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GENETICS OF YIELD TRAITS IN URDBEAN (Vigna mungo L. Hepper)

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ABSTRACT: *In a one-way diallel cross (6x6), genetically diverse parents were used. Both additive and non-additive genetic components were involved in the expression of the traits, with the predominance of the former. Cross TPU-4 x PDU-102 showed positive specific combining ability effects for pods/plant and seed yield/plant with positive general combining ability effects of both the parents and* ***per se*** *performance of these lines and cross is superior than other lines and hybrids respectively. Hence, selection from the segregating generations of this cross is expected to lead to genetic improvement for seed yield.*

Keywords : *Urdbean, Vigna mung L. Hepper, genetics, grifting, diallel cross, yield traits.*

INTRODUCTION

Urdbean (*Vigna mung* L. Hepper) varieties show a wide range of fluctuations in their performance when grown under varied agroclimatic conditions. Though urdbean tolerate water stagnation for small period in Kharif (rainy season), however it behaves differently in rice zones (1200 mm annual rainfall). A very little work has been done in the past to know the genetic nature of this crop. The genetic architecture is however yet to be clearly understood. To obtain basic information on this aspect a study was undertaken using a half diallel (6x6).

MATERIALS AND METHODS

Experimental material comprised of six genetically diverse parents viz. PU-19, JU-2, TPU-4, PDU-102, UL-370 and np-21. These parents were crossed in half diallel fashion to obtain 15 hybrids. All the 15 F1's alongwith their six parents have grown in randomized complete block design with two replications during rainy season of 1995 at research farm of I.G. Agricultural University, Raipur, India. Each entry consists of one row 4 m long 30 cm apart. Five competitive plants were selected from each plot in each replication to record observations on plant height (cm), branches/plant, pod length (cm), seeds/pod, pod clusters/plant, pods/plant and seed yield/plant (g). Statistical analysis of data has been done as per the method suggested by Griffing Model-1 Method-2 (1956).

RESULTS AND DISCUSSION

Analysis of variance for combining ability (Table-1) revealed that the variance due to gca and sca were highly significant for all the characters, indicating importance of both additive and non-additive gene effects in their inheritance. The gca : sca ratio more than unity suggested a predominant role of additive gene effect for all characters.

Table 1. Mean values of yield components of parents and hybrids of Urdbean.

Parent/Cross	Plant ht. (cm)	Branches plant	Pod length (cm)	Seeds/ pod	Clusters plant	Pods/ plant	Seed yield/ plant (g)
PU-19	55.5	3.70	4.55	7.40	10.50	29.0	5.15
JU-2	50.5	3.20	4.30	6.65	9.75	19.5	4.55
TPU-4	62.0	3.45	5.00	5.10	11.50	33.0	11.15
PDU-102	78.0	3.50	4.35	7.95	12.00	24.0	7.10
UL-370	111.0	3.30	5.10	7.10	11.25	26.0	6.40
NP-21	109.5	3.45	5.00	5.15	12.50	23.5	4.90
PU-9 x JU-2	53.5	3.70	4.55	7.40	10.50	29.0	5.15
PU-9 x TPU-4	50.5	3.20	4.30	6.65	9.75	19.5	4.55
PU-9 x PDU-102	62.0	3.45	5.00	5.10	11.50	33.0	11.15
PU-9 x UL-370	78.0	3.50	4.35	7.95	12.00	24.0	7.10
PU-9 x NP-21	111.0	3.30	5.10	7.10	11.25	26.0	6.40
JU-2 x TPU-4	109.5	3.45	5.00	5.15	12.50	23.5	4.90
JU-2 x PDU-102	55.5	3.20	4.90	7.80	13.60	25.5	6.40
JU-2 x UL-370	52.5	4.35	4.90	8.55	14.35	29.0	8.45
JU-2 x NP-21	55.5	3.55	4.90	8.05	14.35	22.5	6.70
TPU-4 x PDU-102	51.5	3.20	4.85	8.30	14.20	43.0	9.85
TPU-4 x UL-370	53.5	3.99	4.90	8.20	13.50	27.0	6.40
TPU-4 x NP-21	17.0	4.10	5.25	8.15	15.00	34.0	9.65
PDU-102 x UL-370	20.5	4.15	5.25	8.25	10.80	37.0	10.75
PDU-102 x NP-21	23.0	4.10	3.45	6.50	11.25	36.0	7.65
UL-370 x NP-21	18.0	3.95	5.20	8.55	14.00	21.0	4.95
CD 5%	3.96	0.20	0.21	0.37	0.84	3.75	1.05

Estimates of general combining ability (gca) effects of parents (Table-2) indicated that for plant height all the parents showed significant gca effects except JU-2, however only three parents are desirable combiners viz. PU-19, UL-370 and NP-21, because their gca effects are positive. For branches/plant UL-370 and NP-21, for pod

lenght TPU-4 and UL-370, for seeds/pod PDU-4 and NP-21 and for pods/plant and yield/plant TPU-4 and PDU-102 were the desirable combiners as their gca effects positive and significant in nature.

Table 2. Analysis of Variance for yield traits in Urdbean.

Source	df	Mean Squares											
		Plant height		Branches/ plant		Pod length		Seeds/ pod		Cluster/ plant		Pods/ plant		Seed yield/ plant	
G.C.A.	5	251.26	**	0.378	**	0.147	**	1.732	**	10.200	**	191.58	**	5.370	**
S.C.A.	15	147.20	**	0.147	**	0.103	**	1.488	**	2.380	**	32.96	**	4.317	**
Error	20	1.81		0.005		0.005		0.016		0.081		1.623		0.126	

* significant at 05 level of significance.
** significant at 01 level of significance.

Specific combining ability (sca) effects for yield and its attributes are given in Table 3. Results indicated that that for plant height, crosses PU-19xUL-370, PU-19xNP-21, JU-2xTPU-4 and JU-2xPDU102 showed positive significant sca. effects. For branches/plant crosses PU-19xJU-2, JU-2xUL-370, TPU-4xUL-370, TPU-4xNP-21, PDU-102xUL-370 and PDU-102xNP-21 has positive sca effects Table 4. For seeds/pod crosses PU-19xJU-2, PU-19xNP-21, PU-19xUL-370, JU-2 x PDU-102, JU-2xUL-370, JU-2xNP-21, TPU-4xPDU-102, TPU-4xUL-370, TPU-4 x NP-21 and UL-370xNP-21 showed positive sca effects. For pods/plant crosses pu-19xPDU-102, JU-2 x UL-370, TPU-4xPDU-102, TPU-4xNP-21 and PDU-102xUL-370 had positive sca effects. For seed yield/plant crosses PU-19xPDU-102,JU-2xUL-370, JU-2xNP-21, TPU-4xPDU-102, TPU-4xNP-21 and PDU-102xUL-370 showed positive significant specific combining ability effects Therefore, these crosses are regarded as desirable.

Table 3. Estimates of general combining ability (g c a) effects of parents.

S. No	Parents	Plant height		Branches/ Plant		Pod length		Seeds/ Pod		Clusters/ Plant		Pods/ Plant		Seed yield/ Plant	
1.	PU-19	4.58	**	-0.09	**	-0.12	**	-0.17	**	-1.17	**	-1.27	*	-0.54	**
2.	JU-2	1.27		-0.08	*	-0.07	*	-0.01		-0.07		-2.9	**	-1.03	**
3.	TPU-4	-2.42	**	-0.05		0.11	**	-0.46	**	-0.32	*	-2.67	**	0.78	**
4.	PDU-102	-7.10	**	-0.02		-0.16	**	0.19	**	0.00		2.60	**	1.07	**
5.	UL-370	2.40	**	0.01	**	0.18	**	0.67	**	0.22		-0.21		0.19	
6.	NP-21	2.27	**	0.08	*	0.06		-0.21	**	0.69	**	-1.90	**	-0.47	**

* significant at 05 level of significance.
** significant at 01 level of significance.

Table 4. Mean values of yield components of parents and hybrids of Urdbean.

Crosses	Plant ht. (cm)	Branches/ plant	Pod length (cm)	Seeds/ pod	Clusters/ plant	Pods/ plant	Seed yield/ plant (g)
1. PU-19 x JU-2	-12.12 **	0.26 **	-0.03	0.39 **	-0.46	4.79 **	-0.28
2. PU-19 x TPU-4	-12.43 **	-0.27 **	-0.46 **	0.09	-1.60 **	-10.28 **	-2.68 **
3. PU-19 x PDU-102	3.76 **	-0.05	0.51 **	-2.11 **	0.48	3.29 *	3.62 **
4. PU-19 x UL-370	10.26 **	-0.18 **	-0.47 **	0.26 *	0.75 **	-2.90 *	0.46
5. PU-19 x NP-21	43.38 **	-0.30 **	0.39 **	0.29 *	-0.46	0.79	0.42
6. JU-2 x TPU-4	50.88 **	-0.03	0.18 *	-1.57 **	0.05	-3.69 **	-1.84 **
7. JU-2 x PDU-102	1.57	-0.31 **	0.35 **	0.43 **	1.48 **	-1.59	-0.63
8. JU-2 x UL-370	-10.93 **	0.66 **	0.02	0.70 **	2.00 **	4.72 **	2.30 **
9. JU-2 x NP-21	-7.80 **	-0.06	0.13	1.08 **	1.54 **	-0.09	1.21 **
10. TPU-4 x PDU-102	0.26	-0.34 **	0.12	1.38 **	1.68 **	10.35 **	1.49 **
11. TPU-4 x UL-370	-7.24 **	0.27 **	0.16 *	0.80 **	0.76 **	-2.84 *	-1.56 **
12. TPU-4 x NP-21	-43.62 **	0.46 **	0.30 **	1.63 **	1.79 **	5.85 **	2.36 **
13. PDU-102 x UL-370	-35.55 **	0.40 **	0.46 **	0.20	-1.62 **	7.22 **	2.50 **
14. PDU-102 x NP-21	-32.93 **	0.43 **	-1.23 **	-0.67 **	-1.63 **	-2.09	0.06
15. UL-370 x NP-21	-47.43 **	0.10	0.19 **	0.90 **	0.89 **	-4.28 **	-1.76 **

* significant at 05 level of significance.
** significant at 01 level of significance.

From the analysis it appears that, for plant height parents PU-19, UL-370 and NP-21 are desirable combiners. Reference to the Table-1 shows that per se performance of these lines is superior than lines. There is a close agreement between crosses selected on the basis of their sca effects and per se performance. Cross combinations PU-19xUL-370 and PU-19xNP-21 has the parents which are desirable combiners. Hense, selection from the segregating generations of these crosses for plant height is expected to lead to substantial genetic improvement.

As far as pod length is concerned, parent TPU-4 and UL-370 showed significant positive gca effect and are desirable combiners. Cross combination TPU-4xUL-370 has both the desirable combiners and the cross showed positive sca effect. The selections in the subsequent generations of the cross may lead to genetic improvement for pod length in Urdbean.

For pod clusters/plant, parents TPU-4 and NP-21 were found to be desirable on the basis of their gca effects and hiybrid TPU-4xNP-21 showed positive sca effects and per se performance and has both the parents which are desirable combiners. Hence.

selections in this cross for number of pod clusters/plant may lead to substantial genetic gain.

For pods/plant and seed yield/plant parents TPU-4 and PDU-102 are the desirable combiners. Mean data shows that per se performance of these lines is superior than the other lines. The hybrid of these parents i.e. TPU-4 x PDU-102 shows significant positive specific combining ability for both the traits. Hence, selections from the segregating generations of these crosses is expected to lead to genetic improvement for pods/plant and seed yield/plant. These results are in general agreement with the findings of Rao (1986) and Haque et al.(1988).

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