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Motes percentage and ginning outturn as affected with cotton cultivar and location

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ABSTRACT

The present study was conducted to analyze cotton cultivar and location differences in motes, and to determine the relationships among these and ginning outturn. Therefore, the seed cotton of five promising hybrids namely; G.77 × Pima S6 and G.84 × (G.74 × G.68) growing in [Kafr El-Sheikh - Kafr El-Dawar - Etay El-Barood - Damietta], G.89 × Pima S6 growing in [El-Sharkia - El-Gharbiya - El-Dakahliya - El-Monofiya], G.83 × (G.75 × 5844) × G.80 and G.90 × Australian growing in [Sohag - El-Minia - Beni-Sueif - El-Faium] were used in this study. The results obtained indicate that the varieties exhibited different behavior responses to environmental conditions. On the whole, environmental factors associated with differences in place of growth, appeared to have much more influence on the number of motes than did varietal factors. Most of the locks for the promising hybrids at the different locations tend to cluster around the mean of 6 or 7 seeds per lock. There is a fairly marked tendency for the lock index, lint weight and lint percentage to decrease as the motes percentage increase. On the other hand, most of the promising hybrids under study tend to increase in the seed index as the motes percentage increase. However, the increasing in seed index as a result of the increasing in motes percentage for some cotton cultivars growing at different environments could be explain the difference in behavior for these cotton cultivars in lint percentage.

Keywords: Cotton Cultivar; Ginning Outturn; Location; Lock Index; Motes; Seed Index

1. INTRODUCTION

Cotton ginning outturn is much used measurement in cotton production, marketing and ginning. Ginning outturn is the percentage of ginned lint obtained from a mass of seed cotton. However, plant location plays a serious role on ginning outturn. The number of seeds per boll is a component of both cotton yield and fiber quality and is a function of the number of locules (carpels) per boll and the number of ovules per locule [1]. Both cultivar and environment contribute to the variation in the number of seeds per boll. Weather conditions affect ovule development, pollen fertility, and pollen dispersal [1-3].

Motes are defined as ovules that have not been fertilized or underdeveloped seed in which embryos ceased growth shortly after fertilization [4,5]. Mangialardi and Meredith [6] reported that there was an interaction between variety and year for the number of motes. Davidonis *et al*. [7] found discrepancies between reports relating mote frequency and boll location. They concluded from their study that long fiber motes were related to the timing and intensity of environmental stress, not harvest date or boll location. Bolek [8] stated that motes are cotton (*Gossypium* spp.) ovules that fail to ripen into mature seeds. These aborted ovules represent a loss in yield and can cause imperfections in yarn and cloth quality.

Mote frequencies and mote weights were affected by varieties and years. Percy [9] found that high ovule abortionn rates (mote production) observed in *Gossypium hirsutum* L. x G. *barbadense* L. interspecific F_1 hybrids (ISH) have generally been attributed to the presence of genetic incompatibilities between the two parent species. Other causes of mote production within G. *hirsutum* and G. *barbadense* cottons are adverse environmental factors. The environmental variance in seed index was generally small [10]. In contrast to [10], Turner *et al*. [11] reported that the variance in seed index due to cultivar and cultivar x location were highly significant. However, Understanding factors controlling seed abortion is of importance to physiologists, breeders, producers, and ginners.

Thus, the objectives of this research were to 1) determine the frequency of seeds, motes production and ginning outturn as affected with cotton cultivar and location, and 2) determine if seed weight per locules was related to ginning outturn.

2. MATERIALS AND METHODS

The present study was conducted to determine variation in motes number (motes per lock), and its effect on ginning outturn for seed-cotton samples, representing different varieties and environments (locations). The varieties and locations are listed in the following table.

No.	Cotton cultivar	location
1	H1: G.77 × Pima S6	Kafr El-Sheikh Kafr El-Dawar Etay El-Barood Damietta
2	H2: G.84 × (G.74 × G.68)	Kafr El-Sheikh Kafr El-Dawar Etay El-Barood Damietta
3	H4: G.89 × Pima S6	El-Sharkia El-Gharbiya El-Dakahliya El-Monofiya
4	H6: G.83 × (G.75 × 5844) × G.80	Sohag El-Minia Beni-Sueif El-Faium
5	H8: G.90 × Australian	Sohag El-Minia Beni-Sueif El-Faium

The present study was carried out in 2008 at the Cotton Ginning Research Section, Cotton Research Institute, Agricultural Research Center. The sample consists of 100 locks and the seeds in each lock were numbered and sorted according to the presence or absence of motes. The percentage of locks with motes was determined. Measurements made included: potential seed number (determined to be the number of seed plus motes per locule), ovule abortion rate (expressed as the percent of the potential seed number per locule which were motes), lock index (the weight, in grams, of 100 locks), lint weight per 100 locks and seed index (the weight, in grams, of 100 seeds). The samples were ginned by the McCarthy reciprocating knife 16-inch roller gin stand. The lint percentage (ginning outturn) was calculated for each sample by dividing the weight of the ginned lint by the initial seed cotton weight.

3. RESULTS AND DISCUSSION

The present investigation was conducted to determine to what degree environment and cotton cultivar contributes to the mote numbers and ginning outturn.

3.1. Variations in the Number of Motes in Seed Cottons

Varietal differences in the number of motes formed are very striking (**Table 1**, **Figures 1-8**). The average per-

Table 1. Lock properties and lint percentage as affected with the cotton cultivar and location.

Promising Hybrid	Location	Seed (%)	Motes (%)	Lock index (g)	Lint weight (g)	Seed index (g)	Lint percentage (%)
G.77 × Pima S6	Kafr El-Sheikh	70.6	29.4	89.1	32.2	10.5	36.1
	Kafr El-Dawar	76.4	23.6	90.9	33.4	9.6	36.7
	Etay El-Barood	81.3	18.8	97.4	36.1	9.4	37.0
	Damietta	73.3	26.8	77.2	26.7	8.2	34.6
	Mean	**75.4**	**24.7**	**88.7**	**32.1**	**9.4**	**36.1**
G.84 × (G.74 × G.68)	Kafr El-Sheikh	78.8	21.3	102.9	38.5	10.4	37.4
	Kafr El-Dawar	81.5	18.5	109.8	41.0	10.3	37.3
	Etay El-Barood	84.8	15.3	113.5	40.8	10.8	35.9
	Damietta	79.9	20.1	95.6	33.8	9.6	35.4
	Mean	**81.3**	**18.8**	**105.5**	**38.5**	**10.3**	**36.5**
G.89 × Pima S6	El-Sharkia	80.9	19.1	117.7	45.5	11.1	38.7
	El-Gharbiya	77.3	22.8	92.0	35.8	9.0	38.9
	El-Dakahliya	75.8	24.3	91.0	34.8	9.2	38.2
	El-Monofiya	72.1	27.9	100.7	39.3	10.6	39.0
	Mean	**76.5**	**23.5**	**100.4**	**38.9**	**10.0**	**38.7**
G.83 × (G.75 × 5844) × G.80	Sohag	74.4	25.6	88.6	36.1	8.8	40.8
	El-Minia	81.3	18.8	75.3	31.0	6.1	41.2
	Beni-Sueif	73.5	26.5	98.8	39.6	9.7	40.1
	El-Faium	72.1	27.9	76.7	32.0	7.7	41.7
	Mean	**75.3**	**24.7**	**84.8**	**34.7**	**8.1**	**40.9**
G.90 × Australian	Sohag	76.5	23.5	90.3	37.0	8.9	41.0
	El-Minia	81.4	18.6	82.4	34.7	7.3	42.1
	Beni-Sueif	77.5	22.5	86.4	36.3	8.2	42.0
	El-Faium	75.9	24.1	86.1	36.4	8.4	42.3
	Mean	**77.8**	**22.2**	**86.3**	**36.1**	**8.2**	**41.8**

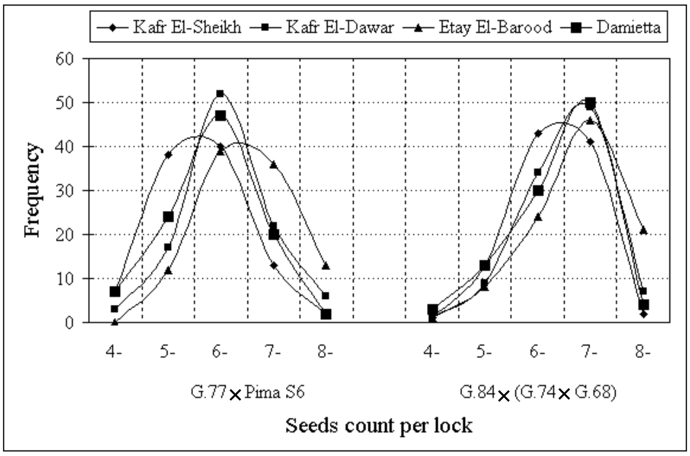

Figure 1. Normal distribution curves of seeds count per lock for the promising hybrids [G.77 × Pima S6 and G.84 × (G.74 × G.68)] at 4 locations.

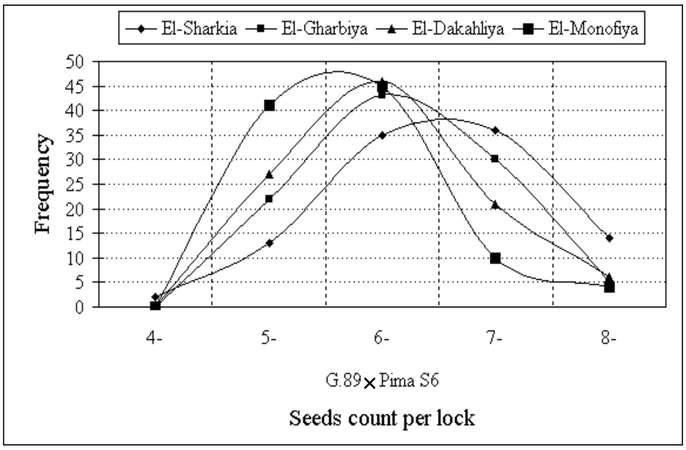

Figure 2. Normal distribution curves of seeds count per lock for the promising hybrid [G.89 × Pima S6] at 4 locations.

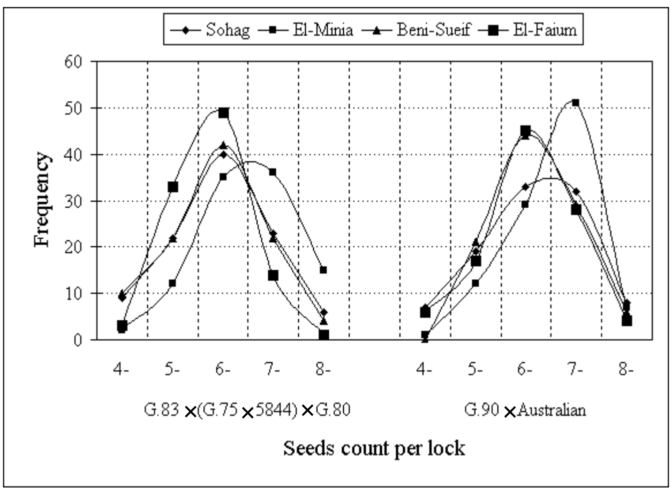

Figure 3. Normal distribution curves of seeds count per lock for the promising hybrids [G.83 × (G.75 × 5844) × G.80 and G.90 × Australian] at 4 locations.

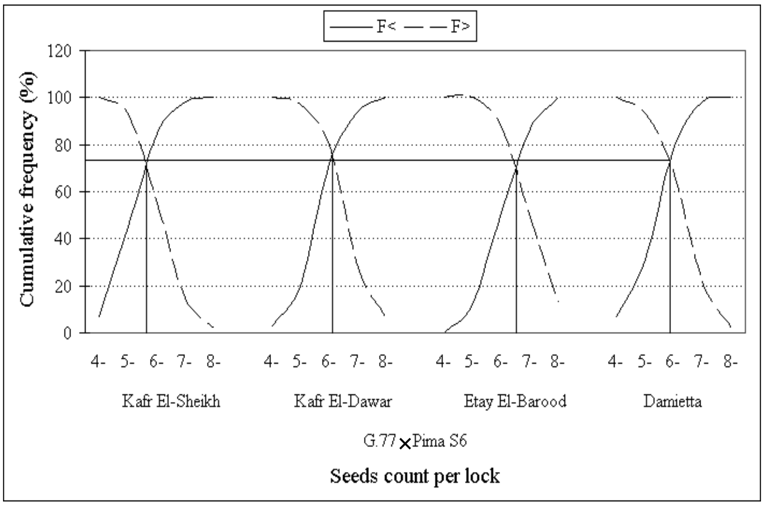

Figure 4. Cumulative frequency curves of seeds count per lock for the promising hybrid [G.77 × Pima S6] at 4 locations.

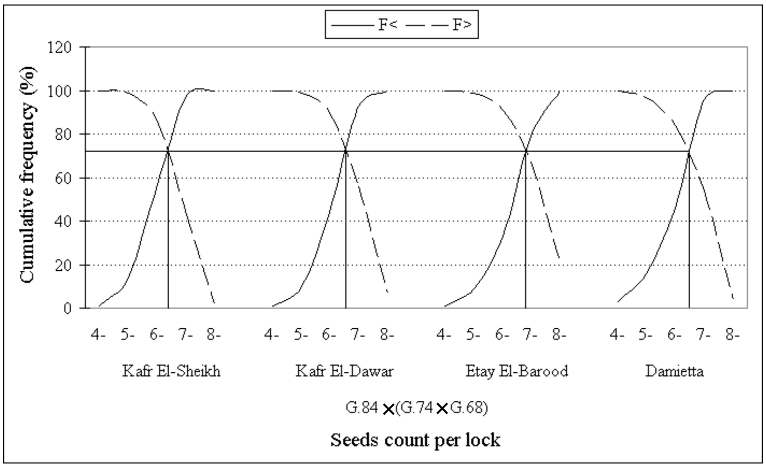

Figure 5. Cumulative frequency curves of seeds count per lock for the promising hybrid [G.84 × (G.74 × G.68)] at 4 locations.

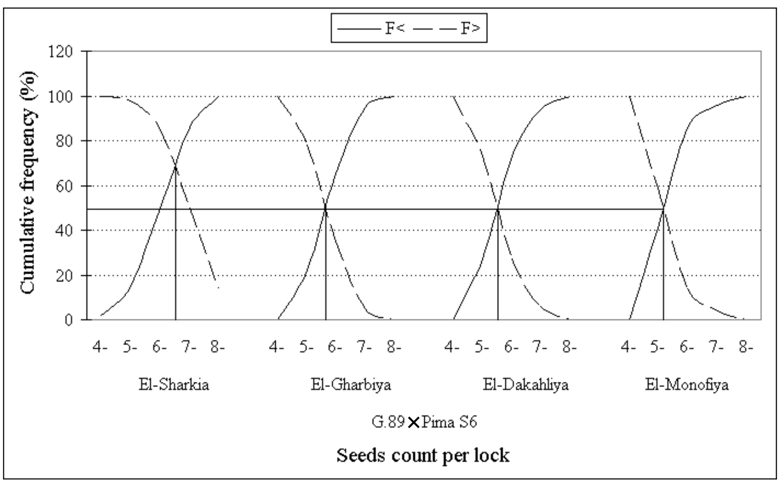

Figure 6. Cumulative frequency curves of seeds count per lock for the promising hybrid [G.89 × Pima S6] at 4 locations.

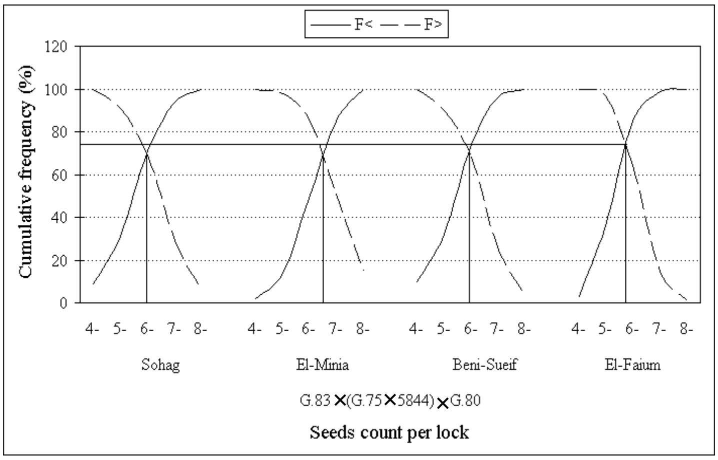

Figure 7. Cumulative frequency curves of seeds count per lock for the promising hybrid [G.83 × (G.75 × 5844) × G.80] at 4 locations.

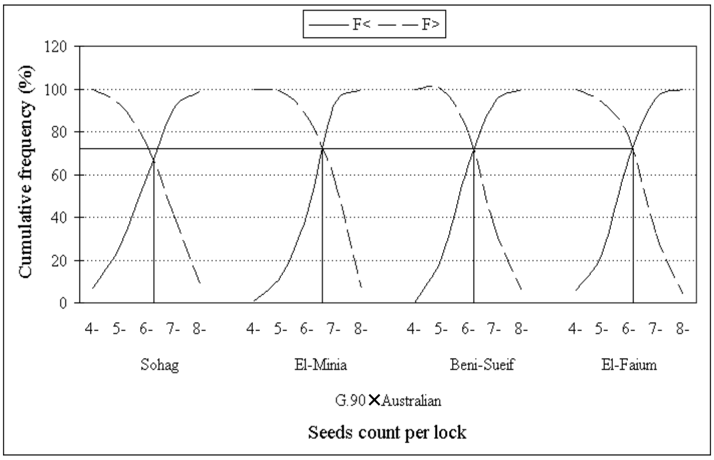

Figure 8. Cumulative frequency curves of seeds count per lock for the promising hybrid [G.90 × Australian] at 4 locations.

centages of locks possessing motes ranged from 18.8 % for the promising hybrid [G.84 × (G.74 × G.68)] to 24.7 % for the promising hybrid [G.77 × Pima S6] and [G.83 × (G.75 × 5844) × G.80]. In general, the relative differences among the varieties were about the same from location to location. The varieties exhibited different behavior responses to environmental conditions. However, the percentages of locks with motes were higher for [G.77 × Pima S6] in Kafr El-Sheikh (29.4 %) than [G.84 × (G.74 × G.68)] in Etay El-Barood (15.3 %). The importance of the influence of environmental factors and cotton cultivars on the development of motes is shown by the highly differences in the number of motes in seed-cotton samples representing different locations and cotton cultivars (**Table 1**). On the whole, environmental factors associated only with differences in place of growth, appeared to have much more influence on the number of motes developed than did varietal factors.

Figures 1-8 of normal distribution and cumulative frequency curves of locks with motes in 4-, 5-, 6-, 7-, and 8-seed per lock classes illustrate the mean, median and concentration the data around the mean for the 5 promising hybrids at the different locations. Its show that most of the locks for the promising hybrid at the different locations tends to cluster around the mean of 6 or 7 seeds per lock.

3.2. Relation between Motes Percentage and Ginning Outturn

The results are not entirely consistent, but in general and for most promising hybrids under study there is a fairly marked tendency for the lock index (the weight, in grams, of 100 locks), lint weight per 100 locks and lint percentage to decrease as the motes percentage increase (**Figures 9**, **10** and **12**). It is true that certain varieties failed to show this tend, and some showed it to a much more pronounced degree than others. On the other hand, most of the promising hybrids under study tend to increase in the seed index (the weight, in grams, of 100 seeds) as the motes percentage increase (**Figure 11**).

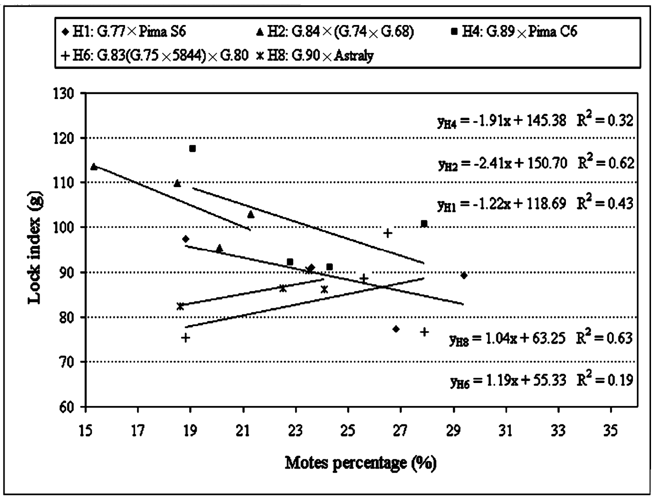

Figure 9. Relationship between lock index and motes percentage for the 5 promising hybrids.

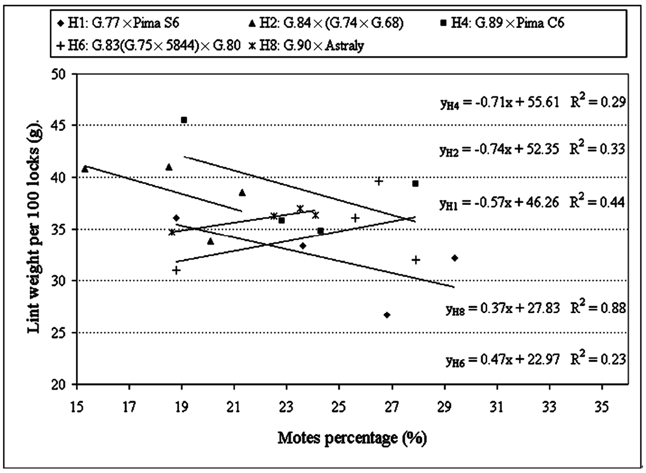

Figure 10. Relationship between lint weight per 100 locks and motes percentage for the 5 promising hybrids.

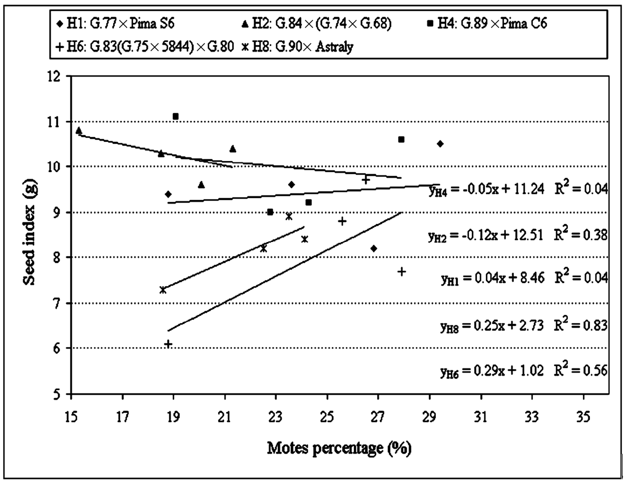

Figure 11. Relationship between seed index and motes per centage for the 5 promising hybrids.

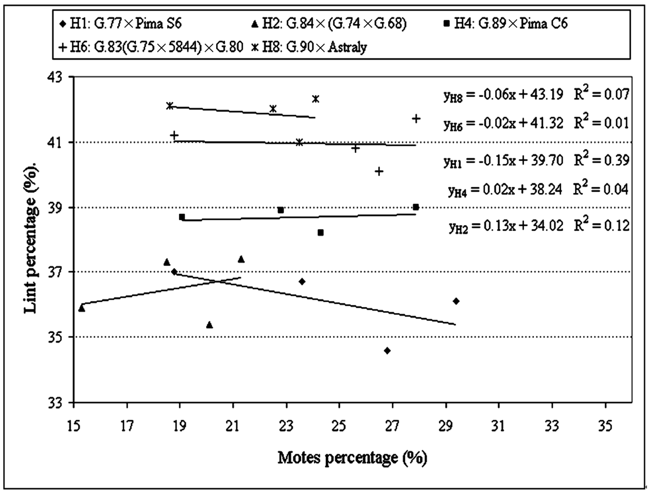

Figure 12. Relationship between lint percentage and motes percentage for the 5 promising hybrids.

For the promising hybrids [G.84 × (G.74 × G.68) and G.89 × Pima S6] the results show that as the motes percentage increased the lock index and lint weight per 100 locks decreased and the lint percentage increased this could be explained a result of the decreasing in seed index. But, for the promising hybrid [G.77 × Pima S6] the results show that as the motes percentage increased the lock index and lint weight per 100 locks decreased and the lint percentage decreased as a result of the increasing in seed index. while, for the promising hybrids [G.83 × (G.75 × 5844) × G.80 and G.90 × Australian] the results indicated that as the motes percentage increased the lock index and lint weight per 100 locks increased and the lint percentage decreased as a result of the increasing in seed index.

However, the increasing in seed index as a result of the increasing in motes percentage for some cotton cultivars growing at different environments could be explain the difference in behavior for these cotton cultivars in lint percentage.

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