MOTES PERCENTAGE AND GINNING OUTTURN AS AFFECTED BY COTTON GENOTYPE AND GROWING LOCATION

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Abstract

The present study was conducted to analyze cotton genotype and growing location differences in motes formation and content, as well as to determine the relationships among these factors and ginning outturn. Therefore, the seed cotton of five promising crosses namely; G.77 x Pima S6 and G.84 x (G.74 x G.68) grown in [Kafr El-Sheikh - Kafr El-Dawar - Etay El-Barood - Damietta], G.89 x Pima S6 grown in [El-Sharkia - El-Gharbiya - El-Dakahliya - El-Monofiya], G.83 x (G.75 x 5844) x G.80 and G.90 x Australian grown in [Sohag - El-Minia - Beni-Sueif -El-Faium] were used in this study. The obtained results indicate that the promising crosses exhibited different behavior responses to environmental conditions. On the whole, environmental factors associated with differences in location of growth, appeared to have much more influence on the number of motes than did varietal factors. Most of the locks for the promising crosses 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 crosses under study tend to increase in the seed index as the motes percentage increase.

However, the increase in seed index as a result of the increase in motes percentage for some cotton genotypes grown at different environments could explain the difference in the behavior of these cotton genotypes in lint percentage.

INTRODUCTION

Cotton ginning outturn is a 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 quality and as well as being a function of the number of locules (carpels) per boll and the number of ovules per locule (Stewart, 1986). 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 (Powell, 1969; Fisher, 1973; Stewart, 1986).

Motes are defined as ovules that have not been fertilized or underdeveloped seed in which embryos ceased growth shortly after fertilization (Pearson, 1949; Davidonis et al., 1996). Mangialardi and Meredith (1990) reported that there was an interaction between variety and year for the number of motes. Davidonis et al. (2000) 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 (2006) 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. Youssef et al. (1982) found that varieties differed considerably in motes percentage and weight of 1000 motes. They also found that as the number and percentage of motes decreased, boll, lint and seed weight increased. Percy (1986) found that high ovule abortion 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 (Miller et al., 1958). In contrast to Miller et al., (1958), Turner et al., (1976) 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 (i) determine the frequency of seeds, motes production and ginning outturn as affected with cotton genotype and growing location, and (ii) determine if seed weight per locule was related to ginning outturn.

MATERIALS AND METHODS

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

No.	Cotton genotype	growing location
1	H1: G.77 x Pima S6	Kafr El-Sheikh Kafr El-Dawar Etay El-Barood Damietta
2	H2: G.84 x (G.74 x G.68)	Kafr El-Sheikh Kafr El-Dawar Etay El-Barood Damietta
3	H4: G.89 x Pima S6	El-Sharkia El-Gharbiya El-Dakahliya El-Monofiya
4	H6: G.83 x (G.75 x 5844) x G.80	Sohag El-Minia Beni-Sueif El-Faium
5	H8: G.90 x 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. Each of the chosen samples consisted 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.

A factorial analysis of variance, in a completely randomized design was conducted and the differences between means were tested by Duncan's new multiple range test according to (SAS, 1996).

RESULTS AND DISCUSSION

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

Variations in the number of motes in seed cotton

Differences between cotton genotypes in the number of motes formed are very striking (tables 1, figs. 1 to 13). The average percentages of locks possessing motes ranged from 18.8 % for the promising cross [G.84 x (G.74 x G.68)] to 24.7 % for the promising cross [G.77 x Pima S6] and [G.83 x (G.75 x 5844) x G.80]. In general, the relative differences among the cotton crosses were about the same from location to location. The cotton crosses exhibited different behavior responses to environmental conditions. However, the percentages of locks with motes were higher for [G.77 x Pima S6] in Kafr El-Sheikh (29.4 %) than [G.84 x (G.74 x G.68)] in Etay El-Barood (15.3 %). The importance of the influence of environmental factors and cotton genotypes on the development of motes is shown by the big differences in the number of motes in seed-cotton samples representing different growing locations and cotton genotypes (tables 1). In general, environmental factors were associated only with differences in place of growth, appeared to have much more influence on the number of the developed motes than did varietal factors.

Figures from 1 to 8 show the normal distribution and cumulative frequency curves of locks with motes in 4-, 5-, 6-, 7-, and 8-seed per lock classes. The figures illustrate the mean, median and concentration of the data around the mean for the 5 promising crosses at the different growing locations. It is shown that most of the locks for the promising cross at the different growing locations tend to cluster around the mean of 6 or 7 seeds per lock.

From the data recorded in table 1 and figures 9 to 13, it is shown that, the promising cross [G.84 x (G.74 x G.68)] significantly exhibited the highest Seed percentage, Lock index and Lint weight as compared to the promising cross [G.77 x Pima S6] one. On the other hand, no significant difference was found between the promising crosses [G.83 x (G.75 x 5844) x G.80] and [G.90 x Australian]. However, the growing locations Etay El-Barood and El-Sharkia significantly exhibited the highest Seed percentage, Lock index and Lint weight. However, the differences between growing location in Seed index and Lint percentage were not significant.

Relation between motes percentage and ginning outturn

The results are not entirely consistent, but in general and for most promising crosses 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 (figs. 14, 15 and 17). 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 crosses under study tend to increase in the seed index (the weight, in grams, of 100 seeds) as the motes percentage increase (fig. 16).

As for the promising crosses [G.84 x (G.74 x G.68) and G.89 x 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 by the decrease in seed index. But, for the promising cross [G.77 x 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 crosses [G.83 x (G.75 x 5844) x G.80 and G.90 x 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 increase in seed index as a result of the increasing in motes percentage for some cotton genotypes grown at different environments could be explain the difference in the behavior of these cotton genotypes in lint percentage.

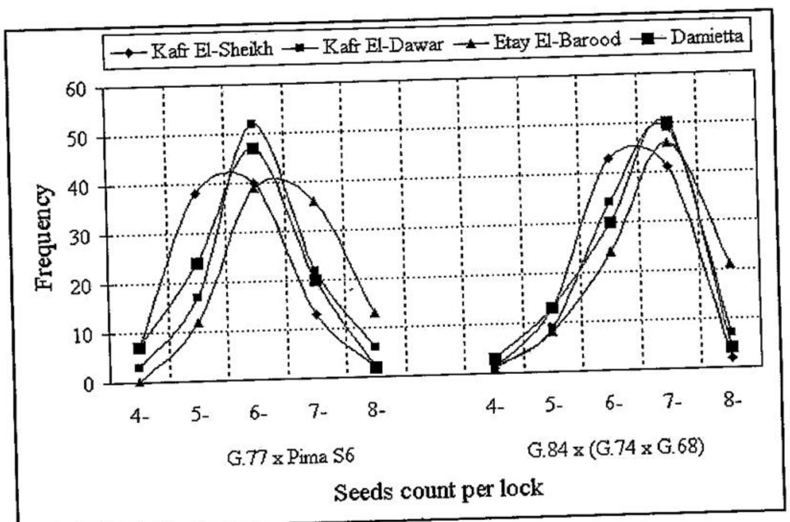

Fig 1. Normal distribution curves of seeds count per lock for the promising crosses [G.77 x Pima S6 and G.84 x (G.74 x G.68)] at 4 growing locations.

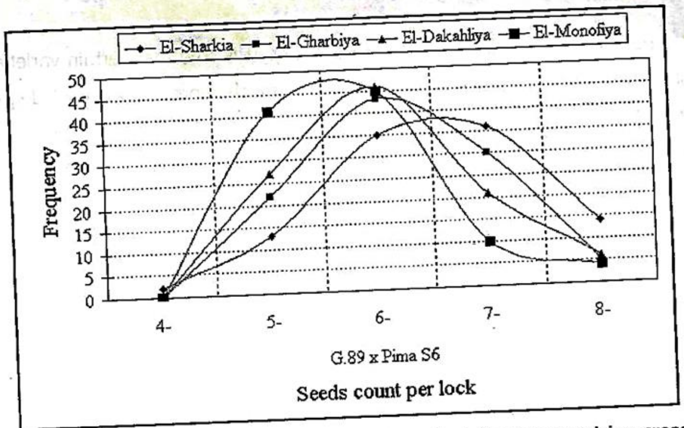

Fig 2. Normal distribution curves of seeds count per lock for the promising cross [G.89 x Pima S6] at 4 growing locations.

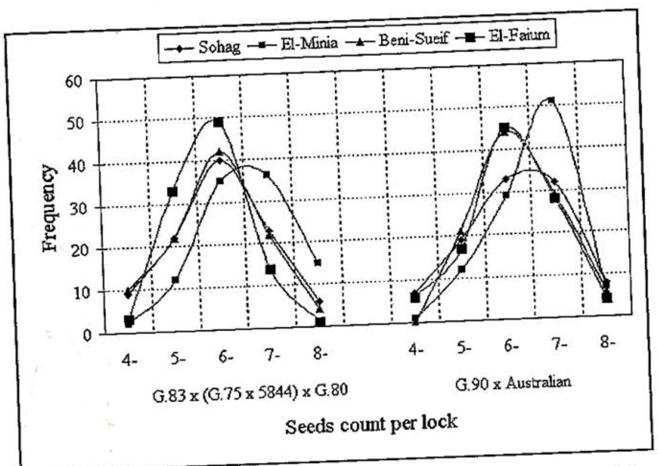

Fig 3. Normal distribution curves of seeds count per lock for the promising crosses [G.83 x (G.75 x 5844) x G.80 and G.90 x Australian] at 4 growing locations.

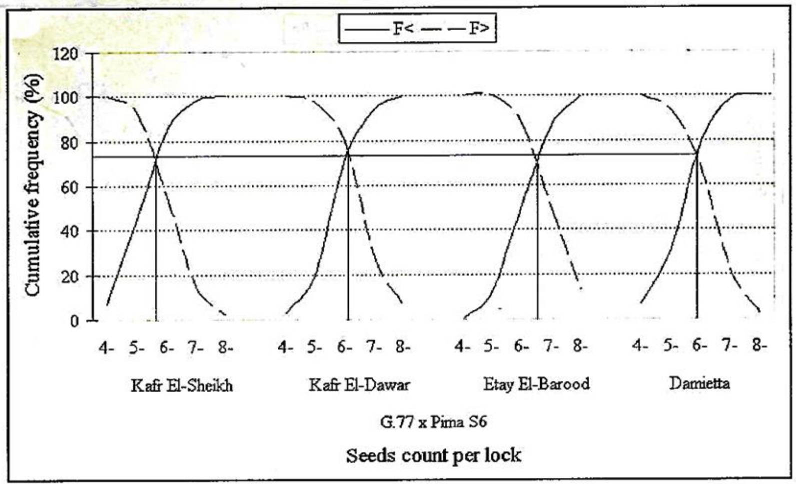

Fig 4. Cumulative frequency curves of seeds count per lock for the promising cross [G.77 x Pima S6] at 4 growing locations.

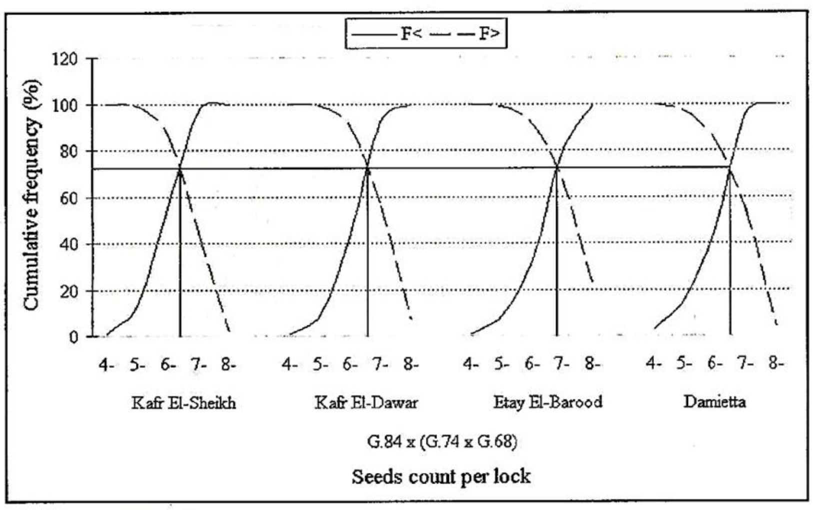

Fig 5. Cumulative frequency curves of seeds count per lock for the promising cross [G.84 x (G.74 x G.68)] at 4 growing locations.

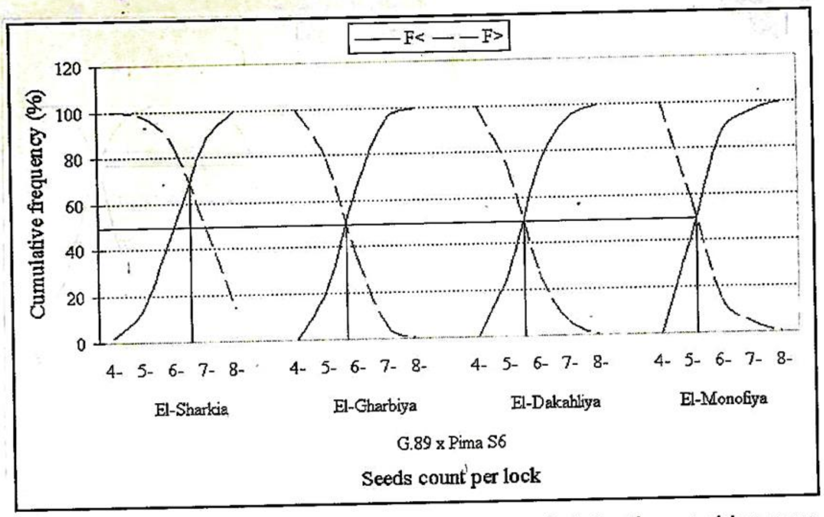

Fig 6. Cumulative frequency curves of seeds count per lock for the promising cross [G.89 x Pima S6] at 4 growing locations.

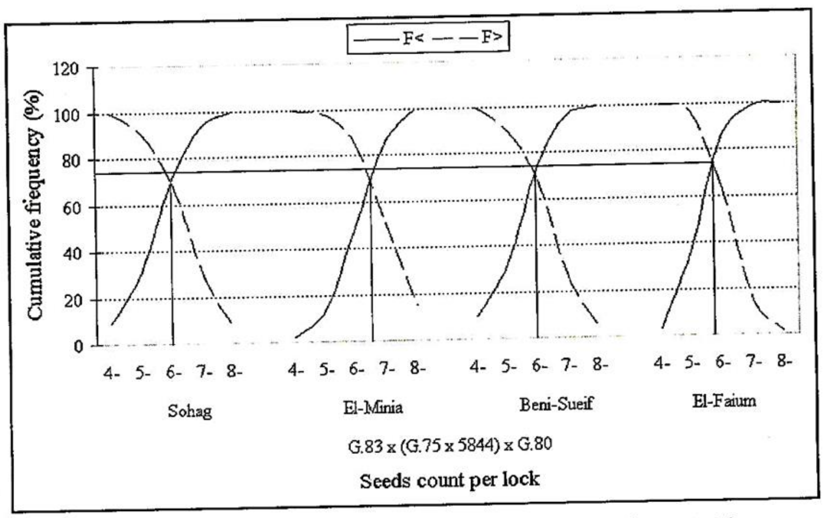

Fig 7. Cumulative frequency curves of seeds count per lock for the promising cross [G.83 x (G.75 x 5844) x G.80] at 4 growing locations.

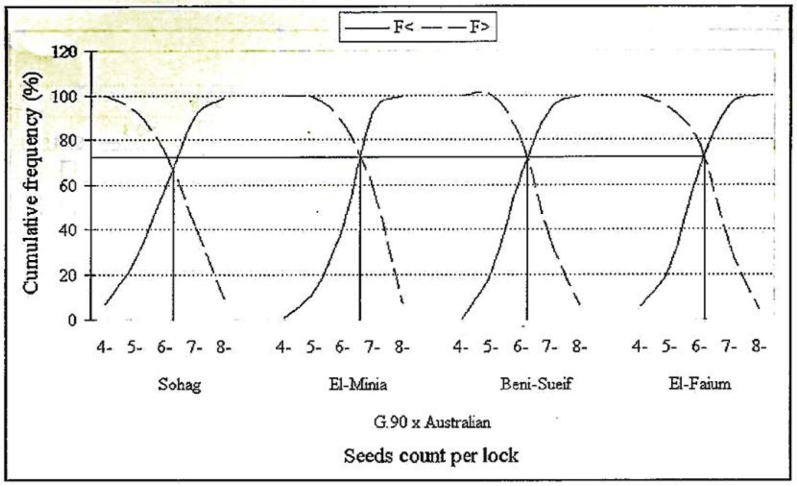

Fig 8. Cumulative frequency curves of seeds count per lock for the promising cross [G.90 x Australian] at 4 growing locations.

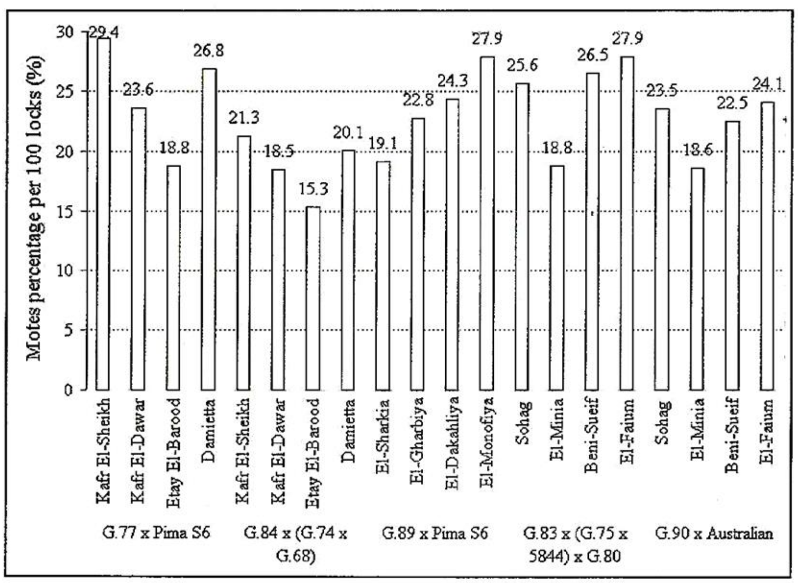

Fig 9. Motes percentage per 100 locks as affected by cotton genotype and growing location.

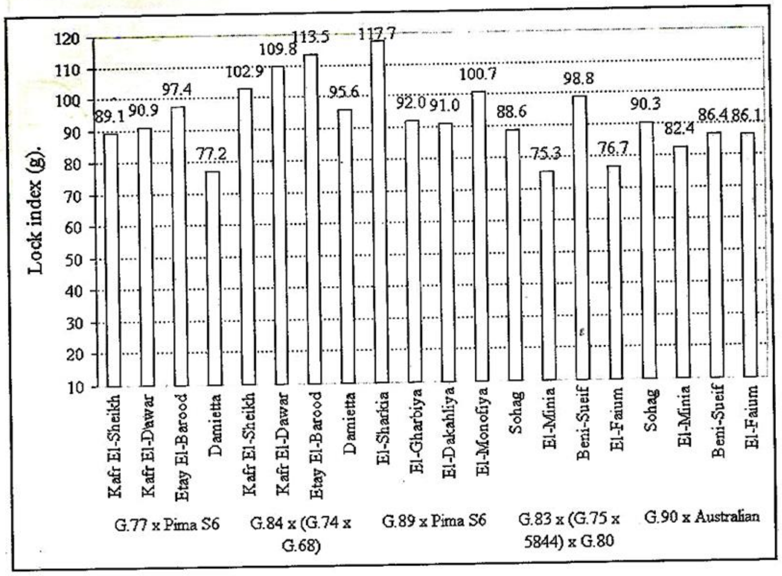

Fig 10. Lock index as affected by cotton genotype and growing location.

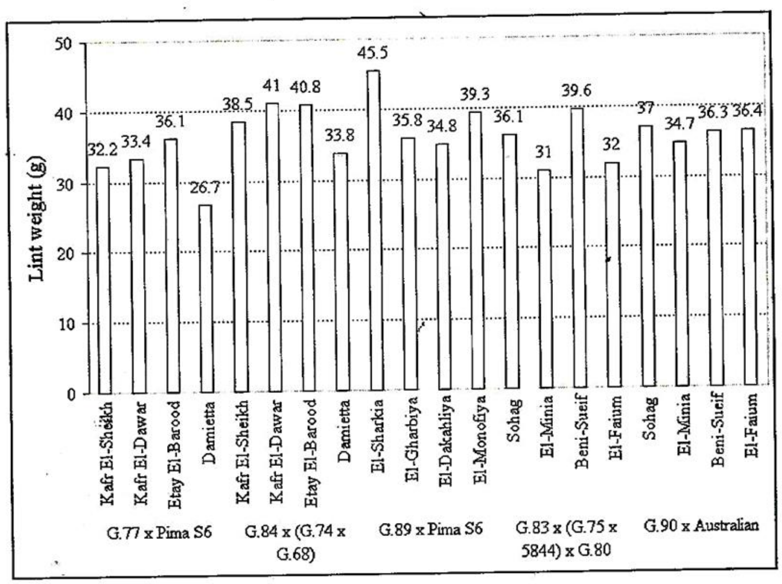

Fig 11. Lint weight as affected by cotton genotype and growing location.

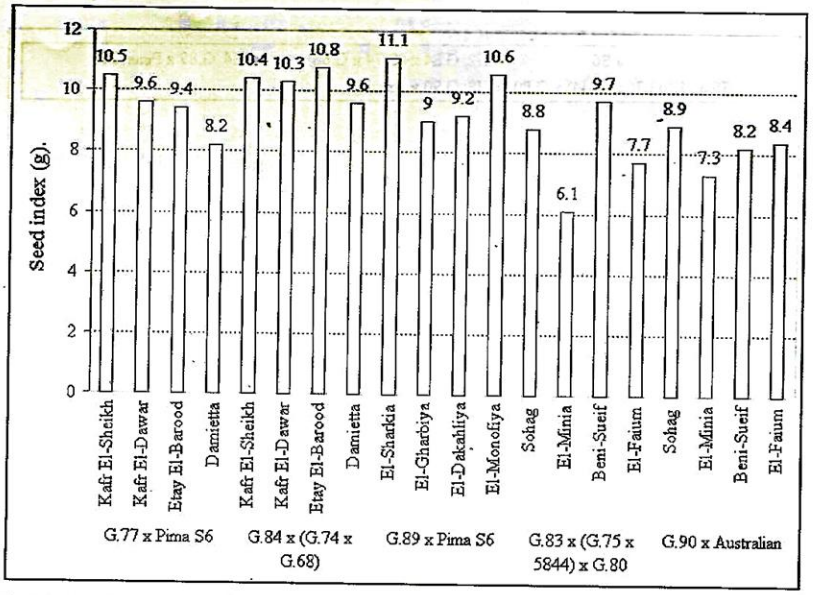

Fig 12. Seed index as affected by cotton genotype and growing location.

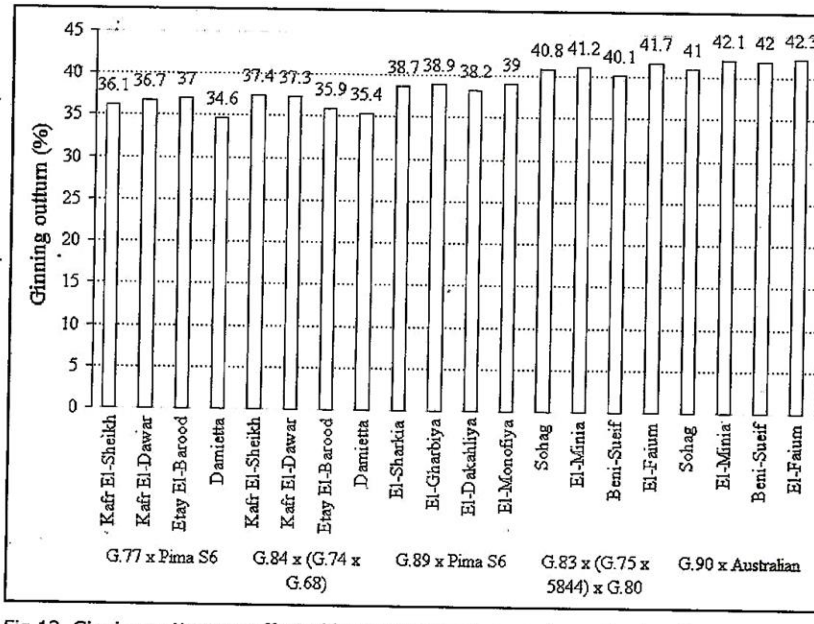

Fig 13. Ginning outturn as affected by cotton genotype and growing location.

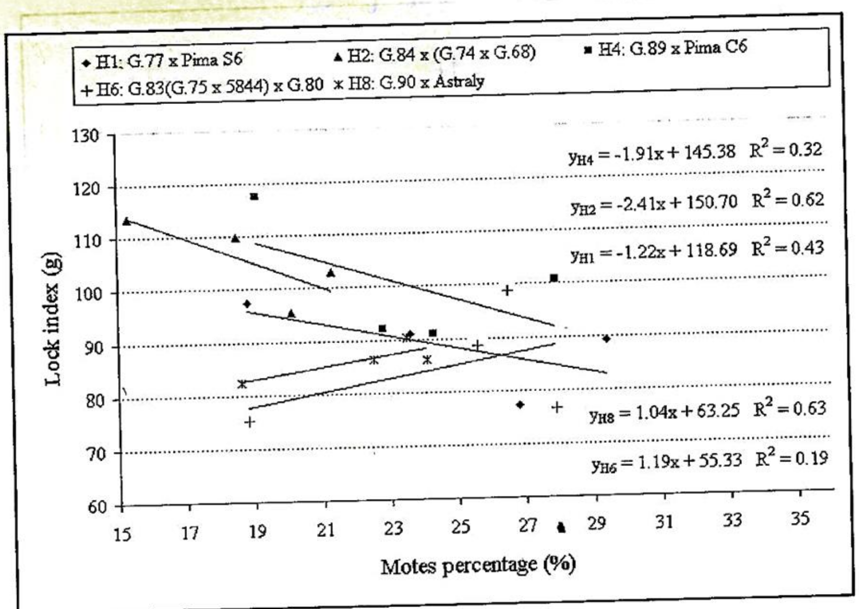

Fig 14. Relationship between lock index and motes percentage for the five promising crosses.

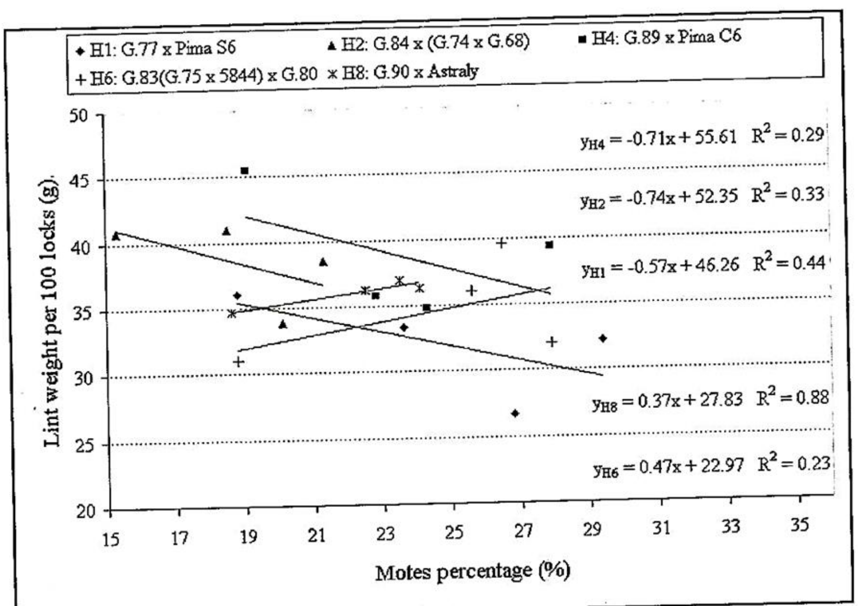

Fig 15. Relationship between lint weight per 100 locks and motes percentage for the five promising crosses.

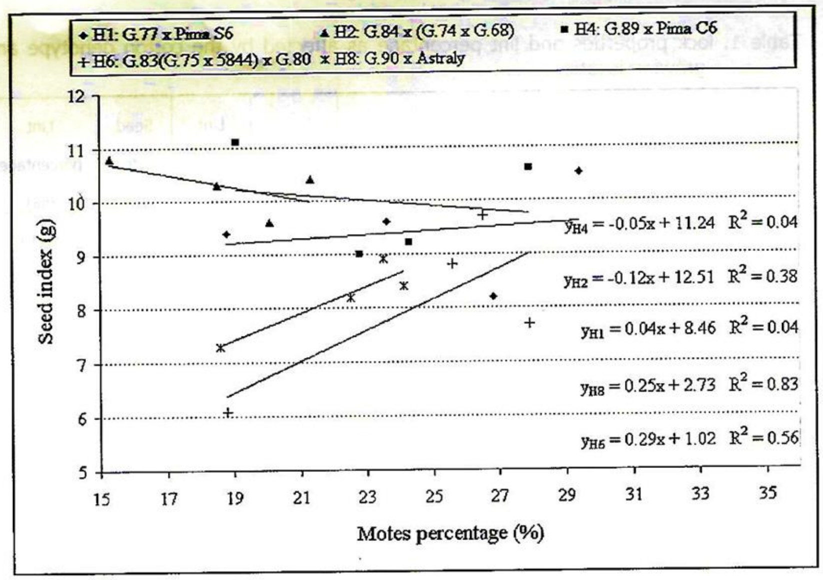

Fig 16. Relationship between seed index and motes percentage for the five promising crosses.

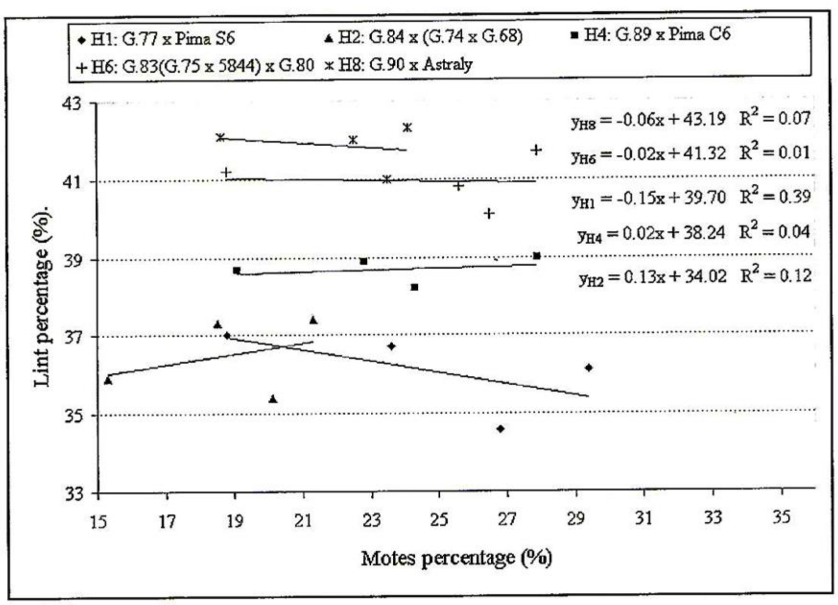

Fig 17. Relationship between lint percentage and motes percentage for the five promising crosses.

Table 1. lock properties and lint percentage as affected by the cotton genotype and growing location.

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

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تأثير منطقة الزراعة على نسبة البذور المجهضة (الموتس) وصافي الحلج لبعض تراكيب القطن الوراثية

حسام الدين الحسيني حامد الفقي ، سعيد عبد الرازق محمد حسن

معهد بحوث القطن – مركز البحوث الزراعية – الجيزة

أجري هذا البحث لدراسة تأثير منطقة الزراعة على نسبة البذور المجهضة (الموتس) وعلاقته بصافي الحلج (نسبة الشعر) لبعض تراكيب القطن الوراثية. استخدم لهذه الدراسة خمس هجن مبشرة، الهجينان: جـ٧٧ × بيما س٦، وجـ٨٤ × (جـ٧٤ × جـ٦٨) تم زراعتهما في مناطق {كفر الشيخ – كفر الدوار – ايتاي البارود – دمياط}، والهجين: جـ٨٩ × بيما س٦ تم زراعته في مناطق {الشرقية – الغربية – الدقهلية – المنوفية}، أما الهجينان: جـ٨٣ × (جـ٧٥ × ٥٨٤٤) × جـ٨٠ وجـ٩٠ × استرالي فتم زراعتهما في {سوهاج – المنيا – بني سويف – الفيوم}.
وقد أسفرت الدراسة عن النتائج التالية:

١- اظهرت الهجن المستخدمة في الدراسة استجابة مختلفة للعوامل البيئية.
٢- العوامل البيئية المرتبطة بمناطق الزراعة كان لها تأثير أكبر من العامل الصنفي على نسب البذور المجهضة (الموتس).
٣- تراوح عدد البذور في فصوص القطن الزهر للهجن بين (٦ – ٧ بذرة لكل فص).
٤- يوجد اتجاه واضح نحو انخفاض معامل الفص (وزن ١٠٠ فص)، ووزن ونسبة الشعر بزيادة نسبة البذور المجهضة، وعلى العكس من ذلك فإن هناك اتجاه نحو زيادة معامل البذرة (وزن ١٠٠ بذرة) بزيادة نسبة البذور المجهضة لبعض الهجن المستخدمة في الدراسة.

لهذا يمكن القول أن زيادة معامل البذرة بزيادة نسبة البذور المجهضة (الموتس) لبعض الهجن المستخدمة في الدراسة والمنزرعة فى مناطق مختلفة يفسر اختلاف سلوك الاصناف في نسبة الشعر (صافي الحلج).