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Short Communication

Evaluation and exploitation of genetic diversity for improving grain yield in summer urdbean

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Introduction of pulses in crop rotation has long been advocated as protective approach for agro-ecosystem. However, it is still to be accomplished as high yielding varieties of pulses are not available. Improvement of food legumes in Asia is inhibited by the large number of species of current and potential importance (1). Among the food legumes, mungbean and urdbean are unique as these are short duration (65-75 days) pulses and can be grown in any cropping season. Therefore, these two crops hold great promise in sustainable agriculture if varieties with higher yield potential are available and suitably fitted in a cropping system of Indian subcontinent. In urdbean (*Vigna mungo* L. Hepper), it is observed that total dry matter per plant, harvest index and number of peduncles per plant are the major yield attributing characters (3). These traits show relatively higher genetic variability than other characters from studies with 28 genotypes over three environments. In the present paper, the variability among different genotypes and the performance of selected lines in advanced generation on the basis of these traits are discussed.

Twenty eight genotypes of diverse origin were evaluated for three consecutive seasons 1997-1999 in a randomized block design (RBD) with three replications in the D.S. Farm Kalyani. In a separate experiment, few elite lines were selected and crossed, F_2 and subsequent generations were advanced to F_4 following pedigree method. The elite lines were tested in the field in a RBD with three replications along with some standard varieties in summer seasons of 2002 and 2003. Data were analyzed following standard statistical methods.

Analysis of variance revealed significant difference for all the traits. Variability for different characters among 28 genotypes revealed higher values of genotypic coefficient of variation for harvest index, dry matter per plant, pods per plant and seed yield (Table 1). Heritability (broad sense) estimate for harvest index was very high followed by plant height and days to maturity.

Top five high yielding and five low yielding lines among 28 genotypes were selected and their performance over three seasons were pooled and presented in Table 2. Top high yielding lines gave 31.7% more grain yield than the population mean while low yielding lines gave 32.3% lower grain yield than the population mean. Top high yielding lines among 28 genotypes recorded higher values for all the characters studied while the mean values were lower in the low yielding group. Significantly higher yield was achieved through higher values for total dry matter, pods per plant and plant height. Differences in 100-seed weight and harvest index from the

Table 1. Variability among different characters of 28 urdbean genotypes over three environments

Character	Mean	PCV (%)	GCV (%)	h^2 (b)
Plant height (cm)	22.80	16.34	14.16	75.18
Number of pods/plant	17.12	21.55	14.49	45.21
No. of peduncles on main stem	4.43	16.27	13.08	65.26
No. of pods/peduncle	2.66	12.83	6.80	27.58
Number of seeds/pod	5.19	7.08	4.02	31.62
100- seed weight (g)	3.63	11.55	9.04	61.32
Dry matter/plant (g)	10.89	22.56	18.55	67.39
Days to maturity	73.78	3.44	2.92	71.39
Harvest Index (%)	31.53	24.65	23.60	90.39
Seed yield / plant (g)	3.46	19.38	15.44	63.33

Table 2. Mean values of 5 top high yielding and 5 low yielding genotypes of urdbean (pooled)

Lines	Seed yield (g)	Plant height (cm)	Total dry matter/plant (g)	100-seed weight (g)	Harvest Index (%)	Pods/ plant
High yielding lines						
M-268	4 .8	24.1	15.3	3.9	31.4	19.9
M-306	4 .6	29.5	16.1	3.7	27.4	21.3
M-297	4 .4	28.7	14.3	4.0	30.3	24.5
M-276	4 .3	28.3	11.6	3.9	35.3	17.9
M-275	4 .3	22.7	11.8	4.0	35.6	19.7
Mean	4 .48	26.6	13.8	3.9	32.0	20.6
Difference (%)	31 .7	16.1	27.8	8.3	1.58	20.4
Low yielding lines						
M-224	2 .0	16.6	6.1	3.1	33.8	10.4
M-16 x glph	2 .2	22.2	7.6	3.8	29.1	11.5
T-9	2 .2	22.2	8.1	3.1	28.4	15.7
M-295	2 .3	22.4	8.7	3.6	26.3	21.0
M-298	2 .8	20.6	8.0	3.2	34.9	15.2
Mean	2 .3	20.8	7.7	3.36	30.5	14.7
Difference (%)	-32 .3	-9.2	-28.7	-6.6	-3.17	-14.0
Pop. Mean	3 .40	22.9	10.8	3.6	31.5	17.1
CD at 5 %	1. 05	5.22	2.63	0.35	3.71	3.82

population mean were not significant. Almost similar but reverse trend was noticed for these traits among the low yielding lines. These results clearly established that dry matter per plant was the most important trait contributing to higher seed yield followed by pods per plant and plant height in urdbean. As there was enough variability for dry matter per plant among the genotypes, it would be easy to select better genotypes having higher dry matter per plant. However, to increase dry matter further as well as yield, hybridization between these genotypes and selection in the segregating generation has to be done.

In order to test this hypothesis, a few promising lines were selected and crossed, and their segregating progenies were advanced to F_4 generation through pedigree method of selection. Selections as well as standard varieties were grouped according to their growth habit such as busy, semi-erect and erect (Table 3). Varieties like T 9 and Sarada along with two elite selections were in the bushy group which produced comparatively lower biological yield and lower seed yield excepting L-22-44. However, they showed better harvest index than the semi-erect and erect groups. In the semi-erect group, there were five selections, one released variety and one elite germplasm (M 297). The mean values for economic and biological yields were better in semi-erect group than that in the bushy group but harvest index was lower. While the erect group recorded the highest seed yield as well as biological yield, the harvest index was comparable to bushy group. These results clearly showed that seed yield was increased along with biological yield in most of the cases barring few exceptions in all groups. Lawn and Williams (2) observed that the productivity in terms of dry matter accumulation of differing genotypes was remarkably similar once a closed canopy had been formed. This observation is not universal and is applicable to the common bushy form. If the growth habit is changed from bushy to semi-erect or erect, dry matter accumulation does not remain constant. However, in semi-erect or erect growth habits, the closed canopy is not attained so the pattern of dry matter accumulation does not remain constant. These results support the view that increasing seed yield potential in urdbean is possible by enhancing biological yield through the manipulation of growth habit. However, no improvement in harvest index was observed among the semi-erect and erect groups.

Table 3. Performance of elite lines derived from crosses involving high yielding lines in urdbean

Genotype	Seed yield/plant (g)	Biological yield/plant (g)	Harvest index (%)
	Bushy lines		
T 9 (check)	2.30	6.58	34.95
Sarada (check)	2.23	5.79	36.21
L-22-44 (T9 x LBG 623)	3.12	7.40	41.89
L-25-48 (BR68 x LBG 623)	1.95	5.28	36.74
Mean	2.4	6.26	37.45
	Semi-erect lines		
M 297 (check)	2.75	7.61	36.67
TU 94-2 (check)	3.38	8.71	37.37
L -27-37 (LU 9 x LBG 623)	2.36	5.96	38.71
L -26-3(LU9 x LU 487)	2.86	8.61	32.79
L -24-14 (BR68 x LU487)	2.05	5.95	34.91
L -17-24 (WB16 x LU 487)	3.62	9.47	38.85
L -26-4 (LU9 x LU 487)	2.61	9.00	32.42
Mean	2.80	7.90	35.87
	Erect lines		
L-26-2 (LU 9 x LU 487)	2.49	6.59	36.33
L-12-35 (NP14 x LU 487)	3.42	9.32	36.49
L-28-13 (LU 487 x LBG 623)	3.13	9.01	34.75
Mean	3.01	8.31	35.86
CD at 5 % level	0.86	2.98	4.68

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