DETERMINATION THE EFFECT OF DEFOLIATION TIMING ON COTTON YIELD AND QUALITY

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ABSTRACT

This study was carried out for determining the effect of different application times at 40, 50, 60 and 70 % boll opening and untreated plot of the defoliant on cotton yield, earliness and technological properties in Southeast Anatolia Region conditions in Turkey. Maras 92 cotton variety was used as plant material in the experiment field of the Southeast Anatolia Agricultural Research Institute during 2000-2001. Defoliant was including thidiazuron + diuron chemical substance.

The result of this study showed that ginning percentage, 100 seed weight, seed germination percentage, fiber fineness, fiber length, fiber strength, reflectance, elongation and seed cotton yield were not affected by the treatment; plant height and first picking percentage in 2001, fiber uniformity in 2000 were 5 % significantly affected. This study showed that application of defoliant didn't affect significantly yield and technological properties of cotton and after 40 % boll opening the defoliant can be used.

Keywords: Cotton (Gossypium hirsutum L.), Defoliation, Yield, Quality, Application Time

INTRODUCTION

Cotton is one of the most important crops at the Southeast Anatolia Region in Turkey. In recently years, cotton sowing area and fiber production were increased significantly due to increase in irrigated area by GAP project. In addition to this, large field owner prefer mechanical harvesting of cotton instead of hand harvesting and therefore, they have to apply defoliation materials before harvest.

Defoliation is an important management practice associated with high yields and high quality cotton. Defoliation allows earlier harvest than if the crop matured naturally, but it can reduce yield and alter fiber quality if the application of the harvest aid is premature [16]. Therefore, producers attempt to optimize the timing of harvest-aid applications by maximizing the number of young bolls that are mature and harvestable without sacrificing the yield and quality of older bolls [1, 10]. Many variables determine the optimum defoliation timing for cotton grown in different area.

There are several techniques for determining when to begin applying harvest aids. Such as seed and fiber maturity, including percent open bolls, nodes above white flower, nodes above cracked boll, micronaire reading and visual inspection of cut bolls such as sharp knife techniques and Hall Lewis method [3, 15]. The number of days required to develop bolls to maturity depends upon growing conditions and weather. Hot and dry conditions will generally hasten maturity, while cool and wet conditions delay cotton maturity. Other factors that can impact maturity are fertility, plant-growth regulators, insect control, irrigation termination, and stand density. Cotton maturity is difficult to determine without using one of the above techniques to monitor the crop. Producers should employ proper techniques to determine cotton maturity before initiating harvest-aid applications. Harvest-aid efficacy is influenced by environmental conditions before, at the time of, and following application [5, 6]. The producer can more effectively and economically prepare cotton for harvest by selecting the appropriate harvest aid based on environmental and crop conditions [7, 12].

The objective of this study was to determine the effect of defoliation timing on cotton yield and quality and promise to producers when defoliation time is proper to cotton harvest under Southeastern Anatolia Region which is the major cotton production area in Turkey.

MATERIALS AND METHODS

Field experiments were conducted in 2000 and 2001 in experimental area of the Southeastern Anatolia Agricultural Research Institute in Diyarbakır. Maraş 92 cotton variety was used as plant material which was registered for the region. Treatments were arranged in a 5 x 5 Latin square designs and defoliation treatments were initiated at 40, 50, 60 and 70 % boll opening time and untreated check. The dose of Thidiazuron + Diuron chemical substance was at 600 ml/ha. Weeds and fertilizer management and furrow irrigation were given as needed according to regional recommendations. Percent open boll was determined by counting total and open bolls in ten plants selected randomly.

At sowing, plots were consisted of 6 rows 10 m long and spaced 0.70 m apart. At harvest, plot area was 22.4 m^2. The four center rows of each plot were picked by hand 14 days after treatment application, seed cotton harvested from each plot was weighed and air-dried before ginning and data were used to calculate total yields. Earliness was calculated as the percent of total yield picked at the first harvest, seed cotton samples were ginned and lint was weighed to calculate ginning turnout and a sub-sample of lint was analyzed by high volume instrument (HVI) testing. Data obtained were subjected to the analysis of variance and the means were compared using the LSD test.

RESULTS

The means and LSD groups regarding to examine characteristics were given in Tables. Defoliation timing and harvest aid affects on cotton yield and ginning percentage are presented in Table 1.

As seen in Table 1; there were non-significant differences among the treatment means for seed cotton yield but the highest seed cotton yield was obtained from control treatment all of two years. Findings of this study confirm the results obtained by other researcher [6] while another researchers reported that seed cotton yield decreased by treatment [4, 10]; but Abd-El-et al. (1990) [1] reported that seed cotton yield were increased. Snipes and Baskin (1994) [16] reported that defoliation before 60% open bolls, resulted in yield losses of 7 to 15%. Kerby et al. (1992) [9] also reported that the need for an early harvest under some conditions to avoid potential grade losses due to later inclement weather.

The effect of defoliation on ginning percentage was given on Table 1. It can be seen that non significant effect were recorded for ginning percentage, although first year 40% boll opening time treatment was higher (41.98%) compared with another treatments.

There were no significant differences among the treatments for 100 seed weight and seed germination

Table 1. Harvest aid effects on seed cotton yield and ginning percentage

	Seed Cotton Yield (kg ha^{-1})		Ginning Percentage (%)	
Treatment	**2000**	**2001**	**2000**	**2001**
Control (Unthreat)	6010	4970	39.04	37.86
% 40	5680	4705	41.98	38.34
% 50	5600	4470	39.48	38.62
% 60	5700	4520	38.86	37.86
% 70	5950	4700	39.50	38.54
C.V (%)	5.14	6.77	5.00	1.59
LSD (0.05)	n.s	n.s	n.s	n.s

* Significant at the 0.05 level
** Significant at the 0.01 level
ns: non significant

Table 2. Harvest aid effects on 100 seed weight and seed germination percentage

	100 seed weight (g)		Seed germination percentage (%)	
Treatment	**2000**	**2001**	**2000**	**2001**
Control (Unthreat)	11.00	9.52	86.00	87.00
% 40	11.14	9.36	80.40	90.80
% 50	10.91	9.28	81.20	88.80
% 60	11.19	9.80	81.20	92.00
% 70	11.12	9.96	84.80	90.80
C.V (%)	3.53	12.66	8.14	7.34
LSD (0.05)	n.s	n.s	n.s	n.s

* Significant at the 0.05 level
** Significant at the 0.01 level
ns: non significant

Table 3. Harvest aid effects on first picking percentage and plant height

	First picking percentage (%)		Plant height (cm)	
Treatment	**2000**	**2001**	**2000**	**2001**
Control (Unthreat)	82.06	92.54 ab	107.48	97.70 a
% 40	86.64	94.16 a	102.80	94.62 abc
% 50	86.18	94.04 a	104.40	93.94 bc
% 60	83.46	90.78 b	103.08	93.00 c
% 70	81.52	90.92 b	106.72	96.78 ab
C.V (%)	3.46	1.97	4.54	2.52
LSD (0.05)	n.s	2.517 *	n.s	3.312*

* Significant at the 0.05 level
** Significant at the 0.01 level
ns: non significant

Table 4. Harvest aid effects on fiber length and fiber fineness

	Fiber length (mm)		Fiber fineness (micronaire)	
Treatment	**2000**	**2001**	**2000**	**2001**
Control (Unthreat)	30.88	29.72	4.52	4.34
% 40	30.33	29.89	4.46	4.28
% 50	30.08	29.47	4.62	4.02
% 60	30.24	29.73	4.70	4.18
% 70	30.77	29.83	4.66	4.26
C.V (%)	1.71	1.61	5.14	12.00
LSD (0.05)	n.s	n.s	n.s	n.s

* Significant at the 0.05 level
** Significant at the 0.01 level
ns: non significant

Table 5. Harvest aid effects on fiber strength and fiber elongation

	Fiber strength (g/tex)		Fiber elongation (%)	
Treatment	**2000**	**2001**	**2000**	**2001**
Control (Unthreat)	29.30	30.88	7.76	7.64
% 40	28.80	31.10	7.22	7.52
% 50	27.86	31.30	7.70	7.66
% 60	28.06	31.92	7.48	7.68
% 70	28.84	31.52	7.50	7.40
C.V (%)	5.03	5.11	6.37	8.12
LSD (0.05)	n.s	n.s	n.s	n.s

* Significant at the 0.05 level
** Significant at the 0.01 level
ns: non significant

Table 6. Harvest aid effects on fiber elongation and fiber uniformity

	Fiber uniformity (%)		Reflectance (Rd)	
Treatment	**2000**	**2001**	**2000**	**2001**
Control (Unthreat)	85.16 a	83.94	68.98	73.72
% 40	83.90 b	84.72	69.32	71.26
% 50	84.64 ab	83.92	69.60	71.82
% 60	84.62 ab	84.14	69.96	72.26
% 70	85.38 a	84.60	70.50	71.48
C.V (%)	0.80	0.76	3.31	3.59
LSD (0.05)	0.9316*	n.s	n.s	n.s

* Significant at the 0.05 level
** Significant at the 0.01 level
ns: non significant

(Table 2) all of two years.

As seen in Table 3 for first picking percentage, first year didn't show any significant differences among the treatments, although 40 and 50% boll opening time treatments were higher than the other treatments, but second year applications in 40 and 50% boll opening times resulted in significant increases for first picking percentage when compared the other treatment means. The findings showed that defoliant and application time probably caused some earliness.

It can be seen that Table 3; there were significant differences exist for plant height in 2001, the plant height were affected from defoliation timing, control (untreated) and 70% boll opening time treatment shared same group, this findings showed that early applications resulted shorter plant height than the untreated check.

Defoliation timing and harvest aid impacts on fiber length and fiber fineness are presented in Table 4. It can be seen that in Table 4, there were non significant differences for fiber length and fiber fineness all of the year 2000 and 2001. The result of this study confirm to Larson et al.. (2005) [11] who reported that defoliation timing did not impact the fiber strength, staple length and length uniformity.

There were non significant differences for fiber strength and fiber elongation among the whole treatments (Table 5). Similar results have been reported by [4, 13, 6, 8, 14, and 1].

Table 6 showed that for fiber reflectance there were non significant differences, significant differences were found among the treatments in first year for fiber uniformity, control and 70% boll opening time treatment were highest and shared same group, second year there were non significant differences.

DISCUSSION

Recently year's large producers to prefer to mechanical harvest instead of hand harvest in Turkey. Therefore, information about determining different defoliation timing schemes is useful for cotton producers. From this study, it was observed that, after 40% boll opening time defoliant material can be applied

and this material did not detrimental effect on cotton yield and quality. So it can be used confidently when cotton is at least 40% percent open.

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