Indian J. Genet., **60**(3): 321-326 (2000)

SELECTION OF PROTEIN RICH GENOTYPES IN MUNGBEAN

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(Received : September, 1998; accepted: June, 2000)

ABSTRACT

Variability in 37 local land races of mungbean collected from different parts of Orissa and selections from them was studied for protein content (%), protein yield and seed yield per plant. The protein content (%) ranged from 17.20 to 29.90; protein yield/plant ranged from 0.18 g to 0.95 g and seed yield per plant ranged from 0.81 g to 3.49 g. The association of protein content (%) and protein yield per plant with yield components revealed a significant association of protein content with early flowering, pod length, pod number, seed number and yield per plant.

Key words : Mungbean, proteint content, glossiness

Mungbean, *Vigna radiata* (L.) Wilczek, contains about 24% protein in seeds and is a major source of vegetable protein. Any breeding strategy in this crop should, therefore, accentuate on protein content and total protein yield. Protein content is a quantitative trait and hence component characters associated with this trait should be identified for indirect selection of genotypes for direct cultivation or for using as parent materials in breeding programmes.

Available literature evidences for equivocal nature of correlation of protein content with seed yield and its component characters, reported associations being positive, negative and nonsignificant. Such differences are most likely due to use of populations differing in size, extent of genetic variation besides several other factors. It is then imperative to observe a larger germplasm with wide diversity to precisely assess the nature and extent of variation in protein content and protein yield and to evaluate the association of agronomic traits with these two traits. Yan *et al.* [1] reported negative correlation of seed glossiness with protein content in mungbean. It would be useful then to verify whether qualitative traits as colour and mosaicness of seeds besides glossiness have any bearing on seed protein content.

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Local land races (LLRs) in mungbean have not been well explored for their agronomic potential. Previous observations on ten LLRs of Orissa and selections therefrom exhibited a broad base of variation and even superiority over many standard varieties with regard to some agronomic characters [2,3]. These genotypes are worth studying for their seed protein content. The present investigation, therefore, included study of variation in protein content and protein yield in mungbean genotypes including some LLRs and the nature of association of these traits with some quantitative and qualitative characters with a view to selecting genotypes for protein improvement.

MATERIALS AND METHODS

Thirty seven genotypes including 27 improved varieties of diverse sources and 10 LLRs collected from different parts of Orissa and selections from them were evaluated in a randomized complete block design with two replications during the summer season of 1995. Seeds were sown in three metre rows with a row to row spacing of 30 cm and plant to plant spacing of 10 cm. Observations were recorded on nine agronomic characters and also on colour (green/black/brown), lustre (glossy/dull) and mosaicness (presence/absence) of seed coat.

Total nitrogen content (N) in seed flour was estimated by microkjeldah method [4]. Crude protein content was estimated as N × 6.25. Content of crude protein (%) was multiplied by the mean seed yield/plant to estimate protein yield/plant. Range, mean, standard deviation (σ) and coefficient of variation (CV%) were calculated using mean values pooled over two replications. Standard error to compare between genotypes and the correlation coefficient values between each pair of characters were calculated following standard statistical procedures. The genotypes were grouped according to seed coat colour, mosaicness and seed coat lustre. Two contrasting phenotypes for each of these traits were assigned numerical value of 1 or 2 to calculate simple correlation coefficients with protein content and protein yield.

RESULTS AND DISCUSSION

The genotypes exhibited significant variation in crude protein content which varied from 17.2 to 29.9% with an average of 22.83% and CV of 14.65% (Table 1). These results corroborate well to the reported range of 19.1 to 28.3% seed protein with an average of 24% in this crop [5]. Six genotypes including MGG 330, Nagpuri, BSN 1, TARM 18, GDI 47-4 and MUS 288 superseded $\mu+\sigma$ of the population (25.94%), whereas four genotypes including WGG 35, Jhainmung, ML 2 and PUSA 103 were below $\mu-\sigma$ (19.71%). About 72.9% (27) genotypes were within the range

Table 1. Comparative performance of 37 genotypes of mungbean with regard to protein content, protein yield and seed yield

Sl No.	Genotypes*	Protein content (%)	Protein yield/plant (g)	Seed yield/plant (g)
1	MGG 330	29.90	0.78	2.61
2	*NAGPURI*	29.30	0.24	0.81
3	*BSN* 1**	27.80	0.23	0.81
4	TARM 18	27.60	0.40	1.45
5	MUS 288	27.40	0.73	2.65
6	GDI 47-4	27.40	0.95	3.48
7	MGG 332	25.90	0.74	2.85
8	NARP I	25.50	0.55	2.17
9	*BARBAHAL*	24.80	0.29	1.15
10	ML 5	24.80	0.57	2.30
11	COBG 2	24.70	0.48	1.93
12	OUM 6	24.20	0.60	2.46
13	*BAHALMUNG*	23.30	0.48	2.06
14	*RANPUR*	23.10	0.51	2.20
15	*KARLAKHAMAN*	23.10	0.41	1.78
16	PS 16	22.80	0.44	1.95
17	MH 309	22.80	0.52	2.30
18	WGG 37	22.50	0.61	2.71
19	TARM 2	22.10	0.39	1.77
20	PDM 84-146	21.90	0.53	2.40
21	*KENDRAPARA* 2**	21.50	0.18	0.83
22	ML 515	21.40	0.52	2.45
23	DHAULI	21.30	0.53	2.47
24	K 851	21.10	0.54	2.56
25	PUSA 108	21.00	0.35	1.67
26	*RATILA I***	20.90	0.36	1.71
27	CO 5	20.80	0.41	1.95
28	ML 538	20.50	0.57	2.79
29	UPM 79-1-12	20.40	0.44	2.16
30	JYOTI	20.30	0.71	3.49
31	*KALAMUNG*	20.30	0.22	1.10

(*Table 1 Contd.*)

Sl No.	Genotypes*	Protein content (%)	Protein Yield/plant (g)	Seed Yield/plant (g)
32	T 44	20.20	0.49	2.41
33	LGG 410	20.00	0.45	2.27
34	PUSA 103	19.30	0.38	1.96
35	ML 2	18.90	0.42	2.22
36	*JHAINMUNG*	18.60	0.21	1.13
37	WGG 35	17.20	0.51	2.95
	Mean	22.83	0.48	2.11
	SE	0.51	0.03	0.11
	CV (%)	13.65	35.22	31.95

*Local land races are italicized, **Selection from the local land race

of $\mu \pm \sigma$, which is fairly close to the expected proportion of 68% in a normally distributed population. This indicated quantitative nature of genetic control for protein content. Wide variation in protein content suggests the scope of effective preferential selection for improvement. The LLRs had, in general, comparable protein content averaging 23.27% with a range of 18.6 to 29.3% to the improved varieties averaging 22.66% with a range of 17.2 to 29.9% (Table 1).

Protein yield ranged from 0.18 to 0.95 g with an average of 0.48g and CV of 35.22%. Five genotypes including GDI 47-4, MGG 330, MGG 332, MUS 288 and Jyoti were above the range of $\mu + \sigma$ (0.65g), while six genotypes including Kendrapara 2, Jainmung, Kalamung, BSN 1, Nagpuri and Barbahal were below $\mu - \sigma$ (0.31g). A proportion of 70.27% of the cultivars were with the range of $\mu \pm \sigma$ substantiated the population to be following normal distribution. The order of the genotypes varied in terms of performance with regard to protein content and protein yield as expected. Eight genotypes including six improved varieties, MGG 330, TARM 18, GDI 47-4, MUS 288, MGG 332 and Jyoti; a local land race, Nagpuri and its selection, BSN 1 had higher protein content and/or protein yield and therefore, deserve to be recommended for cultivation and also for inclusion as parent materials in breeding programmes for improvement in seed protein.

Identification of component traits showing significant association with protein content is a prerequisite for indirect selection of genotypes for improving seed protein. Protein content in mungbean was reported to be negatively associated with most of the plant characters except for significant positive correlation with 100 seed weight [6]. Sandhu *et al.* [7] observed that seed yield in mungbean did not show any association with protein content; on the other hand, Vidyadhar *et al.* [8] found positive association of protein content with seed yield. Yohe *et al.* [5] observed that the high protein strains tended to be late flowering, small seeded and low yielding. Bhadra *et al.* [9] also found high protein cultivars to be small seeded and low yielding. In contrast, Trung and Yoshida [10] reported a positive association of seed size and protein content. Previous studies using the same test genotypes revealed highly significant variation in all the eight component characters (Table 2) and moderately high or high heritability and these characters, therefore, could be used as reliable selection criteria. In the present study, protein content was negatively

Table 2. Simple correlation of nine agronomic characters *inter se* and with protein content and protein yield in mungbean

Characters	2	3	4	5	6	7	8	9	10	11
1. Days to flower initiation	0.800**	0.507**	0.312	–0.386*	0.370*	0.218	0.303	–0.194	–0.365*	–0.337*
2. Duration (days)		0.708**	0.247	–0.476**	0.448**	0.212	0.358*	–0.226	–0.197	–0.289
3. Plant height (cm)			0.162	–0.040	0.482**	0.423**	0.102	0.218	–0.336*	0.092
4. No. of primary branches				0.044	0.136	0.168	–0.465**	–0.205	–0.220	–0.217
5. Number of pods/plant					–0.031	0.423**	–0.622**	0.758**	–0.063	0.738**
6. Pod length (cm)						0.549**	0.442**	0.420**	0.074	0.400*
7. No. of seeds/pod							–0.375*	0.454**	–0.171	0.414*
8. 100 seed weight (g)								–0.134	0.302	–0.089
9. Seed yield/plant (g)									–0.101	0.911**
10. Protein content (%)										0.289
11. Protein yield/plant (g)										

* and ** denotes significant at P 0.05 (> 0.325) and P 0.01 (> 0.418) level respectively

correlated with plant height and days taken to flower initiation (Table 2). With rest of the characters, it has no significant association. A positive association of protein content and early flowering in contrast to negative correlation reported previously [5] might be due to difference of test genotypes. Protein yield in the present study was negatively correlated with days taken for flower initiation and positively with pod length and seed number and had highly positive association with seed yield and pod number. For improvement of protein yield, therefore, emphasis should be laid on early flowering genotypes with higher seed yield, profuse pods, longer pods and more seeds in pods during selection.

Yan *et al.* [1] reported negative association of seed glossiness with protein content in mungbean. Correlation studies of protein content and protein yield with three seed coat attributes, colour, lustre and presence of mosaics in the present investigation, however, revealed no such association.

ACKNOWLEDGEMENTS

Financial assistance through an ICAR ad-hoc project (F. No. 16(1)/93-FC II, dated 14.2.94) is duly acknowledged.

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