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VARIABILITY FOR NODULATING ABILITY IN GREEN GRAM GENOTYPES UNDER FIELD CONDITIONS

RATHNASWAMY, A. S. SHANMUGAM and S. R. SREERANGASWAMY

Seventy seven green gram genotypes were studied for the nodulating ability under field conditions. Large variation was observed for nodule number among the host geno types both at flowering and maturity phases. Nodulating ability and DMP components benaved independently in the population studied and hence simultaneous selection may be useful. The green gram line 1791 possessed high nhdulating ability as well as yield potential.

Greengram (*Vigna radiata* (L.) Wilczek) is one of the important grain legumes having the unique property of fixing the atmospheric nitrogen through its root nodules, thus minimising the nitrogen application. The initiation of root nodule occurs in the first week of germination and reaches its peak at mid-flowering. Subsequently the nodule number gets reduced due to senescence. Since nodule formation is a heritable character and responds to selection, evaluation of host genotypes for effectve nodule formation was made to identify cultivars having high nitrogen fixation capabilities and to understand the relation between nodulation and yield components.

MATERIALS AND METHODS

Seventy seven green gram genotypes of diverse origin were grown and studied in field condition during monsoon, 1983 in randomised block design replicated twice. Seeds were inoculated with rhizobium strain (Co. G1) before sowing. Individual genotypes were studied for their nodulating ability both at mid flowering and maturity phases by carefully uprooting five random plants per replication. Besides, individual components of dry matter production such as root weight, shoot weight, leaf wight and reproductive parts were studied at both phases. Genotypic coefficient of variation (GVC), phenotypic coefficient of variation (PVC), heritability estimate in broad sense and genetic advance were estimated for nodule number. Correlation coefficients were computed between nodule number and dry matter components following the methods suggested by Panse and Sukatme (1954).

RESULTS AND DISCUSSION

Nodule number per plant ranged from 1.8 to 27.6 among the 77 genotypes at flowering phase with a mean of 10.19. However, the range was only from 0.0 to 21.2 during the maturity phase having a mean of

1 Professor, 2. Asst. Professor,
3. Director,, School of Genetics' TNAU, CBE-3.

6.14 nodules per plant (Table 1). Thus the reduction in the number of nodules was observed from peak flowering to maturity. The genotypic coefficient of variation, heritability and genetic advance were higher when estimated during flowering phase as compared to maturity phase (Table 2). The nitrogen fixation activity was reported to be high at peak flowering phase and sharp decline thereafter was reported by many workers (Ham *et. el.*, 1976; La Rue and Kurz, 1973 and Rupela and Dart, 1979).

The correlation coefficients between components of seed yield and nodule number per plant showed that except root weight at flowering phase, none of the characters had significant correlation with nodule number either at flowering or at maturity phase indicating that yield and DMP components are independent of nodule numbers (Table 3). Therefore, it may be feasible to combine varieties with high nodulating ability and yield.

Table 1 Frequency distribution of 77 genotypes for nodule number

Crop phase	Nodule number (Class value)										
	0—3	4—6	7—9	10—12	13—15	16—18	19—21	22—24	25—27	28—30	—
Flowering	3	17	25	8	8	7	4	3	1	1	10.19
Maturity	28	15	16	10	3	3	1	2		—	6.14

Table 2 Genetic paremeters for nodule number per plant

Estimate	Crop Phase	
	Flowering	Maturity
Phenotypic Variance	69.31	28.52
Genotypic variance	27.06	9.42
Coefficient of variation		
Phenotypic	81.70	86.98
Genotypic	51.04	49.99
Heritability (%)	39.04	33.03
Genetic advance as % of mean	81.60	73.55

The mean *per se* performance of the selected genotypes at 10% intensity for nodule number, DMP and seed yield for high and low values in the present study had further indicated that nodulating ability may be independent of productivity (Table 4). Simultaneous selection for nodulation and yield characters seems to be a viable breeding technique. Such selection in the present investigation resulted in the identification of line 1791 with high DMP, seed yield and nodulating ability (Table 5). The nodulating capacity substained in this variety till maturity may be due to non - senescence or formation of newer ones. Selection of such lines as parents for further breeding may be of great value However, resorting to the study of nodulating characters across the seasons and locations for stability will further strengthen our knowledge and help us to formulate suitable breeding strategies

Table 3 Correlation coefficient between nodule number, dry matter components and seed yield

	Flowering phase						Maturity phase						
	NN	SW	RW	LW	RP	DMP	NN	SW	RW	LW	PY	DMP	HI
Y	0.0004	0.551**	0.532**	0.432**	0.059	0.336**	−0.143	0.799**	0.248*	0.574**	0.976**	0.936**	0.128
NN		0.150	0.249*	0.186	−0.028	0.102	0.488**	0.056	−0.054	−0.0003	−0.032	−0.004	0.060
SW			0.768**	0.491**	0.239*	0.742**	0.216	0.661**	0.183	0.704**	0.510**	0.655**	−0.237*
RW				0.363**	0.017	0.482**	0.265**	0.620**	0.216	0.594**	0.504**	0.617	−0.220
LW					0.070	0.499**	0.056	0.278**	−0.047	0.322**	0.144	0.233*	−0.217
RP						0.800**	0.125	0.021	0.096	0.163	0.037	0.056	0.054
DMP							0.207	0.394**	0.015	0.517**	0.305**	0.405**	−0.1252
NN								0.029	0.074	0.168	−0.176	−0.049	−0.234*
SW									0.345**	0.650**	0.795**	0.919**	−0.342**
RW										0.191	0.257*	0.358**	−0.382**
LW											0.560**	0.744**	−0.412**
PY												0.946**	0.020
DMP													−0.209

** Significant at 1 percent level
* Significant at 5 percent level

Y-Seed yield; NN-Nodule number; SW-Shoot weight; RW-Root weight; LW-Leaf weight; RP-Reproductive Part weight; DMP-Total matter; PY-Pod yield andHI-Harvest index.

Table 4 Mean values of eight genotypes disruptively selected for three characters with 10% intencity

Catogery	Mean of eight genotypes				
	Nodule Number		DMP (g)		Seed Yield (g)
	F	M	F	M	M
	Nodule number as selection criterion				
H	22.82	12.76	17.90	26.67	10.90
L	3.62	3.95	14.49	27.48	10.32
	Seed yield as selection criterion				
H	10.78	5.38	19.23	49.94	18.97
L	11.68	7.15	14.79	20.76	7.18
	DMP as selection criterion				
H	11.18	6.73	19.56	50.80	18.04
L	11.58	6.58	14.60	19.66	7.32

H - High ; L Low
F - 50% flowering
M - Maturity

Table 5 Green gram genotypes with high nodulation ability and their seed yield potential

Genotypes	Nodule number/plant		DMP (g)		Seed yield (g)
	Flowering	Maturity	lowering	Maturity	
GRS	27.6	7.10	19.80	19 97	8.49
78/37	26.8	20. 4	13,78	20.90	8.95
V 109	23 2	12. 6	11.06	19.28	7.90
1791	22 2	21. 2	32.44	64.46	23.70
MG 143	22.0	15. 4	14.34	28.24	10.00
GES 14	20.8	11. 6	15,70	20.60	10.28
PLS 419/1	20 4	5. 4	15.22	16.46	7.50
1790/3	19.6	8. 4	20.86	23.46	10.42
Mean (selected)	22.8	12. 8	17.90	26.67	10 90
,, (Population)	10.2	6. 14	15.58	29.95	11.67

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