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# Genetic analysis in black gram (*Vigna mungo* (L.) hepper) under saline condition

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**Abstract: Combining ability analysis of 28 $F_1$'s of a diallel cross (excluding reciprocals) and their parents showed both additive and non-additive components of variation for the inheritance of grain yield/plant and 100 seed weight. For plant height, clusters/plant, pods/plant and seeds/pod, only the additive component was observed. The parent KU 300 was adjudged as a good general combiner for grain yield/plant, whereas, TU 94-2 and P 165 were adjudged as good general combiners for 100 seed weight. Six cross combinations *viz.*, 2 KU 53/TU 94-2, 99 V 48/KU 300, 99 V 48/P 165, KU 300/LBG 645, PV 94-2/LBG 623 and TU 94-2/P 165 recorded high specific combining ability and they could be exploited for further breeding programmes.**

***Key words: Urdbean, Combining ability, Saline.***

## Introduction

Urdbean (*Vigna mungo* (L.) Hepper) is one of the important legume of India, grown under diverse conditions. It is essential to develop varieties with high yield potential. The *per se* performance of parents may not necessarily reveal to be a good general combiners for breeding programme. Combining ability analysis is an important and powerful tool for selecting the parents. The present study was undertaken with the aim of gathering information on this aspect and to select suitable parents for further breeding programme.

## Materials and Methods

Eight diverse strains of Urdbean namely, 99 V 48, KU309, PV 94-2, LBG 623, 2 KU 53, KU 300, P 165, LBG 645. PV 94-2 and LBG 623 were crossed in all possible combinations, excluding reciprocals. The 28 $F_1$'s along with the eight parents were raised in the experimental farm, Department of Agricultural Botany, Faculty of Agriculture, Annamalai University during Jan-Nov 2005. The entries were raised in Randomized Block Design (RBD) replicated thrice with a spacing of 30X10 cm. The experimental field was under saline condition with pH of 7.8 and EC 4.1 $dSm^{-1}$. Observations were recorded on 10 and 20 randomly selected plants in case of hybrids and parents, respectively for five biometric characters *viz.*, plants height, clusters/plant, pods/plant, seeds/pod, 100 seed weight and seed yield/plant.

## Results and Discussion

The analysis of variance (Table 1) showed significant difference among the genotypes for all the characters under study. The magnitude of variance due to *sca* ($\sigma^2$s) and *gca* ($\sigma^2$g) indicated the predominance of non-additive component for most of the characters except 100 seed weight. These results are in partial agreement with the earlier reports of Elangaimannan (2005) and Kute and Deshmukh (2002) in green gram.

**Table 1. Analysis of variance for five biometric characters in Urdbean**

| Source | df | Mean square | | | | | |
|---|---|---|---|---|---|---|---|
| | | Plant height | Clusters/ plant | Pods/ plant | Seeds/ pod | Grain yield/ plant | 100 seed weight |
| Genotype | 35 | 223.02** | 100.05** | 103.10** | 242.01** | 4.26** | 1.17** |
| gca | 7 | 14.91 | 10.85 | 11.38 | 168.14 | 1.20** | 1.52** |
| sca | 28 | 100.31** | 38.59** | 40.11** | 974.18** | 1.41** | 0.09** |
| Error | 70 | 23.39 | 7.01 | 7.42 | 198.24 | 0.33 | 0.05 |
| $\sigma^2$gca | - | -8.48 | -2.01 | -3.03 | -81.08 | -0.07 | 0.09 |
| $\sigma^2$sca | - | 77.23 | 3.02 | 3.33 | 776.24 | 0.18 | 0.11 |

** - Significant at 1% level.

**Table 2. General combining ability effects of parents for five quantitative characters in Urdbean**

| Parents | gca effect | | | | | |
|---|---|---|---|---|---|---|
| | Plant height | Clusters/ plant | Pods/ plant | Seeds/ pod | Grain yield/ plant | 100 seed weight |
| 99 V 48 | 0.72 | -0.43 | -0.51 | -3.14 | -0.22 | -0.03 |
| 2 KU 53 | -2.02 | -0.75 | -0.85 | -4.42 | -0.47** | 0.43** |
| KU 300 | 1.14 | 1.51 | 1.54 | 6.31 | 0.42* | 0.14 |
| PV 94-2 | 0.47 | -2.01 | -2.02 | -9.42* | -0.45** | -0.41** |
| LBG 623 | -1.32 | 1.00 | 1.04 | 5.53 | 0.24 | 0.12 |
| TU 94-2 | 2.02 | 0.48 | 0.54 | 4.14 | 0.33 | 0.23** |
| LBG 645 | -1.01 | -0.35 | -0.44 | 1.18 | -0.02 | 0.02 |
| P165 | -0.44 | 0.50 | 0.53 | -0.04 | 0.25 | 0.32** |
| SE (Si) | 1.46 | 0.72 | 0.81 | 4.28 | 0.23 | 0.08 |
| SE (Si-SI) | 2.19 | 1.14 | 1.24 | 6.34 | 0.26 | 0.07 |

*, ** - Significant at 5% and 1% levels, respectively.

**Table 3. Promising cross combinations with their specific combinig ability effects for grain yield / plant and other yield components.**

| Cross | *sca* effect | | | | | |
|---|---|---|---|---|---|---|
| | Plant height | Clusters/ plant | Pods/ plant | Seeds/ pod | Grain yield/ plant | 100 seed weight |
| 2 KU 53 X TU 94-2 | 13.34** | 10.21** | 11.43** | 57.42** | 2.21** | -0.13 |
| 99V48 X 2 KU 53 | -3.41 | 6.52* | 8.24** | 31.04** | 1.52** | 0.32* |
| 99 V 48 X P 165 | -1.02 | 8.38** | 11.23** | 57.05** | 1.47** | -0.71** |
| KU 300 X LBG 645 | -10.71** | 6.01* | 4.82* | 59.32** | 1.51** | -0.25 |
| PV 94-2 X LBG 623 | 7.84* | 5.00 | 5.02** | 24.04** | 1.6288 | 0.24 |
| TU 94-2 X P 165 | 7.11 | 11.85 | 14.53** | 51.11** | 2.70** | 0.12 |
| SE (Sij) | 3.79 | 2.01 | 2.13* | 11.10 | 1.43 | 0.23 |
| SE (Sij - Si) | 6.52 | 3.01 | 3.63 | 19.07 | 0.74 | 0.32 |

*, ** - Significant at 5% and 1% levels, respectively.

The estimated *gca* effects (Table 2) indicated that the parent KU 300 was the best general combiner for grain yield/plant. The strains 2KU53 and PV 94-2 were observed as poor general combiners while the remaining were observed as average combiners for grain yield/plant. The parents 2 KU 53, TU 94-2 and P 165 possessed positive and significant estimates of *gca* for 100 seed weight. For plant height, pods/plant and seeds/pod, all the parents were adjudged as average general combiners except PV 94-2, which was a poor general combiner for pods/plant.

Among the 28 crosses, six were selected as desirable, since they had positive significant *sca* effect for seed yield/plant (Table 3). Three of the six crosses *viz.*, 2 KU 53/TU 94-2, KU 300/LBG 645 and PV 94-2/LBG 623 possessed positive and significant *sca* effects for all the characters except 100 seed weight. The remaining three crosses had significant and positive *sca* effects for pods/plant and seeds/pod. This situation further confirms earlier views on the importance of the contribution of these two traits towards grain yield/plant. KU 300 was the best general combiner that involved in two of the six cross combinations. The desirable cross combinations comprised of good X average, average X average and poor X average type of general combiners for grain yield/plant. The desirable average performance of cross complimentions like average X average or poor X average general combiners might be ascribed to complimentary effects of genes (Khattak *et al.*, 2001; Mansurial and Joshi, 1996; Elangaimannan, 2005 and Karthikeyan, 2006).

For the improvement of 100 seed weight where the predominance of additive component had been observed, simple standard methods of selection might be employed. On the other hand, for grain yield/plant and other characters where the predominance of non-additive component had been found, breeding methods like modified recurrent selection or repeated crossing in segregating generations might be useful in pooling up the desirable genes in one genotype by simultaneously exploring non-additive variance. Moreover, transgressive segregants for grain yield/plant are expected from the selected cross combinations and the use of general combiners in future breeding programme.

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