Evaluation of Cotton Transplanting in Salin Soils

Z. Tahmasebi Sarvestani, and M. Kordi

Department of Agronomy, College of Agriculture, University of Tarbiat Modarres, Tehran, Iran.

ABSTRACT

During 1998 an experiment was carried out to evaluate cotton transplanting in saline soils in the experimental field of Cotton Research Institute, Varamin, Iran. The experimental design was a randomised complete block in the form of split-split plot with three replications. Main plots were two planting dates; May 20 and June 10. Single and double row plantings were used as sub-plots and sub-sub-plots were the age of transplants with four levels; direct seeding, 10, 30, and 40 days old transplants. The results showed that delaying planting date reduced yield, earliness, number of bolls and monopodia per plant. Double row planting in comparison with single row planting resulted in higher yield, stand counts, number of bolls and monopodia per plant. Transplanted plants compared to direct seeded plants had more sympodia. Stand counts were affected by transplanting and as age of transplants increased, this trait decreased. Use of cotton transplanting had no effect on yield, earliness, number of bolls per plant, and boll size.

Key words

Age of transplanting, cotton, planting arrangement, planting date, saline soil.

INTRODUCTION

Continuation of production in cotton cultivation, needs using new agronomic methods which are proper for this plant habits and adaptation. Cotton transplanting using paper pots, recently is noticed as a new method by major cotton producer countries. With having a successful transplanting following results may accessed yield increase (Sun and Wang, 1996), saving seed, elimination of thinning, using transplants in replanting, increase in fields output using a one year cotton-winter cereals rotation (Choi et al., 1992), elimination of harmful effects of environment at planting time (Hu and Lei, 1994), more effective use of limited water sources at beginning of growing season that water is used for other crops, decrease in fertiliser use after rotation with legumes (Seif-El-Nasr, 1995), and having enough time to prepare field before planting.

Using paper pot method in saline soils needs a more care. In furrow cultivation in these kinds of soils the most amount of salts accumulated on top of the rows, when water evaporated. One way to access a successful yield, is choosing an appropriate planting arrangement which decreases salt effects on transplants or emerging seeds (Waddle, 1993). It seems that double row planting method can reduce salinity negative effects. This investigation with aim of increasing cotton planting utilization and the best use of saline soils, studies cotton transplanting possibility, the best date of transplanting, the best age of transplants, and also proper arrangement of cotton cultivation in saline soils.

MATERIALS AND METHODS

This study was carried out in 1998, in a saline field of Deputy Office of Cotton Research Institute, Varamin, Iran. On base of Koppen divides, the region has a cold-desert climate. Field soil had a loam-sand structure with a 7.75 pH and 9.7 dSm^{-1} EC. The statistical design used was a split-split plot on base of randomised complete blocks with three replications. Main plots were planting dates: May 20 (normal) and June 10 (late), sub-plots were two planting arrangement: single and double row plantings, and sub-sub plots were four age of transplants: direct seeding; 10 days old (cotyledon stage); 30 days old (two real leaves); and 40 days old (four real leaves). Used paper pots had a 2.7 cm diameter, 12 cm length and were filled with a mixture of sand, field soil and manure with a rate of 1:5:1. One *Gossypium hirsutum* L. var. Varamin seed was sowed in each pot. Field preparing operations were consisted of autumn

plowing, applying 200 kg/ha ammunium phosphate, disk harrow and furrowing in spring. Seedlings transplanted by a hand transplanter at early morning or late afternoon. Row spacing and distance among seedlings on rows were 80 cm and 20 cm, respectively. Also 45 days after each transplanting date, 250 kg/ha urea fertiliser was applied. Thinning and replanting was done 30 days after each planting date. The first and second planting dates were irrigated 11 and 9 times, respectively. To access the potential production, pests and diseases were controlled appropriately. The data were analysed by analysis of variance.

RESULTS AND DISCUSSION

Plants of June 10 transplanting had less monopodia, boll numbers, earliness, and yield in comparison with May 20 transplants. Delay in transplanting due to shorter vegetative growth period and reduced vegetative parts of plants. Since boll weight did not significantly changed in different treatments and environmental conditions (Sun and Wang, 1996), it was obvious that in late transplanting dates, yield reduced through reduction of boll number per plant (Hu and Lei, 1994; Sun and Wang, 1996).

Using double row planting (zigzag) compared to single row planting, increased monopodia and boll number per plant, stand counts and yield. With regard to placement of seeds and transplants were far from accumulated salts in double row planting, emergence and growth of seedling and as a result stand counts were more than single row planting. In the other hand better distribution of plants caused a higher consumption of radiation, and finally increase of vegetative parts and boll number in double row planting. All above mentioned factors caused yield increase, Backer (1996) confirmed these results.

Transplanting treatments (a ^{2} , a ^{3} , and a ^{4} in table 1) in comparison with direct seeding (a ^{1}) increased monopodia and sympodia number per plant and decreased stand counts. It also had no effect on yield and other recorded traits. Radwan and Abd-El-Malak (1995) also reported similar results. Since in direct seeding, several seeds were sown in the planting hill, it is certain that seedling establishment was higher, and reduced stand counts in transplanting plants caused an increase in vegetative growth of each plant.

As age of transplants increased, number of monopodia and stand counts decreased. It seems that this is related to branching of roots in transplants. Root length in 10, 30, and 40 days old transplants were 6.2, 12.3,and 14.2 cm, respectively, but length of pots were 12 cm. Therefore tip of the roots went out of the pots in older transplants and at time of handling, injured. It caused formation of secondary roots. These kind of roots could not pierced deep in soil (Waddle, 1993) and their growth beside accumulated salts on the rows, had a harmful effect on growth and stand counts.

Table 1. Effects of transplanting date, planting arrangement and transplanting age on yield and other agronomical traits.

Treatment	Monopodia	Sympodia	Stand counts	Boll size	Bolls	Earliness	Yield
	No.plant $^{-1}$	*No.plant* $^{-1}$	*No.m* $^{-2}$	*gr.boll* $^{-1}$	*No.plant* $^{-1}$	*%*	*Kg.ha* $^{-1}$
d_1	4.53 a	12.16 a	5.38 a	4.57 a	14.40 a	85.12 a	3297 a
d_2	3.97 b	11.79 a	5.04 a	4.48 a	10.93 b	41.41 b	2595 b

p_1	3.92 b	11.69 a	4.93 b	4.49 a	12.19 b	62.81 a	2793 b
p_2	4.58 a	12.26 a	5.48 a	4.56 a	13.14 a	63.72 a	3099 a
a_1	3.93 b	10.50 b	6.12 a	4.51 a	12.21 a	57.39 a	3152 a
a_2	5.21 a	12.52 a	5.08 b	4.54 a	12.71 a	63.50 a	2963 a
a_3	4.03 b	12.34 a	4.92 bc	4.51 a	12.93 a	67.35 a	2905 a
a_4	3.82 b	12.53 a	4.72 c	4.52 a	12.81 a	64.83 a	2763 a

D: Transplanting date (d $_1$: june19 and d $_2$: may 20), **P**: Planting arrangement (p $_1$: single row and p $_2$: double row) and **A**: Transplanting age (a $_1$, a $_2$, a $_3$ and a $_4$: directed seed plant, 10, 30 and 40 days old transplants respectively)

Means followed by similar letters in each column, are not significantly different at the 5% level according to Duncan's multiple range test.

CONCLUSION

Based on this experiment results, delay in transplanting, had a negative effect on many plant traits. It seems that double row planting (zigzag arrangement) is more appropriate planting system for saline soils. Transplanting was not significantly superior to direct seeding in many traits. Damaged roots of transplants, highly affected the results of this study, so we suggest more work on texture and of pots soil and the length of pots.

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