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INHERITANCE OF PROTEIN CONTENT IN MUNGBEAN UNDER DIFFERENT ENVIRONMENTS

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ABSTRACT

Additive and nonadditive gene effects were found to be important in the expression of protein content studied at three locations through a 7 x 7 diallel cross of mungbean. Interaction mean squares of gca and sca with environments were significant, indicating their inconsistency over environments. Parent varieties ML 5 and A 36-4 had high protein content and were good general combiners.

Key words: Combining ability, protein, mungbean, environmental effects.

Among the pulses, mungbean (*Vigna radiata* (L.) Wilczek) is considered easily digestible with about 20-25% protein and is free from flatulence inducing substances to great extent [1]. Efforts are being made to increase seed yield but very little attention has been paid toward improving protein content and quality.

MATERIALS AND METHODS

Seven parents and their 21 one-way diallel F_1 and F_2 were evaluated in randomized block design replicated thrice at Sardar Krushinagar, Talod and Vadodara during Kharif season. The plot size was 1.5 m long single row each for parents and F_1, and five rows of same length for F_2 with 45 x 15 cm spacing. Total nitrogen of each seed sample determined by colorimetric method [2] was multiplied by 6.25 to obtain protein per cent. The arcsin transformed data were subjected to combining ability analysis as per Method 2, Model 1 of Griffing [3] and analysis over environments following Singh [4].

RESULTS AND DISCUSSION

Mean squares due to gca and sca in F_1 (Table 1) were significant in all the analyses, indicating importance of both additive and nonadditive gene effects in the inheritance of

Table 1. Individual and pooled analysis of variance for protein content in F_1 generation

Source	d.f.	Mean squares			
		S.K. Nagar	Talod	Vadodara	Pooled
Gca	6	1.97**	0.64**	0.55**	1.07**
Sca	21	0.48*	0.86**	0.77**	1.11**
Environments (E)	2	—	—	—	4.98**
Gca x E	12	—	—	—	1.05**
Sca x E	42	—	—	—	0.50**
Error	54	0.28	0.16	0.13	—
	162	—	—	—	0.19

*, ** P = 0.05 and 0.01, respectively.

protein content. These results are in agreement with those reported earlier [5]. However, importance of gca effects has also been reported [6, 7]. The varying magnitude of gca and sca variance at different locations as well as significance of their interaction with environments indicated that both the components were highly influenced by change of

Table 2. Pooled estimates of gca effects in F_1 (upper values in diagonal) and F_2 (in parentheses), and sca effects in F_1 (above the diagonal) and F_2 (below the diagonal) generations for protein content

Parent	Sabarmati	T44	K 851	ML 5	A 36-4	12/333	Gujarat 2
Sabarmati	–0.47* (–0.62*)	0.78	–0.47	–0.77	–0.44	–0.01	–0.08
T 44	0.07	–0.39 (–0.54*)	–0.45	–1.18	–0.61	–0.05	–0.91
K 851	0.10	0.17	0.04 (–0.07)	–0.40	–0.16	–0.26	0.10
ML 5	–1.40	–0.59	0.78	0.36 (0.67**)	–0.28	–0.15	–0.21
A 36-4	–0.19	–0.42	–1.54*	0.14	0.44 (0.52*)	–0.50	0.03
12/333	0.06	–1.43	0.75	0.40	0.16	–0.08 (–0.05)	–0.62
Gujarat 2	0.58	–0.14	–1.48*	–0.47	1.05	–0.67	0.09 (0.09)
Average protein (%)	20.73	21.66	21.44	22.85	23.30	21.25	22.80

*, ** P = 0.05 and 0.01, respectively. SE (gi) for F_1 and F_2 = 0.23 and 0.25, respectively.
SE (sij) for F_1 and F_2 = 0.68 and 0.72, respectively. SE (m) = 0.48.

location. It emphasised the importance of multienvironment evaluation of materials for unbiased estimation of the genetic components.

Parents ML 5 and A 36-4 had significantly higher protein than other parents except Gujarat 2 (Table 2). They had highest positive gca effects in F_1 and significant in F_2. These parents, therefore, were good general combiners having favourable genes for higher protein levels in their progenies. The other parents were poor combiners. None of the crosses in both generations depicted significant sca effect, except three crosses showing significantly negative values in F_2 (Table 2). However, in individual location analysis, crosses K 851 x Gujarat 2 and ML 5 x 12/333 at Sardar Krushinagar, A 36-4 x Gujarat 2 and 12/333 x Gujarat 2 at Talod, and A 36-4 x Gujarat 2 and Sabarmati x Gujarat 2 at Vadodara showed significant positive sca effects for high protein content. At least one of the parents in these crosses was good general combiner. These crosses, therefore, had potential to give transgressive segregates in subsequent generations.

These results indicate that biparental matings of selected plants in the early segregating generations would be beneficial for simultaneous exploitation of additive and nonadditive gene effects to achieve improvement in protein content.

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