.14
Direct late sowing at 20cm	10.71	10.45	11.11	11.67	11.47	11.19	11.19	10.96	11.40
Traansplanting at 20 cm	10.24	10.74	10.40	11.64	11.48	11.56	10.94	11.11	10.98
Traansplanting at 25 cm	10.71	10.73	11.17	11.46	11.58	11.37	11.08	11.15	11.24
Traansplanting at 30 cm	11.21	10.68	9.86	11.77	11.81	11.39	11.49	11.25	10.62
L.S.D. at 5% level		0.51			0.33			0.28	

3. Node number of first fruiting branch:

The results in Table 2, indicate that the location of first fruiting node was initiated in lower node when transplanting at 30 cm between hills as compared with direct sowing only in the second season and the combined analysis, while in the first season planting methods had no significant effect on this trait. These results are similar to those of El-Sayed (1992) and El-Shazily (1992), but contrary to those reported by El-Agroudy and Iman (1994) and Hamed (1995) who reported that first sympodium was obtained on slightly higher nodes in plants sown by transplanting.

With regard to hill spacing within transplanting, the results indicate that node number of first fruiting branch was decreased by increasing the distance between hills. These results are in agreement with those reported by Yasseen (1994) and Wassel *et al.* (1995). While, Hamed (1995), who mentioned that row width and hill spacing had insignificant effect on this trait.

Concerning the effect of potassium on height of first fruiting branch, no significant differences were detected in the two seasons or in the combined analysis (Table 3) of experimental soil. This trend is in harmony with those obtained by El-Gahel et al. (1993) and Hamed (1995).

The interaction between hill spacing and potassium levels had no significant effect on this trait.

B. Yield and yield components:

1. Number of total bolls/plant

Results presented in Table 2, indicate that total number of bolls/plant was significantly higher in case of transplanting methods as compared with direct seed planting in 1995 and 1996 seasons and the combined analysis. The increase of total bolls/plant in case of transplanting methods is due to the high number of fruiting branches per plant and the lower plant population. Similar results were obtained by El-Shazily (1992), Yasseen (1993), Hamed (1995), Yasseen (1997) and Yasseen and Abd El-Hadi (1997).

Data in Table (2), also revealed that number of total bolls per plant increased slightly by increasing hill spacing within transplanting treatments. These results are in agreement with those obtained by El-Zaree (1981), Darwish (1991) and Hamed (1995).

From Table (3), it is clear that potassium levels had significant effect on number of total bolls/plant in the first seaason and the combined analysis. Hamed (1995) found that potassium fertilization did not affect significantly the number of total bolls/plant. While, Darwish (1991), reported that this trait was significantly increased by raising potassium level.

The effect of the interaction between hill spacing and potassium levels on total number of bolls/plant had a significant effect only in 1996 season. The results in Table 5, show that the highest number of total bolls/plant was obtained by transplanting at 25cm between hills and without application of potassium, while, the lower value was obtained by direct late sowing and application 24 kg K_2O/feddan. The effect of interaction on this trait was similar to that on number of fruiting branches/plant (Table 4).

2. Number of open bolls/plant

Results presented in Table (2), indicate that the effect of plant density on number of open bolls/plant was similar to that obtained on total number of bolls/plant. The data revealed that the highest number of open bolls/plant was obtained from transplanting as compared with direct seeding in 1995 and 1996 seasons . In

this respect, Yasseen (1993), Hamed (1995) and Yasseen (1997), reported that number of open bolls/plant was significantly higher in case of transplanting. Also, Abd El-Hadi and Yasseen (1997) and Yasseen and Abd El-Hadi (1997), found that transplanting the seedling decreased significantly the number of open bolls/plant as compared with direct early sowing only, but increased it as compared with direct late sowing.

Regarding effect of hill spacing within transplanting, results in Table 2, obviously show that this trait increased signfiicantly as hill spacing increased. Similar results were reported by El-Shazly (1992) and Yasseen (1994). While, Hussein et al. (1983) and Hamed (1995), reported that plant population densities had no significant effect on this trait, but it increased slightly by increasing hill spacing within transplanting.

The results in Table (3), show that potassium fertilizer level effect on number of open bolls/plant was similar to that on total number of bolls/plant. This is in agreement with the results obtained by Hamed (1995). On the other hand, Abd El-Aal et al. (1990) and El-Gahel et al. (1993), found that increasing K_2O from 24 to 48 kg/feddan increased number of open bolls/plant. No significant interaction could be detected on this trait.

3. Boll weight

From Table 2, it could be seen that weight of seed cotton/boll was not affected significantly by transplanting and direct planting. This result is in contrary to results obtained by Yassen (1993), Hamed (1995), Abd El-Hadi and Yasseen (1997) and Yesseen and Abd El-Hadi (1997) . However, El-Sayed (1992), El-Shazily (1992) and El-Agroudy and Iman (1994), reported that transplanting gave higer boll weight compared with direct sowing..

The date in Table (2), show that boll weight was not affected significantly by varying hill spacing within transplanting Theses result are in agreement with th results of Yasseen (1994) and Hamed (1995).

Concerning the effect of potassium fertilizer levels, fertilization treatment did not affect significantly boll weight. Similar results were reported by Abd El-Aal et al. (1990), El-Gahel et al. (1993) and Hamed (1995). Also, Darwish (1991) Showed that boll wight was significantly increased by increasing k fertilization. No significant interaction could be detected on this trait.

4. Number of plants per feddan at harvest:

From Table 2, it is obvious that actual number of plants per feddan at harvest was significantly influenced due to the different planting methods Number of plants at harvest was significantly lower in case of sowing cotton by transplanting, especially at 20 cm between hills as compared with directly sown plants. The low number of plants in transplanting treatment (at 20 cm between hills) might be due to the perish of seedling and use of seedling without lateral roots during transplanting process and the need for period for rcovery. These might lead to the absence of some plqants, which in turn affect the stand of cotton plants at harvest. Similar results were obtained by Yaseen (1993), Hamed (1995) and Yasseen and Abd El-Hadi (1997). A contradictory trend which was obtained by El- shazily (1992) who, indicated that transplanting mthods increased signififcantly number of plants/feddan over that obtained from conventional seed growing methods. However, Yasseen (1997), reported that this trait was not significantly affected by planting methods.

Data prsent in Table (2), show that number of plants/feddan ws increased significantly by increasing population density through narrowing distnce between hills, within transplanting treatments. The percentage of survived plants, in the combind analysis, amounted to 68.20,75.88 and 83.28% for cotton plants sown by transplanting at 20,25 and 30 cm between hills, respectively. the higher loss in plants at dense Planting could be attributed to mechanical injury due to the cultural practices that followed , as cultivation and irrifation. also to higher intraspecific competilion in danse planting. Actual number of plants/feddan at harvest was noticed to be greater by narrowing the distance between hills. Similar results were reported by Yasseen (1994) andHamed (1995).

With regard potassium fertilizer level (Table 3), it is obvious that application of potassium did not exert any significant effect on number of plants/feddan at harves.This trend is in general agreement with those obtained by Darwish (1991) and Hamed (1995). The interaction involved did not show any significant effect on this trait.

5. Seed cotton yield per feddan:

The results in Table (2),show that direct early seeding had substantial significant influence on the yield of seed cotton/feddan, in the two growing seasins and in

the combined analysis as compared with transplanting treatments and direct late sowing. The present results could be ascribed to sutiablity of direct early date to the growth and to the lower actual population density at harvest for transplanting treatments when compared with direct sowing. However, number of open bolls/plant and boll weight took another trend. Therefore the increase of population density of conventional method led to the higher yield/unit area. These results are in harmony with those obtained by Hamed (1995), Abd El-Hadi and Yasseen (1997) and Yasseen and Abd El-Hadi (1997), who reported that transplanting produced lower yields than normal direct seeding. However Yasseen (1997) found that average of seed cotton yield/feddan was significantly greater in case of planting cotton by transplanting as compared with direct early or late sowing.

The data in Table 2, reveal no significant effect of hill spacing within transplanting treatments on seed cotton yield. Hamed (1995), found that no significant effect on this trait when planting at 25 and 30 cm between hills in the first season and at 20-25 cm in the second season, also, Wassel (1995), found that decreasing hill spacing from 30 to 20 cm tended to give insignificantly increase in seed cotton yield. However, Yasseen (1994), showed that seed cotton yield/feddan increased as population density was increased.

Data in Table 3, indicate insignificant effect for potassium levels on seed cotton yield/feddan. This was true in both seasons and their combined analysis. Table (1), show that the experimental soils were rich in phosphorus. This means that this nutrient was not limiting factor. El-Gahel et al. (1993) and Hamed (1995), reported that application of potassium had no significant effect on average seed cotton yield/feddan. While, Abd El-Aal et al. (1990), reported that the potassium fertilizer tended to decrease seed cotto yield when applied at a rate of 48 kg K2O/feddan as compared with that of 24 kg K2O/feddan. The interaction between hill spacing and potassium levels was insignificant on this trait.

6. Seed index:

No significant differences were observed in seed index between direct planting and transplanting treatments, also, within transplanting treatments (Table 2). Data in Table 3 show no relationship between seed index and potassium amounts added to the cotton plants. Yasseen (1993), Hamed (1995), Yasseen (1997) and Yasseen and Abd El-Hadi (1997), found that no significant difference in seed index between normal direct seeding and transplanting. Also, Yasseen (1994) and Hamed (1995), stat-

ed that average of seed index within transplanted plants was insignificantly affected by different spacing of hills. Abd El-Aal et al. (1990) and Hamed (1995) reported that seed index was not significantly affected by potassium application. While, Darwish (1991), who reported that this trait was significantly increased by increasing k fertilization.

The effect of interaction between hill spacing and potassium levels on seed index in the two seasons and their combined analysis being shown in Table (5) was significant. However, the highest values were obtained from transplanting at 30 cm between hills and without application of potassium, while the lower values were obtained also, from transplanting plants at 30 cm between hills and application 48 kg K2O/feddan. These results were true in both seasons and the combined analysis.

Table 5. Effect of interaction between hill spacing and potassium fertilizer levels on plant height at harvest and total number of bolls/plant in 1996 season.

Treatments	Plant height (1996)			Total number of bolls/plant (1996)		
	Without K_2O	24 kg K_2O	48 kg K_2O	Without K_2O	24 kg K_2O	48 kg K_2O
Direct early sowing at 20cm	133.16	121.67	122.55	15.98	15.24	16.83
Direct late sowing at 20cm	138.23	123.38	122.80	14.23	13.30	14.53
Traansplanting at 20 cm	94.80	100.55	116.45	16.28	15.95	18.73
Traansplanting at 25 cm	126.63	120.85	119.95	19.78	18.63	16.63
Traansplanting at 30 cm	133.08	121.95	109.75	18.78	18.98	19.43
L.S.D. at 5% level		15.67			2.30	

7. Lint percentage

Data in Table (2), indicate that lint percentage decreased significantly in case of direct seed planting than transplanting treatments. This was in the second season only, and the combined analysis. The highest value in the combined aanalysis (39.93%) was obtained when plants were transplanted at 30 cm between hills. These results are in general agreement with those obtained by El-Agroudy and Iman (1994) and Abd El-Hadi and Yasseen (1997), who reported that lint percentage was significantly higher in case of transplanting than direct seeding. While, Yasseen (1993), Hamed (1995), Yasseen (1997) and Yasseeen and Abd El-Hadi (1997) found that lint percentage was not significantly affected by transplanting method and direct seed planting.

The data in Table 2, show that, lint percentage was not affected by different

hill spacing within transplanting cotton plants. Similar result was obtained by Yasseen (1994) and Hamed (1995).

Fertilization treatments (Table 3) exerted a significant effect on lint percentage in 1995 only, but insignificant effect in 1996 and the combined analysis. However, the application of 24 kg K_2O/feddan produced the higher lint percentage. Similar result was obtained by Abd El-Aal et al. (1990) and Darwish (1991). While, Hamed(1995), reported that lint percentage did not significantly react to potassium rate.

The interaction between hill spacing and potassium levels were not significant in both seasons and their combined analysis.

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دراسة مقارنة لزراعة القطن شتلا وزراعته بالبذرة

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معهد بحوث القطن – مركز البحوث الزراعية بالجيزة.

أقيمت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بسدس – محافظة بني سويف خلال موسمي ١٩٩٥ ، ١٩٩٦ علي صنف القطن جيزة ٨٠ وهو الصنف المنزرع في تلك المنطقة لدراسة ومقارنة الزراعة التقليدية بالبذرة مع زراعة القطن شتلا باستخدام طريقة المقرش البلاستيك (طريقة المشمع) تحت مسافات زراعية مختلفة (٢٠ ، ٢٥ ، ٣٠ سم بين الجور) ومعدلات تسميد بوتاسي (بدون تسميد ٢٤ ، ٤٨ كيلو جرام بوتاسيوم للفدان) والتفاعل بينهما علي النمو والمحصول ومكوناته في تجربة مصممة في قطاعات منشقة بعدد أربعة مكررات للمعاملة الواحدة وكانت معاملات الدراسة هي :

أ. القطع الرئيسية (مسافات الزراعة).

١. زراعة تقليدية بالبذرة مع ميعاد زراعة المشتل وعلي مسافة ٢٠ سم يبين الجور وهي المسافة الموصي بها.

٢ . زراعة تقليدية بالبذرة مع ميعاد نقل الشتلات للأرض المستديمة وعلي مسافة ٢٠ سم بين الجور. وهي المسافة الموصي بها.

٣. شتل بادرات القطن علي مسافة ٢٠ سم بين الجور.

٤. شتل بادرات القطن علي مسافة ٢٥ سم بين الجور.

٥. شتل بادرات القطن علي مسافة ٣٠ سم بين الجور.

ب. القطع المنشقة (مستويات التسميد البوتاسي)

١. بدون تسميد بوتاسي.

٢. التسميد بمعدل ٢٤ وحدة بوتاسيوم للفدان.

٣. التسميد بمعدل ٤٨ وحدة بوتاسيوم للفدان.

وقد أوضحت نتائج الدراسة مايلي:

١. أدت الزراعة المباشرة بالبذرة إلي زيادة في الطول النهائي للنبات. وإرتفاع أول فرع ثمري، وعدد النباتات النهائية عند الجني وكذا محصول الفدان من القطن الزهر، بينما أنخفض عدد الأفرع الثمرية للنبات وعدد اللوز الكلي والمتفتح للنبات وكذا صافي الحليج وذلك بالزراعة التقليدية بالبذرة بمقارنتها بمعاملات الزراعة شتلاً. كذلك لوحظ عدم تأثر كل من متوسط وزن اللوزة وكذلك معامل البذرة باختلاف طريقة الزراعة.

٢. أدت زيادة مسافات الزراعة من ٢٠ – ٣٠ سم بين الجور في الزراعة بطريقة الشتل إلي زيادة معنوية في الطول النهائي للنباتات عند الجني، وعدد الأفرع الثمرية للنبات وعدد اللوز الكلي والمتفتح للنبات وكذلك صافي الحليج. بينما انخفض عقدة أول فرع ثمري، وعدد النباتات النهائية عند الجني، وكذلك محصول الفدان من القطن الزهر.

٣. لم تؤثر معدلات التسميد البوتاسي علي كل من الطول النهائي للنباتات عند الجني، عدد الأفرع الثمرية للنبات، وارتفاع أول فرع ثمري، ومتوسط وزن اللوزة، وعدد النباتات النهائية عند الجني، ومحصول الفدان من القطن الزهر، ومعامل البذرةوكذلك صافي الحليج. بينما انخفض كل من عدد اللوز الكلي وعدد اللوز المتفتح للنبات بزيادة معدلات البوتاسيوم.

٤. لوحظ أن إضافة التسميد البوتاسيوم بمعدل ٢٤ وحدة بوتاسيوم للفدان أدي إلي زيادة غير معنوية في عدد النباتات النهائية للفدان وكذلك محصول الفدان من القطن الزهر.

٥. أظهر التفاعل بين المعاملات المختلفة تأثيراً معنويا علي كل من عدد الأفرع الثمرية للنبات ومعدل البذرة خلال موسمي الزراعة والتفاعل بينهما. بينما أظهرت معاملات التفاعل أيضا تأثيراً معنويا علي كل من الطول النهائي للنباتات عند الجني وكذلك عدد اللوز الكلي للنبات خلال موسم ١٩٩٦ فقط.

٦. لم يوجد فرق معنوي بين الزراعة المتأخرة بالبذرة ومعاملات لشتل.