ANALYSIS OF YIELD COMPONENTS IN CROSSES BETWEEN ZERO-BRANCHING AND NORMAL BRANCHING TYPES OF COTTON

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INTRODUCTION

Yield in cotton is a most important breeding objectives. But yield in cotton, as it is another crops, is acomplex character the direct selection for which is usually inaffective. Nor does a direct genetic study of yield yield the type of information helpful in yield improvement. The breeder therefore resorts to the partitioning of yield to its simple components and to the study of each component separately. Genetic information on such things as dominance, type of genetic effects (additive or otherwise) heritability as well as correlation between yield and its components can help draw a picture more or less complete which would enable the breeder to evaluate fully the breeding situation and act accordingly.

In this investigation a study is made of components of seed cotton yield in 2 crosses involving one [illegible] cotton varieties. The path coefficient [illegible]

REVIEW OF LITERATURE

Yield, in general is a complex character and yield of seed cotton is no exception. The most efficient way for studying such character is through the study of its components. The present review will be concerned with yield and its components.

1- Days to first flower:

Aboul-Ela (1930) stated that date of the first flower in one of the best indications for earliness. In the F1 of interspecific crosses, he found strong evidence for the dominance of earliness over lateness, which was confirmed by practical yield observance with respect to the actual ripening of families. Thus complete dominance was reported for early flowering. Kime and Tilley (1947) studied hybrid vigour in intraspecific crosses between inbred lines selected from Coker 100, stonville and Deltapine HA varieties of G. hirsutum. F_1 showed hybrid vigour in earliness and rate of blooming. In a comparative study of seven methods of measuring earliness Richmond and Radwan (1962) found complete dominance of early flowering in two F_1 crosses and complete dominance for late flowering in one cross.

All involving hirsutum parents, when earliness was measured as days to first flower.

White and Richmond (1963) observed no hybrid vigour for days to first flower in diallel crosses among five G. hirsutum varieties. They noted further the significance of the variance of general combining ability and the non-significance of the variance of specific combing ability. However, Marani (1964) observed significant heterotic effects for early flowering in interspecific and intraspecific crosses of G. hirsutum. In all possible F_1 hybrid combinations among nine selected upland cotton varieties Al-Rawi and Kohel (1969) noted highly significant negative heterosis and inbreeding depression for days to first flower. They mentioned that heterosis was due to the presence of dominance. Their results showed that the additive genetic component was significantly different from zero and greater than the dominance component parameter. Potence value was 0.81 indicating partial dominance of lateness. Heritability as the ratio of the additive, or additive x aditive variance or both to the total phenotypic variance was 0.46 for days to first flower trait. Rady (1969) studied date of first flower in across between Giza 63 x 5.8017 (Zero-branching type). He noted that this character behaved as a quantitative character, with a tendency towards the late parent in the F_1 and F_2 generations. Number of genes involved for the parental difference, obtained by different methods, indicated one pair of genes. Estimation values of broad sense heritability by different methods were 30.0, 37.1 and 34.9 percent.

Salama (1970) studied the cotton cross Giza 69A x Giza 66. He found that first flower date was a quantitative character and reported a potence value of -2.37 for this character indicating hybrid vigour in the direction of early flowering. The nature of gene action was inconclusive. He attributed the difference between the parents (1.58 days) to the action of one pair of genes. Aheritability value of 0.276 for this character was reported. In the first cross Giza 69 x 5.8017 and second Giza 45 x 5.8017 Rady (1973) found that date of first flower behaved he also noted dominance for plant height in crosses between *G. barbadense* varieties. Gurshan *et al.* (1964) found heterosis for plant height in most F_1 hybrids within *G. hirsutum*. Al-Rawi and Kahel (1969) made all possible F_1 hybrid combinations among nine selected varieties. Both heterosis and inbreeding depression effects were small but significant. Plant height was polygenically inherited and exhibited partial dominance. Baluch (1970) studied the *G. arboreum* intervarietal cross (SN.R x R.82) and its reciprocal. He found that F_1 exhibited heterosis for tallness, whereas F_2 populations retained this character. The F_1's of the *G. hirsutum* intervarietal cross (M_4 x S.S) and its reciprocal displayed heterosis for tallness. Heterosis for tallness was also exhibited in the F_1 of (*G. hirsutum* x *G. barbadense*) crosses, (M_4 x Karnak and its reciprocal and M_4 x Pima 67b). Tallness was maintained in the F_2 of (M_4 x Pima 67b) but declined in (M_4 x Karnak) and its reciporocal. In F_1 intraspecific hybrids of *G. hirsutum* Rasubov (1970) found that stem height was intermediate. Singh *et al.* (1971) observed heterosis and additive gene action for plant height in some upland cotton crosses. Gupta et al. (1971) estimated broad sense heritability and genetic advance in some upland cotton varieties planted during 1968 and 1969. Heritability values were 57.28% and 62.27% and genetic advance values were 26.69 and 40.92% cms. during 1968 and 1969, respectively.

3- Boll number:

Turner (1953) studied 21 crosses produced from seven selected inbred lines of upland cotton at Georgia. Hybrids producing significantly more bolls than the varieties were found to be those with highest seed cotton yield in 1949. The same hybrid which appeared heterosis in yield gave large number of bolls in 1950. Boll number was more important than boll size in determining final yield. Flower and boll number is believed by Al-Didi et al. (1961) to be the most important contributer to yield. In upland cotton crosses Joshi et al. (1961) and Gurshan et al. (1964) found that F_1 hybrids showed hybrid vigour for number of bolls per plant. Al-Rawi and Kohel (1969) found significant heterosis in 33 and he found significant dominance deviation only in one cross, while epistasis was not significant, but was so in another cross. He also found that additive genetic variance was dominanting in one cross but less than the dominance genetic variance in another cross. The average degree of dominance was less than unity in one cross, but in another, its value was more than one indicating that genes controlling this trait was in the over-dominance range. Heritability estimates were 13.69% and 34.61% in the broad sense in the F_2; 9.41 and 7.23 percent in the narrow sense in the lines in the two crosses zero type (Karnak) x Giza 69 and Zero type (Karnak) x Giza 66), respectively. He concluded that low heritability value indicated, that the trait was greatly effect by environmental factors, and that selection would not be effective. Bedair (1971) studied the number of bolls per plant in crosses among Egyptian cotton varieties. He tstated that this character showed significant genetic variability only in the cross Giza 69 x Ashmouni. Positive highly significant heterosis and inbreeding depression values (28.74

and 23.16 percent, respectively) were found. Heritability estimate in the broad sense was (47.43%). Gupta et al. (1971) estimated heritability for boll number in the broad sense as well as the genetic advance under selection in some upland cotton varieties. Heritability values in the broad sense for boll number were 79.40%, 29.93% and genetic advance were 12.49 and 4.55 during 1968 and 1969, respectively. In the interspecific cross G. 45 x Coker 100 W Gad (1972) found that boll number behaved as a quantitative character. He found a high significant heterosis (28.7%) and a significant inbreeding depression (13.2%). Heritability values in the broad sense were 41.39 and 56.95 percent for the F_2 and F_3 generation, respectively.

4- <u>Yield of seed cotton per plant:</u>

Turner (1953) made twenty one hand-produced hybrids developed from 7 selected inbred lines of upland cotton. He found six hybrids in 1949 and one in 1950 that gave seed cotton yields significantly higher than the variety checks. The best senses. It was 16.76 and -13.24 in the broad sense, 26.96% and -68.75% in the narrow sense for the crosses Giza 45 x Giza 66 and Giza 45 x Giza 67, respectively. He also found that yield of seed cotton behaved as a quantitative character. Al-Rawi and Kohel (1969) found significant heterosis in 29 crosses and inbreeding depression in 8 crosses out of 36 diallel crosses between upland cotton varieties with regard to seed cotton yield. Pathak and Singh (1970) found that the magnitude of dominance variance was greater than the additive genetic variance in five *G. hirsutum* crosses for seed cotton yield per plant. The estimates of degree of dominance exceeded unity in all crosses indicating the importance of dominance variance. Most of the dominance effects were positive for all the crosses which indicated positive effects of dominant genes. In some upland cotton var- [illegible] et al. (1971) estimated heritability in the broad sense and genetic [illegible] [illegible] 35.6 [illegible] genetic [illegible] and [illegible] [illegible] respectively.

Bedair (1971) studied intervarietal crosses of Egyptian cotton; namely Giza 69 x Ashmouni, Giza 69 x Giza 45 and Giza 45 x Ashmouni. He reported that the first cross exhibited highly significant heterosis of 43.59 percent with a highly significant inbreeding depression of 32.61 percent. He also found that the dominance genetic variance, estimated from the first cross for yield of seed cotton, was about 4 times the additive genetic variance. The average degree of dominance was more than unity for yield of seed cotton indicating that genes controlling this character, in the first cross were in the over-dominance range. In the second cross, dominance genetic variance was -310 ± 840, so all genetic variance were due to additive effects of genes. Heritability estimates were 26.45 and 69.10 percent in the broad sense and 5.54 and 69.10% percent in the narrow sense for the first and second crosses, respectively. Upon mass selection the expected genetic advance would be 3.48 and 44.25, percent for the two crosses, respectively. Al-Ashry (1972), working on two Egyptian cotton crosses showed that a significant heterotic effect for yield was detected in one cross. He concluded that a great portion of the variance in yield was due to the environment. In the interspecific cross G.barbadense (G.145) x G.hirsutum (Coker 100 W) Gad (1972) found that heterosis 2.5% was not significant but inbreeding depression 14.9% was highly significant for yield. Heritability estimates in the narrow sense were 22.50% and 48.57% based on F_2 and F_3 data, respectively. He found that yield of seed cotton behaved as a quantitative character.

5- Boll weight:

In across between two upland cottons Kokuev (1936) found the F_1 to be intermediate with regard to boll weight, F_2 distribution was in the form of the regular unimodal curve. The author poihted out that boll weight was dependent on a number of factors and that the desired types can be obtained among the segregates only by growing at least 2000 or 3000 F_2 seedlings. In his F_2 population of 3000 individuals, he found all types from the largest to the smallest bolls. He also stated that in F_3 several of the intermediate forms were found to be homozygous. Working