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COMBINING ABILITY AND GENE ACTION FOR TANNIN CONTENT IN SORGHUM GRAIN*

D. NARAYANA[1] and M. N. PRASAD[2]

Estimates of components of variance and combining ability were estimated for grain tannin in 7 x 7 diallel set of sorghum. Additive and non-additive gene actions were both found to be important while the former had got vital role in determining the tannin in sorghum grain. IS 2261 and IS 9225 were the best combiners. The high sca effects in poor x poor and poor x high indicated the non allelic interations for the inheritance of tannin content in sorghum grain.

Even though, high tannin varieties have the disadvantage of nutritionally inferior, several agronomic traits such as bird resistance to bird attack and weathering having been attributed to high tannin content in grain sorghum. Hence to manipulate the tannin content of grain sorghum, more information needs to be made available to the breeder inovolving agronomically superior sorghum varieties. In the present investigation, attempts were made to understand the genetics governing the tannin content in cultivated grain sorghums.

MATERIAL AND METHODS

The material previously reported by Narayana and Prasad (1982) were utilised for this study. Seed samples were collected from five randomly selected competitive plants from each entry for estimating the tannin content in grain. Tannin was estimated (as percent tannic acid) following Folin Denis Method (AOAC, 1965).

Method I and Model I of Griffing (1956) was adopted for estimating the general and specific combining ability effects and variances. The diallel analysis was also done for estimating the components of genetic variance as per the method of Hayman (1954).

RESULTS AND DISCUSSION

The preliminary analysis of the data indicated that there were significant differences among the parents and F_1 hybrids.

Combining ability analysis :

Analysis of variance for combining ability (table 1) revealed that GCA and SCA variances were statistically significant indicating that additive and non additive component of variances were important for governing the tannin content in sorghum grain. However, preponderance of additive gene action was observed to have vital role for this character. Variances due to reciprocal effects were also significant, indicating

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1 & 2 Sorghum Breeder, APAU and Professor of Millets, TNAU Coimbatore, respectively.

the role of maternal influence for this trait.

IS 2261 was best combiner for increased tannin followed by IS 9225 (table 2). E 35-1 and CSV-1 were very poor combiners. The highest postive SCA effect was recorded by the cross CSV-1 x CSV-3 followed by IS 2328 x E 35-1 and IS 2261 x CSV-1. The highest sca effects in poor x poor and high x poor indicated the genetic diversity of the parents and non allelic interaction governing the inheritance of tannin content in grain. Improvement of annin content in grain. (in the commonly cultivated varieties) probably minimise the weathering hazards.

Component of variances

The test of homogenity (t^2) was significant. The regression coefficient (b) was not significantly different from zero but deviated significantly from unity. These tests indicated non fulfilment of assumptions of diallel analysis and also suggested the presence of non allelic interactions for this character.

The estimates of genetic components and thier proportions are presented in table 3. The estimates of dominance (H_1 and H_2) were significant while additive component (D) was nonsignificant. The relative magnitude of non additive components indicating the predominant role of non-additive gene action.

The average degree of dominance $(H_1/D)^{\frac{1}{2}}$ was higher than unity suggesting the importance of non additive gane action. The genes governing tannin content exhibited unequal distribution of positive and negative alleles. The ratio K_D/K_R was more than unity indicating higher proportion of dominant genes.

The heritability estimates were also low. Since none of the assumptions of diallel were fulfilled the information obtained through those genetic analysis may be biased and unreliable. Arunachalam (1976) suggested that the information obtained through combining ability analysis might score over genetic analysis. Hence both additive and non additive gene actions might be important while the former has got a major role in determining the tannin in sorghm grain based on the combining ability analysis.

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Table 1 : Analysis of variance for combining ability in a 7 x 7 diallel of sorghum.

Source of Variation	D. F.	Tannin in grain
GCA	6	0.022**
SCA	21	0.012**
RCA	21	0.005**
Error	27	0.00003
GCA : SCA		1.83

Table 2: GCA (Diagonal and) SCA effects for Tannin content in a 7 x 7 diallel of sorghum.

	IS 2327	IS 2328	IS 9225	IS 2261	E 35-1	CSV-1	CSV-3
S 2327	0.00	0.036**	−0.054**	0.035**	0.059**	−0.031**	0.024**
IS 2328		0 011**	0.039**	−0.041**	0 078**	−0,108**	0.069**
IS 9225			0.015**	−0.035**	0.049**	−0.008**	−0.038**
IS 2261				0.061**	−0.028**	0.077**	0.013**
E 35 1					−0.006**	−0.117**	−0.169**
CSV-1						−0.074**	0.170
CSV-3							0.007**

SE 0.003
**Significant at P=0.01

Table 3: Estimates of components and their proportions for tannin content in grain in a 7 x 7 diallel of sorghum

	Components	/	Proportions
) 0.007	$(H_1/D)^{\frac{1}{2}}$		2,1086
H_1 ±0.029*	$H_2/4H_1$		0.2163
±0 010			
H_2 ± 0.025*			
±0.009*	K_D / K_R		1.3538
F+0.002	h^2/H_2		0.07145
±0.006			
0.004	Heritability		32 068
±0.009	(narrow sense)		
±0.0002			
±0.0015			
77.389**			
0.187			
±0.228			

* Significant at 0.05 level ; ** Significant at 0.01 level