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EFFECTS OF COTTON PICKER AGES ON COTTON LOSSES AND QUALITY

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Abstract

In this study, the effects of the cotton picker model and drivers ability on cotton harvest losses and cotton quality were investigated. In experiments, five cotton pickers were used. Four cotton pickers have four rowed and one picker has six rowed with baler. John Deere cotton pickers were used in 2013 cotton harvest season. All of the experiments were conducted on BA119 cotton variety with and without defoliant treatment in Diyarbakır city.
Defoliant and boll opening chemicals (DROP Ultra + FINISH Pro) that were applied 15-25 days prior to harvest. In conclusion, no difference was found between in cotton lint quality by hand harvest and cotton pickers. On the other hand, cotton picker model and drivers ability were statistically differed on harvest losses. The highest harvest loss (60 kg da^{-1}) was found on 1998 model picker. The harvest losses were low than 25 kg da^{-1} on 2007 and the youngest model pickers. Fiber property measurements made by High Volume Instrument (HVI) systems. It is widely used to describe cotton quality in international commerce.

Key words*: cotton, harvest, cotton losses, lint quality.*

INTRODUCTION

Cotton is a major raw material for textile sector in Turkey and worldwide. Turkey is one of the important cotton producer countries. In Turkey, Cotton cultivation is mostly made especially in Southern east, Aegean and Çukurova regions. With the full implementation of the GAP gradually, Aegean and Çukurova region showed a decrease in cotton production areas, Southeastern Anatolia Region has also been an increase in the production area. This increase can also be provided based on the development of the cotton industry. Therefore, this has a strategic importance for the region. GAP covered in Diyarbakır, Şanlıurfa, Mardin and Batman as agricultural areas with more as well as the producers of the region opportunities for irrigation on the gap in the provinces of through boreholes have opened their own facilities, irrigated farmland has increased significantly. With water, a significant increase in the area of cotton production has occurred. This increase, today more than half of Turkey's cotton production is covered by the South Eastern Anatolia. In 2013, 2,250,000 tons cotton were cultivated in 450,890 ha area and 4,990 kg ha^{-1} fiber yield was estimated in Turkey. In GAP region 131,368 tons cotton cultivated in 278,950 ha area which is 58% of the total Turkish production (Tuik, 2014). Harvest in cotton production costs in the region, constitute the largest proportion of about 20-25% share. This value is very high. For many years, cotton production was made in the Aegean and Çukurova in Turkey and performed manually by the harvest workers. Significant reductions in the number of outgoing workers as cheap labor with the adoption of irrigated agriculture in the GAP region has occurred. Therefore, due to the reduction in workforce, cotton producing areas in the Aegean and Çukurova has reduced. Naturally fertile land with water having increased cotton production areas in the GAP region and provide labor for the cotton harvest has started to become an important issue. In particular, the inability to meet the demand for labor in response to increasing cotton production area, and for reasons such as difficulties in providing workers, although it increased harvesting costs, decreased the economic advantages of harvesting by hand. Demand for workers and increase the cost of

harvesting, has pushed manufacturers to use the machine as required. Because of the increase in labor costs in the region and in Turkey, paved the way for the use of cotton harvesters. The machine used in the cotton harvest becomes widespread for these reasons. The continuing increase of the support grants to irrigation systems and machinery-equipment by the government, and the spread of drip irrigation in cotton cultivation, it is expected more years of cotton production in the region will be made and the number of cotton harvest machines will increase. The use of different brands of harvesters is increasing every year in Bismil and Çınar district of Diyarbakır city which has an intensive cotton production. Although the situations like this, operator skills, machine age, plant varieties, precipitation, machine settings, inappropriate harvesting time, the losses due to equipment such as improper machine operation parameters, machine harvest losses are more than hand harvest and decreased fiber quality is reported by the manufacturer. In these reasons, it was decided to carry out such a study to determine the source of the problem in the GAP region at the manufacturer conditions. The aim of the study was to determine the effect of the age of machine and skill of the operator by using cotton harvesters of different ages on harvest losses and cotton fiber quality.

MATERIALS AND METHODS

Harvest experiments were carried out in the fields belonging to different manufacturers that the BA 119 cotton varieties cultivated in Bismil district of Diyarbakir province in 2013. Four four-five rowed cotton harvesters and one six rowed cotton harvester which makes round balers in different ages were used in the study (Figure 1). Plant row spacing was 70 cm, therefore, all the machines in the JD 9970 series were used four rowed for a smooth operation. All experiments were carried out with BA119 cotton variety and the same brand cotton harvest machines (John Deere 9970 and 7760). The working speed of all machines was tried to be 2.5-2.7m s^{-1} during the trial. Ideally, cotton harvest should be completed within 30 days after a defoliant was applied. Many times this cannot be accomplished due to adverse weather conditions (Khalilian et al., 1999). In present study, the defoliant treatment was performed 16-25 days before harvest. Boll opener and defoliant treatment (DropUltra+Finish Pro) was done. Harvest experiments were done in defoliant applied field.

Figure 1. Views of the cotton harvester in experiment area

In addition, to determine the values of efficiency, three each 1kg sample was taken from the tank of the machine in each field. These samples were sent to Ak Çırçır factory laboratory in Bismil district to be taken for roller ginning without any pre-cleaning process.

After ginning, these samples were taken to Fiber Analysis Laboratory of Diyarbakır Commodity Exchange and some important technological features were determined by using HVI (High Volume-Precision Instrument) instrument (Öz and Evcim, 2002 a; Anonymous, 2005; Demirtaş and Doğan., 2006; Bakeret al,. 2010; Kılıçkan et al., 2011; Sessiz et al., 2011). Fiber quality class was determined according to standard test HVI. To determine the field seed cotton yield and

harvest losses, measurements were made on 14 m^2 of randomly selected in two rows of three different places (row spacing 70 cm) and 10 m in-row spacing before and after harvest.

RESULTS AND DISCUSSIONS

Before the tests, measurements about plant were done on randomly selected five different locations on the experimental field. The mean values of these measurements, the yield values and the results of HVI analyze of the variety were given in Table 1.

Table 1. The mean values of the measurements, the yield values and the results of HVI analyze

Features	Mean values	
Plant height, cm	85.40	
Boll number on the plant, number	16.40	
Row spacing, cm	70	
In-row spacing, cm	10	
Seed cotton yield (kg da^{-1})	444.50	
HVI analyze results (cotton quality index)	Machine harvest	Hand harvest
Mean ginning yield	43.00	42.73
Fiber length (mm)	28.40	28.20
Uniformity index (%)	84.60	83.80
Fiber strength (g tex^{-1})	32.40	31.10
Fiber fineness (micronaire)	4.25	4.00
Spinning ability of cottons	151.80	149.00
Elongation (%)	6.55	6.40
Trash content	195.60	142.00

There is no statistically difference between the ginning yield values of BA 119 variety from the fields. Thus only the mean value (43%) was given in the table. This value varieties of catalog value obtained (42-43%) were found to match. Also the mean quality values obtained from HVI test were given in Table 1.

As it can be seen in Table 1, fiber quality classification was made by HVI standards (Öz and Evcim, 2002; Anonymous, 2005;) and the longest fiber length (28.40 mm), the highest length uniformity (84.60%), the highest fiber durability (32.40 g tex^{-1}), the highest fiber thickness (4.25 mm) and the highest elasticity (6.55%) were obtained in machine harvest. Thus, it can be seen that machine harvest has no negative effect on technological properties of cotton. There was no statistical difference on the analyze results between machine harvest and hand harvest.

The mean seed cotton lint yield and mean yield loss values of the cotton picked up from the 14 m^2 area before and after harvest were given in Table 2. Stalk loss, or the amount of seed cotton that was not removed from the plant by picking. The highest yield loss (60.18 kg da^{-1}) with a percent of 12.3% was determined on 1998 model JD 9970 cotton harvest machine. The lowest yield loss was determined on 2007 model JD 9970 cotton harvest machine. As it can be seen in Table 2, harvest losses are not only related with the age of machine but also it is related with maintenance, capability of operator and field conditions.

Table 2.The mean seed cotton yield and mean yield loss values of the cotton

BA 119 Cotton variety	Machine Model				
Properties	1998	2007	2011	2012	2012
	JD 9970	JD 9970	JD 9970	JD 9970	JD7760 (Baled)
Time of defoliant and boll opener application, days prior to harvest	20	25	15	25	16
Harvest dates	22.10.2013	27.10.2013	24.10.2013	23.10.2013	25.10.2013
Cotton lint yield, kg da^{-1}	486.42	443.57	458.5	346.2	487.85
Mean loss, kg da^{-1}	60.18	25.71	38.51	25	33.14
Loss rate, %	12.3	5.8	8.4	7.22	6.79

CONCLUSIONS

It was determined that machine harvest has no negative impact according to hand harvest in ginning, fiber quality and the harvest losses; conversely has big advantages in working time and labor. Thus, it will be advantageous to generalize the machine harvest for producers and country economy. Total of 25% harvest losses of will be reduced.

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