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AN EVALUATION OF GERMPLASM ACCESSIONS IN *GUAR*

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ABSTRACT

300 germplasm accessions of guar [*Cyamopsis tetragonoloba* (L) Taub] were evaluated for a number of component characters including yield. A study of heritability, expected genetic advance and phenotiypc correlation coefficients suggested that there was ample scope for testing snme of the stocks in yield trails and exercising selectiou for lhese traits simultaneously. One of the accessions was promising in yield with field resistance to bacterial blight as well. Some of these accessions are under further evaluation directly and in breeding programmes to improve seed yield.

Guar [*Cyamopsis tetragonoloba* (L) Taub] has assumed great significance in recent years mainly because of the gum content in its seed ; *Guar* gum has diversified uses as in textiles, cosmatics, mining, explosives, food processing and oil industries. As a primary step in breeding for improved performance, it was felt desirable to evaluate the potential of the available germplasm of 300 accessions maintained at the National Bureau of Plant Genetic Resources, New Delhi. The results on evaluation of these accessions are reported and discussed in this paper.

MATERIALS AND METHODS

The 300 *guar* accessions collected from different areas of India were grown in 1974 at the Indian Agricultural Research Institute New Delhi, in an augmented randomised block design Federer, 1956) with four checks—I.C. 9065 (Sona), Durgapura Safed, B 19-1-55 and DS/E_2 J. The first two checks are released varieties and the other two are promising strains. The accessions were sown in single rows, 3 m long 60 cm apart, with 10-15 cm plant to plant distance. Every ten accessions were followed by the four checks constitute one block; the 300 accessions thus gave rise to 30 blocks. Normal cultural practices and recommended bacterial blight control measures were adopted. Observations were recorded on five randomly selected plants from each culture including checks on days to flower (DF), plant height (cm) (PH), days to first maturity (DM), branch number (BN), cluster number (CN), pod number (PN, pod length (PL) seeds per pod (SP), seed yield (SY) and 100 seed weight (SW). The method of analysis of variance of augmented designs given by Federer (1956) was extended to analysis of covariance also. The components of variance were estimated from the xpected values of mean squares. Heritability in broad sense, genetic advance and correlation coefficients were worked out following standard procedures.

RESULTS

There were significant differences amongst the genetic stocks for all the fcharacters. Checks differed significantly from genetic stocks for all characters except plant height and seed per pod. The variation among the four checks was also significant or most of the characters.

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The coefficient of variation was observed to be high for branch number, cluster number, pod number and seed yield, while it was low for days to flower, days to first maturity and seed per pod (Table 1). The mean of genetic stocks differed significantly from that of checks for branch number, cluster number, pod number and seed yield only. The number of accessions that differed significantly from the best check at 5% level is in Table 1, the highest frequency of such accessions being observed for branch number (231), pod number (185) and seed yield (180).

A wide range of heritability (60.7 to 98.8%) was observed for a number of characters like branch number, pod number, 100 seed weight and plant height (Table 1) with a high anticipated genetic advance upto 82.7% for branch number.

TABLE 1

Mean values, heritability and genetic advance for various characters in guar.

Characters	C.V. %	Means		C.D. at 5% level	Genetic stocks different from checks	Heritability	Genetic advance
		Checks	Genetic stocks				
DF	7.6	62.1	62.9	3.9	73	86.8	13.6
PH	22.7	73.1	72.4	12.0	137	89.1	41.5
DM	7.1	116.3	115.9	7.9	46	81.4	11.8
BN	42.0	11.2	7.5*	1.7	231	94.2	82.7
CN	41.3	36.4	23.9*	9.0	101	83.2	70.5
PN	43.6	89.6	62.1*	39.3	185	98.8	56.8
PL	16.2	5.2	5.6	0.2	77	60.7	32.9
SP	6.4	7.7	7.7	0.6	42	72.3	9.4
SY	44.6	21.4	15.8*	6.2	180	84.4	76.5
SW	13.5	3.3	3.4	0.2	120	95.9	25.9

* Significant at 1% level ; for character description see text.

The phenotypic correlations among branch number, cluster number, pod number and seed yield were positive and significant while they were nagative with pod length (Table 2). Plant height was positively correlated with cluster number, pod number, pod length and seed yield and negatively with days to flower which in turn expressed negative association with pod length and seed yield. A similar trend was mostly observed for genotypic correlation coefficients as well.

TABLE 2

Correlation coefficients among various characters in guar

Characters		PH	BN	CN	PN	PL	SY
DF	P	—.337*	.118	—.114	.038	—.200*	—.238*
	G	—.342	.153	—.151	.046	—.286	—.281
	E	—.298*	.031	.160	.011	.124	.050
PH	P		.057	.257*	.216*	.352*	.456*
	G		.046	.260	.235	.430	.497
	E		.022	.232*	—.143	.062	.154
BN	P			.874*	.782*	—.257*	.685*
	G			.929	.951	—.260	.732
	E			.297*	—.009	—.157	.206*
CN	P				.928*	—.242*	.801*
	G				1.098	—.259	.900
	E				.325*	—.058	.572*
PN	P					—.219*	.585*
	G					—.264	.632
	E					.024	.206*
PL	P						—.614*
	G						—.682
	E						.144

*=Significant at 5% level; P=Phenotypic, G=Genotypic, E=Environmental.

DISCUSSION

Genetic variability for component characters if available in germplasm associations, is a major asset for starting a fruitful breeding programme. An evaluation of 300 germplasm accessions in *guar* did not only show a wide range of variation for a number of quantitative characters but revealed that a number of them is superior to checks for many characters. Branch number, cluster number, pod number and seed yield were the important components for which such superiority existed, indicating a possibility of direct selection and evaluation of the superior stocks for these characters, over time and space.

It was interesting to observe high heritability for these characters too. This would mean that a breeder can expect additive genetic variance to be available for selection

in progeny generations for these characters. Desirable peynotypic correlations among these characters with parallel trend in genotypic correlations would lead to further speculations for a possible simultaneous improvement for these characters under selection. The high range of expected genetic advance upto 83% for some of these characters and also simlar reports for branch number and pod number by Mital and Thomas (1969) and for cluster number by Das, Arora add Gupta (1973) add further strength to the above statement.

TABLE 3

Mean values of some important characters of promising accessions of guar

S. No.	Accession No.	DF	PH (Cm)	BN	CN	PN	DM	SY (g)
1.	I.C. 8452/P_3	58	99	12	52	160	119	44
2.	,, 9229/P_3	65	69	15	57	171	121	39
3.	,, 9232/P_2	58	103	18	63	198	115	45
4.	,, 11388	59	79	14	54	129	122	32
5.	,, 739/P_2	59	106	6	32	96	120	33
6.	PLG	68	56	111	14	53	166	119	33
7.	,,	64-1	60	106	6	44	147	124	36

On the basis of these observations, it was possible to select a number of promising genetic stocks (Table 3). These stocks were found to be significantly superior to the controls and rest of the germplasm in seed yield. These may be suitable either as direct productive introductions or as prospective parents in breeding programme for improving seed yield. Of these accessions, I.C. 9229/P_3 was the most promising high yielding selection made from a collection from Nazafgarh (Delhi). It is hairy and branched type producing 14-15 branches with yield ranging from 18 to 22 q/ha in multilocation trials. Its field resistance to bacterial blight is worth emphasis not only for direct introduction but to chalk out breeding programmes of genetic resistance to this disease.

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