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STUDIES ON THE VARIATION OF YIELD IN SORGHUM GENOTYPES

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ABSTRACT

Three genotypes of Sorghum (CSH 5, CS 3541 and SB 461) were studied with respect to various growth and yield components. There were significant differences among the genotypes with regard to the growth components like LAI and NAR and yield components like 1000 grain weight, grain number per ear, grain weight per ear, grain weight per ear, number of grains per ear and length of the ear. CSH 5 was photosynthetically more efficient during the later stages of crop growth as compared to the other two genotypes. It also recorded higher 1000-grain weight and more grain number per ear than those of CS 3541 and SB 461. About 37 and 23 percent more grain yield was obtained in case of CSH 5 as compared to CS 3541 and SB 461 respectively.

KEY WORDS : Sorghum, Variation, Leaf area index, Net assimilation rate.

Growth analysis has been accepted as one of the standard methods of growth and yield analysis. Leaf Area Index (LAI) defines the leaf area available for the photosynthetic production. Net Assimilation Rate (NAR) measures the efficiency of the leaf surface. Thorne and Watson (1955) observed that LAI integrated over a period from head emergence to maturity, was more closely related to the yield. Subsequently Thorne (1965) pointed out that the final yield of cereals was related to leaf area after the emergence of the head but not before. Studies were made on the various growth and yield components of three sorghum genotypes.

MATERIALS AND METHODS

The study was carried out on the black clay loam soil at the Agricultural College Farm, Dharwad, Karnataka, during 1975-76 under rainfed conditions. The experiment was laid out in split plot design with three replications. The treatments included were three genotypes of sorghum *viz.*, CSH 5, CS 3541 and SB 461 as main plots and four nitrogen treatments *viz.*, 80, 160, 240 kg N/ha (4 equal splits) and 80 kg N/ha (2/3rd at sowing + 1/3rd after 30 days) as sub-plots. A common dose of 60 kg P_2O and 40 kg K_2O/ha was applied.

Three plants at random were cut at ground level at 30, 60, 90 days after sowing, physiological maturity and normal maturity of grains. These plants were dried at 65 to 70°C in hot air oven. The dry weight of the plants was recorded. In all, five samples (30, 60, 90 days after sowing, at physiological and normal maturity time) were taken. The various growth components were worked out as per the standard methods (Sestak *et al.*, 1971). The performance of the three varieties with respect to growth and yield structure averaged over the effect of nitrogen treatments is presented.

RESULTS AND DISCUSSION

The grain yield produced by the three genotypes included in the study varied appreciably. CSH 5 produced the highest grain yield of 73.63 q/ha as against CS 3541 which produced the lowest grain yield of 46.55 q/ha. The grain yield in case of SB 461 was 56.89 q/ha (Table 1).

The differences in grain yield of the three genotypes may be related to the

Table 1. **Yield and yield components of sorghum genotypes.**

Genotypes	Length of the ear (cm)	Girth of the ear (cm)	Grain weight per ear (g)	Grain number per ear	1000 - Grain weight (g)	Grain yield (g/ha)
CSH 5	26.5	13.0	33.76	1309	25.93	73.63
CS 3541	19.0	11.5	18.06	699	26.08	46.55
SB 461	21.4	15.2	20.54	892	22.53	56.89
C.D. AT 5%	0.99	1.48	2.29	88	1.14	2.87

inherent differences in some of their yield determining characters. CSH 5 produced the longest ears (26.5 cm), which provided for the accommodation of more number of grains per ear (1309). In addition, the test weight of grains in case of CSH 5 was significantly higher as compared to that of SB 461. This resulted in the highest grain weight per ear (33.76g), which in turn increased the grain yield/ha. On the contrary CS 3541 had shorter ears (19.0cm) which made lesser space for the formation of spikelets and thus had fewer number of grains/ear (699). Eventhough there was no difference in the 1000-grain weight of this genotype and CSH 5, the average grain weight per ear in case of CS 3541 was lower due to shorter ears reflecting in lower grain yield/ha.

Krishnamurthy *et al.* (1973) noticed a significant correlation between the photosynthetic efficiency after the head emergence and the grain yield of sorghum genotypes. In the present study also, it is noticed that the active leaf area index (LAI) present at later stages of growth of CSH 5 was significantly higher than that of CS 3541, eventhough there was no appreciable difference in their Net Assimilation Rate (Table 2). Likewise, CSH 5 had higher NAR as compared to SB 461, during the later stages of crop growth. The lower values of NAR in the case of SB 461 may be due to the shading of the lower leaves, due to the very high LAI values observed in that variety (Table 3). Besides, the leaves of SB 461 rapidly dried after attaining the peak LAI at 90 days (11.14). Thus, at the time of physiological maturity of the grains the

Table 2. **Leaf area Index at different growth stages of sorghum genotypes.**

Genotypes	Growth Stages				
	30 Days	60 Days	90 Days	S_1	S_2
CSH 5	3.25	8.34	5.75	4.68	3.83
CS 3541	1.13	4.89	3.44	3.27	2.60
SB 461	2.69	9.11	11.14	2.25	1.65
C.D. AT 5%	0.20	0.78	0.52	0.43	0.23

S_1 = Physiological maturity.
S_2 = Normal maturity.

Table 3. **Net Assimilation Rate of sorghum genotypes during various growth stages.**

Genotypes	Growth Stages			
	31 to 60 Days	61 to 90 Days	91Days to S_1	S_1 to S_2
CSH 5	0.0418	0.0343	0.0585	0.0497
CS 3541	0.0742	0.0369	0.0746	0.0531
SB 461	0.0727	0.0262	0.0127	0.0148
C.D. AT 5%	0.0187	0.0077	0.0164	0.0129

S_1 = Physiological maturity of grains (corresponds to 106, 101 and 118 days after sowing in CSH-5, CS-3541 and SB-461).

S_2 = Normal maturity of grains (corresponds to 118, 109 and 133 days after sowingin CSH-5, CS-3541 and SB-451, respectively) active leaf area in the case of SB 461 variety was less than half as compared to that of CSH 5. This superiority of CSH 5 with respect to LAI over CS 3541 and LAI and NAR over SB 461 was responsible for its higher dry matter accumulation at the reproductive phase in the ear and the higher yield.

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GENETIC VARIABILITY, CORRELATION AND PATH ANALYSIS IN PIGEONPEA

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ABSTRACT

Estimates of variability, heritability, genetic advance, correlation and path analysis were carried out in pigeonpea for seven characters. The highest genotypic coefficient of variation was observed for pod number followed by cluster number and seed yield while it was lowest for seeds per pod. High heritability and genetic advance were observed for pod number, cluster number and seed yield. Pod number, cluster number and plant height were positively and significantly correlated with seed yield. Cluster number showed high positive direct effect on seed yield. The studies suggested that selection for clusters per plant, pods per plant and plant height is important to evolve high yielding varieties of pigeonpea.

KEY WORDS : Pigeonpea, Variability, Character Association.

Pigeonpea (*Cajanus cajan*(L) Millsp) is one of the important legume crops grown in India. A thorough knowledge of existing genetic variation and extent of association between various yield contributing characters are essential for developing high yielding genotypes in pigeonpea. The observed variability is a combined measure of genetic and environmental causes. It is only the genetic variability that is heritable from generation to generation. However, a measure of heritability alone does not give an idea about the expected gain in the next generation but it has to be considered in conjunction with genetic advance. Correlation and path analysis will establish the extent of association between yield and yield components and bring out relative importance of their direct and indirect effects and thus give a clear understanding of their association with yield. The present investigation in pigeonpea is an attempt in this direction.

MATERIALS AND METHODS

The material consisting of 37 genotypes collected from ICRISAT, Hyderabad were raised at the National Pulses Research Centre, Vamban, Pudukkottai district, in a randomized block design with three replications during 1984 Kharif season adopting a spacing of 90 x 30 cm. Observations were recorded on five randomly selected plants from each plot on plant height, number of branches per plant, number of clusters per plant, number of