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INFLUENCE OF PICKING INTERVALS ON SEED-COTTON YIELD AND FIBER QUALITY OF LOCAL COTTON VARIETIES

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ABSTRACT

This study was conducted at the Nuclear Institute of Agriculture, Tandojam, to determine the influence of cotton picking intervals on yield and fiber quality traits of three cotton varieties viz. Sadori, Chandi-95 and Malmal. The experiment was followed in a Randomized Complete Block Design (factorial) with three replications. Picking intervals were based on boll opening percentage i.e. 1st picking was done at 30% boll opening stage, 2nd at 50, 3rd at 70 and 4th picking was done at 90% boll opening. Compared to other two varieties, the variety Sadori included in the study exhibited higher values for most of the recorded traits (boll weight, seed-cotton yield, ginning outturn, seed index, staple length and micronaire). Compared to other picking intervals, it was observed that picking at 50% boll opening is most suitable stage for cotton crop; particularly it is beneficial for boll weight, seed index, staple length, micronaire value, seed-cotton yield and maintaining fiber quality.

Keywords: cotton, fiber quality, picking intervals, yield

INTRODUCTION

The harvest time in cotton plays an important role in obtaining seed-cotton yield and maintaining its fiber quality (Joel *et al.,* 2004). Several previous studies reported the impact of picking intervals and methods on the seed-cotton yield and quality of cotton fiber (Muthamilselvan *et al.,* 2007). It has also been shared that fiber fineness and fibre strength remain satisfactory during the first picking interval and thereafter they sharply decline with each successive cotton pickings (Soomro *et al.,* 2007). The practice of late picking mainly exposes the seed-cotton to insect emission, dust and small leaf trash that ultimately leads to higher levels of glueyness and lower lint rating compared to programmed successive pickings (Abdel-Latif *et al.,* 2009). Mixing of immature bolls along with mature ones during picking of seed-cotton deteriorates lint quality (Soomro *et al.,* 2004). Varietal response leading to inferior seed quality, with moderately higher values for seed and kernel index, low seed index kernel^{-1} and index ratios; even at their late picking has been noticed in the past. The fortnightly picking intervals; have shown adverse effect on the yield and linit quality of picked seed-cotton.

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The first two pickings and bolls borne on the upper canopy have been found the major factors affecting seed-cotton yield. The seed index gradually decreases in subsequent pickings. Late pickings increase the chances to produce immature seeds in a large quantity, therefore, fiber fineness, seed maturity and fiber strength decrease with delay in sowing (Salam *et al.,* 1993; Soomro *et al.,* 2004). The colour of ginned cotton, purity (without foreign matter) and quality of the ginning process like fiber length are basic factors that help in determining the quality of cotton fiber. Soomro *et al.* (2007) examined the fiber quality of cotton as affected by picking time and reported that ginning outturn remains low in early pickings. This paper reports the effect of different cotton picking intervals on seed-cotton yield and fiber quality of three local cotton varieties.

MATERIALS AND METHODS

A field experiment was staged at the experimental farm of Nuclear Institute of Agriculture, Tandojam, Sindh, Pakistan during Kharif season of 2008-2009.The experimental site was situated in a semi-arid subtropical climate, 14m above the sea level [25.414277N/68.54060E], and the soil texture was sandy clay loam. Three commercial cotton varieties viz; Sadori, Chandi-95 and Malmal were evaluated for their quantitative and qualitative traits, under four cotton picking intervals, based on percent boll opening (30%, 50%, 70% and 90%). Initially mould board plough was used for land preparation, followed by planking and leveling. Seed sowing was done on ridges. Fertilizers were applied at the recommended rates (Zia-ul-hassan *et al.,* 2014); nitrogen (N) and phosphorus (P) were applied @ 150 kg N and 75 kg P_2O_5 ha^{-1}, respectively. All P_2O_5 (one bag) and K_2O (one bag) along with 1/4 of N were applied at the time of sowing, while remaining N was applied into two equal splits. First split was applied at squaring and remaining (1/4) at flowering stage. In total eight irrigations were applied on fortnightly basis. The experiment was laid out in a randomized complete block design (factorial) with three replications. The net plot size was maintained at 6.1 m x 6.1 m (eight rows of 6.09 meter). Five plants were tagged randomly from each plot for data recording such as ginning outturn%, staple length (mm), seed index (g) and micronaire (µg $inch^{-1}$). Obtaining ginning outturn% the formula was used as: lint weight/ seed-cotton weight x 100. Single roller ginning machine was used. Seed index (g) was determined by counting hundred seeds and recording their weight. The tuft method was used for determining the staple length (mm). Microinaire values were determined by spinlab portar instrument. Eight gram blended fiber sample was used for micronaire (µg $inch^{-1}$) observation. The data were analyzed for LSD at $P<0.05$ after ANOVA using statistical software, Statistix.

RESULTS AND DISCUSSION

Boll weight

When seed-cotton was picked at 50% boll opening we observed higher boll weight (g $plant^{-1}$). Maximum boll weight (g $plant^{-1}$) was shown by variety Sadori and Chandi-95, followed by variety Malmal (Table 1). The variation in average mature boll weight was probably due to the ability of different cultivars in utilizing and assimilating the available resources for the increase in average mature boll

weight. These results are in confirmation with Elayan *et al*. (1992) who also reported varietal variability for average mature boll weight.

Seed-cotton yield

The analysis of variance performed for seed-cotton yield plant^{-1} revealed that the varieties, picking intervals and their interactions were highly significant (*P*<0.05%). Maximum seed-cotton yield (plant^{-1}) was observed in variety Sadori (75.08 g), followed by Chandi-95 (69.03 g) (Table 2). The higher values of seed-cotton yield plant^{-1} (102.56 g) were recorded when seed-cotton was picked at 90% boll opening. Varieties showed significant difference in seed-cotton yield. That was mainly due to differences in fruiting branches, productive bolls and seed-cotton weight boll^{-1} (Qayyum, 1992). These results are in consonance with those of Oakley *et al.* (1998) and Nunes *et al.* (1998), who also noted difference in seed-cotton yield; most probably due to genetic makeup of varieties.

Ginning outturn

The analysis of variance on ginning outturn % revealed that there was significant effect of (*P*<0.05) varieties, picking intervals and their interaction for this trait. Variety Sadori displayed maximum ginning outturn (36.4%) as compared to other two (Chandi-95 and Malmal) varieties included in the study (Table 3). The maximum value for ginning outturn (36.17%) was recorded when seed-cotton was picked at 90% boll opening. It has also been reported by other workers that ginning outturn in different cotton cultivars varies significantly (Fahad *et al.,* 2008).

Seed index (100-seed weight)

Seed index is an important character, especially in determining seed-cotton yield and refers to 100-seed weight. The analysis of variance for seed index (g) revealed that varieties, picking intervals and their interactions stayed highly significant (*P*<0.05). The maximum seed index (7.9 g) was presented by the variety Sadori, followed by Chandi-95 (7.5 g) as indicated in Table 4. In the same way, the higher seed index (8.4 g) was recorded when cotton was picked at 50% boll opening intervals. It has also been reported by previous researchers that the quality of cotton seed is affected by the indeterminate growth habit of a cotton plant. Seed vigor and viability are imperative components controlling seedling establishment, crop development, and its output (Rafique, 2006; Zakaria *et al*., 2007).

Staple length

Like other parameters, staple length is also a significant fiber trait measuring the quality of textile products (Mustafayev *et al*., 1999). The results of variance analysis for staple length (mm) points out that varieties, picking intervals and their interactions were greatly significant (*P*<0.05). The lengthy staples (29.8 mm) were shown by variety Chandi-95, followed by variety Sadori (27.9 mm) (Table 5). The maximum staple length (28.66 mm) was recorded when seed-cotton was picked at 50% and 70% boll opening intervals. This indicates that either early or late cotton pickings are less beneficial in terms of staple length and should be

avioded; as quite early and late seed-cotton picking may produce short staple length (mm) with shrinking quality which eventually gives sub-standard fabrics.

Micronaire (fiber fineness)

Micronaire (µg inch^{-1}) is another important attribute showing the quality of cotton fiber. The effect of varieties, picking intervals and their interaction remained highly significant (P<0.05). Medium fiber fineness (4.1 µg inch^{-1}) was determined in variety Sadori (Table 6). Fine fiber fineness (4.3 µg inch^{-1}) was recorded when cotton was picked at 50% boll opening. This shows that cultivar is the most important factor manipulating fiber quality than the agronomic practices in cotton crop (Bednarz *et al*., 2005). The cultivars show varieties for fiber fineness (Gilbert *et al.,* 1998; Oakley *et al.*, 1998).

Table 1. Boll weight (g) of local cotton varieties as affected by picking intervals

Picking intervals (% boll opening)	Boll weight (g)			Mean
	Sadori	Chandi-95	Malmal	
30%	3.1 e	3.1 e	2.8 f	3.0c
50%	3.5 a	3.5 a	3.3 bc	3.4a
70%	3.3 b	3.3 b	3.1 e	3.2b
90%	3.2 cd	3.3 bc	3.2 d	3.2b
Mean	3.3a	3.3a	3.1b	-

	Varieties	Picking intervals	Varieties x Picking intervals
SED	0.0208	0.0240	0.0415
LSD	0.0418	0.0483	0.0836

Table 2. Seed-cotton yield (plant^{-1}) of local cotton varieties as affected by picking intervals

Picking intervals (% boll opening)	Seed cotton yield plant^{-1} (g)			Mean
	Sadori	Chandi-95	Malmal	
30%	27.8j	25.9j	23.8k	25.8d
50%	69.2g	61.8h	57.4i	62.8c
70%	90d	86.4e	74.7	83.7b
90%	113.3a	101b	92.5c	102.5a
Mean	75.1a	69.0b	62.1c	-

	Varieties	Picking intervals	Varieties x Picking intervals
SED	0.5107	0.5899	1.6401
LSD	1.0281	1.1871	3.3014

Table 3. Ginning outturn % of local cotton varieties as affected by picking intervals

Picking intervals (% boll opening)	Ginning outturn %			Mean
	Sadori	Chandi-95	Malmal	
30%	35.3 e	34.6 fg	34.5 g	34.8d
50%	36.6 b	35.3 e	35.3 e	35.7b
70%	36.3 c	35.2 e	34.7 f	35.4c
90%	37.3 a	35.7 d	35.4 e	36.1a
Mean	36.4a	35.2b	35.0c	-

	Varieties	Picking intervals	Varieties x Picking intervals
SED	0.0444	0.0513	0.0888
LSD	0.0894	0.1032	0.1787

Table 4. Seed index 100-seed weight (g) of local cotton varieties as affected by picking intervals

Picking intervals% boll opening	Seed index (100-seed wt. (g))			Mean
	Sadori	Chandi-95	Malmal	
30%	7.4 de	7.4 de	6.7 h	7.2c
50%	8.4 a	8.2 ab	7.5 d	8.0a
70%	8.1 b	7.3 ef	7.2 fg	7.5 b
90%	7.7 c	7.1 fg	7.1 g	7.3 b
Mean	7.9a	7.5b	7.1c	

	Varieties	Picking intervals	Varieties x Picking intervals
SED	0.0536	0.0619	0.1072
LSD	0.1079	0.1245	0.2157

Table 5. Staple length (mm) of local cotton varieties as affected by picking intervals

Picking intervals (% boll opening)	Staple length (mm)			Mean
	Sadori	Chandi-95	Malmal	
30%	27.3 f	29.2 c	26.7 g	27.7c
50%	28.3 d	30.1 a	27.5 ef	28.6a
70%	28.2 d	30.2 a	27.4 ef	28.6a
90%	27.6 e	29.5 b	27.4 ef	28.1b
Mean	27.9b	29.8a	27.2c	-

	Varieties	Picking intervals	Varieties x Picking intervals
SED	0.0504	0.0582	0.1008
LSD	0.1014	0.1171	0.2028

Table 6. Micronaire (µg inch^{-1}) of local cotton varieties as affected by picking intervals

Picking intervals (% boll opening)	Micronaire (µg inch^{-1})			Mean
	Sadori	Chandi-95	Malmal	
30%	4.0 d	3.8 e	4.0 d	3.9d
50%	4.4 a	4.2 bc	4.2 bc	4.3a
70%	4.1cd	4.2 b	4.2 bc	4.2b
90%	3.6 f	4.2 b	4.3 b	4.0c
Mean	4.1c	4.1b	4.2a	--

	Varieties	Picking intervals	Varieties x Picking intervals
SED	0.0279	0.0322	0.0558
LSD	0.0562	0.0649	0.1123

CONCLUSION

It can be concluded from the study that the cotton variety Sadori produces higher ginning outturn %, medium fiber fineness, and higher seed-cotton yield at 50% boll opening picking interval in comparison to other cotton varieties. On the basis of this study, it is suggested that seed-cotton picking may be initiated at 50% boll opening stage.

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