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CHARACTER ASSOCIATION AND PATH ANALYSIS IN GRAIN SORGHUM (*Sorghum bicolor* (L.) moench)

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ABSTRACT

Sixty hybrids of sorghum were evaluated to know the magnitude and direction of association between yield and component traits during rabi and summer seasons of 1994 in four locations. Positive and significant association was noticed between grain yield and component traits except days to 50 per cent flowering and days to maturity. Improvement in grain yield in sorghum would be possible through selection for stem thickness, number of rachis per panicle and 100 grain weight.

KEY WORDS : Sorghum, Correlation, Path-coefficients, Grain yield

Sorghum (*Sorghum bicolor* (L.) moench) is an important food and feed crop cultivated in kharif, rabi and summer seasons in Tamil Nadu. The rainfed vertisol regions of southern parts of Tamil Nadu are highly heterogeneous in land inclination, soil profiles, water and nutrient status. In such highly mosaic environments, sorghum crop is cultivated. Grain yield is a polygenic character and it is influenced by a number of component traits which are inter-related. selection of plants combining all superior characters will be very difficult. A knowledge of the magnitude and direction and direction of association between yield and its components will be much useful to improve the yield through a selection of component traits. Such studies are limited to kharif season (Singh and Baghel, 1977). The present study was, therefore, taken up to know the nature of character association among yield components and to

estimate the direct and indirect effects of different yield components in sorghum F_1 hybrids grown in rabi and summer seasons.

MATERIALS AND METHODS

Sixty F_1 sorghum hybrids were developed by crossing five cytoplasmic genic male sterile lines with 12 medium tall sorghum genotypes. These hybrids were evaluated during rabi season (September-October) in the black cotton soils of the Regional Research Station, Aruppukottai and Agricultural Research Station, Kovilpatti (April-August). The plants were spaced between 45 x 15 cm and each hybrid was accommodated in two row plots with 20 plants in each row. The experiment was carried out in all the four environments. The observations were recorded on 10 random plants in each plot under each environment for days to 50 percent flowering (days), plant height

Table 1. Correlation co-efficients of various characters in sorghum

| Characters | | Plant height | Panicle length | Panicle breadth | Stem thickness | Peduncle girth | Days to maturity | No. of rachis per panicle | 100 grain weight | Grain yield |
|-------------------------------|---|--------------|----------------|-----------------|----------------|----------------|------------------|---------------------------|------------------|-------------|
| Days to 50 per cent flowering | P | -0.083 | -0.129 | -0.011 | -0.079 | -0.065 | 0.939** | 0.011 | -0.031 | -0.089 |
| | G | -0.090 | -0.170 | -0.040 | -0.154 | -0.157 | 0.982** | 0.046 | -0.050 | -0.139 |
| | E | -0.071 | -0.037 | 0.023 | 0.055 | 0.065 | 0.867** | -0.035 | 0.018 | 0.050 |
| Plant height | P | | 0.481** | 0.395** | 0.282* | 0.313** | -0.065 | 0.314** | 0.393** | 0.398** |
| | G | | 0.564** | 0.568** | 0.408** | -0.460** | 0.064 | 0.429** | 0.473** | 0.449** |
| | E | | 0.154 | 0.148 | -0.075 | 0.017 | -0.076 | 0.137 | 0.039 | 0.130 |
| Panicle length | P | | | 0.460** | 0.343** | 0.347** | -0.123 | 0.319** | 0.307** | -0.386** |
| | G | | | 0.691** | 0.518** | -0.553** | -0.148 | 0.463** | 0.391** | 0.448** |
| | E | | | 0.145 | -0.071 | -0.017 | -0.072 | 0.103 | 0.015 | 0.144 |
| Panicle breadth | P | | | | 0.193 | 0.320** | 0.015 | 0.323** | 0.271* | 0.296** |
| | G | | | | 0.443** | 0.637** | 0.006 | 0.519** | 0.423* | 0.414** |
| | E | | | | -0.108 | 0.009 | 0.026 | 0.147 | 0.032 | -0.135 |
| Stem thickness | P | | | | | 0.331** | -0.070 | 0.133 | 0.291** | 0.311** |
| | G | | | | | 0.522** | -0.126 | 0.203 | 0.351** | 0.423** |
| | E | | | | | 0.061 | 0.024 | 0.045 | 0.149 | -0.002 |
| Peduncle girth | P | | | | | | -0.041 | 0.264* | 0.299** | 0.303** |
| | G | | | | | | -0.119 | 0.529** | 0.415** | 0.432** |
| | E | | | | | | 0.064 | -0.014 | 0.091 | 0.051 |
| Days to maturity | P | | | | | | | 0.026 | 0.009 | -0.043 |
| | G | | | | | | | 0.066 | 0.011 | -0.080 |
| | E | | | | | | | -0.023 | 0.006 | 0.056 |
| No. of rachis per panicle | P | | | | | | | | 0.281* | 0.329** |
| | G | | | | | | | | 0.399** | 0.461** |
| | E | | | | | | | | 0.102 | 0.118 |
| 100 grain weight | P | | | | | | | | | 0.429** |
| | G | | | | | | | | | 0.492** |
| | E | | | | | | | | | 0.151 |

* Significant at 5 per cent level

** Significant at 1 per cent level

(cm), panicle length (cm), panicle breadth (cm), stem thickness (cm), peduncle girth (cm), days to maturity (days), number of rachis per panicle and 100 grain weight (g) apart from grain yield per plant (g). The correlation coefficients and path coefficients were worked out following the method suggested by Johnson *et al.* (1955) and Dewey and Lu (1959) respectively.

RESULTS AND DISCUSSION

Positive and significant association was noticed between grain yield and most of the component characters *viz.*, plant height, panicle length, panicle breadth, stem thickness, panicle girth, number of rachis per panicle and 100 grain weight at both genotypic and phenotypic levels.

However days to 50 per cent flowering and days to maturity showed non-significant association with grain yield at both levels (Table 1). Genotypic correlations were, in general, higher than the corresponding phenotypic ones. This was in agreement with the findings of Gomez *et al.* (1986). This revealed the considerable role of environment. In modifying the total expression of the genotypes. Kishan *et al.* (1991) reported positive association of plant height with grain yield. Patel *et al.* (1994) reported positive association of number of rachis per plant with grain yield. High degree of positive association of days to maturity and days to 50 per cent flowering was evident. Positive association of plant height was observed with all other component traits excepting days to maturity.

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Table 2. Direct (diagonal) and indirect effects of component characters on grain yield

| Characters | Indirect effect via different characters | | | | | | | | | |
|-------------------------------|--|--------------|----------------|-----------------|----------------|-----------------|------------------|---------------------------|------------------|-----------------------|
| | Days to 50 % flowering | Plant height | Panicle length | Panicle breadth | Stem thickness | Penduncle girth | Days to maturity | No. of rachis per panicle | 100 grain weight | Genotypic Correlation |
| Days to 50 per cent flowering | -0.819 | -0.211 | -0.049 | 0.003 | 0.001 | 0.001 | 0.933 | 0.013 | 0.010 | -0.139 |
| Plant height | 0.092 | 0.119 | 0.057 | -0.046 | 0.081 | -0.001 | -0.061 | 0.118 | 0.091 | 0.449 |
| Panicle length | 0.173 | 0.067 | 0.100 | -0.057 | 0.103 | -0.001 | -0.141 | 0.127 | 0.075 | 0.448 |
| Panicle breadth | 0.041 | 0.067 | 0.069 | -0.082 | 0.088 | -0.002 | 0.006 | 0.143 | 0.083 | 0.414 |
| Stem thickness | 0.157 | 0.048 | 0.052 | -0.036 | 0.199 | -0.001 | -0.119 | 0.056 | 0.068 | 0.423 |
| Penduncle girth | 0.160 | 0.055 | 0.056 | -0.052 | 0.104 | -0.003 | -0.113 | 0.146 | 0.080 | 0.432 |
| Days to maturity | -0.802 | -0.208 | -0.015 | -0.001 | 0.025 | 0.001 | 0.949 | 0.018 | 0.002 | -0.080 |
| No. of rachis per panicle | -0.047 | 0.051 | 0.047 | -0.042 | 0.040 | -0.001 | 0.063 | 0.275 | 0.077 | 0.461 |
| 100 grain weight | 0.051 | 0.056 | 0.039 | -0.035 | 0.070 | -0.001 | 0.010 | 0.110 | 0.193 | 0.492 |

Residual effect = 0.1571

Significant positive association was observed by panicle breadth with plant height and panicle length. Positive inter correlation was also observed by number of rachis per plant with plant height, panicle length, panicle breadth and panicle girth. 100 grain weight also exhibited positive association with all the component traits except days to 50 per cent flowering and days to maturity. Significant negative association of plant height with peduncle girth was observed at genotypic level.

The path coefficient analysis on genotypic correlations in respect of grain yield are given in Table 2. Number of rachis per panicle had moderate positive direct effects on grain yield and significant positive association. The highest direct effects of days to maturity was nullified by indirect effect via days to 50 per cent flowering and plant height and resulted in non-significant negative association. The indirect effects of 100 grain weight was low but positive in direction. However the other component traits contributed through indirect effects to the significant positive association with grain yield. Through stem thickness, number of rachis per panicle and 100 grain weight all the characters exerted positively moderate indirect effects on grain yield. It could

be concluded that number of rachis per panicle, stem thickness and 100 grain weight were the most important traits contributing to grain yield. It is suggested that these traits may be given due consideration during selection either individually or in combination.

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