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*Research article*

# ESTIMATES OF GENETIC PARAMETERS AND PATH ANALYSIS IN BLACKGRAM (*Vigna mungo* (L.) Hepper)

Y. Pushpa Reni[1*], Y. Koteswara Rao[2], Y. Satish[3] and J. Sateesh Babu[4]

[1]Regional Agricultural Research Station, Lam Farm, Guntur-34, Andhra Pradesh, India
[2]Regional Agricultural Research Station, Lam Farm, Guntur-34, Andhra Pradesh, India
[3]Regional Agricultural Research Station, Lam Farm, Guntur-34, Andhra Pradesh, India
[4]Regional Agricultural Research Station, Lam Farm, Guntur-34, Andhra Pradesh, India
yellinedipushpa@gmail.com

**ABSTACT:** These studies were conducted to determine the genetic parameters and character association in elite lines of urdbean. Genetic parameters like genotypic and phenotypic variance, coefficient of variation, heritability, genetic advance, correlation coefficients and path coefficients were estimated. Significant variation was noted for all the traits. High heritability estimates were observed for all the traits except days to 50% flowering. In general phenotypic coefficient of variability was greater than their corresponding genotypic coefficient of variability. Higher estimates of heritability and genetic advance as percent of mean were observed for grain yield (97.0%, 79.93%), pods per plant (91.0%, 65.50% and plant height (78.0%, 31.74%) indicating that these characters are mainly controlled by additive genes and selection of such traits might be effective for the improvement of grain yield. Pods per plant, 100 seed weight, days to maturity and days to 50% flowering had positive direct effect on grain yield. Pods per plant and plant height had highly significant genotypic and phenotypic correlation with grain yield; hence these traits could be used for the improvement of grain yield resulting in the evolution of high yielding varieties of blackgram.
**Key words:** Blackgram, heritability, correlation, genetic parameters and Path analysis

## INTRODUCTION

Blackgram (*Vigna mungo*(L.)Hepper) is an important pulse crop occupying unique position in Indian Agriculture. Urdbean occupies an important position due to its high seed protein (25-26%, carbohydrates (60%), fat (1.5%), minerals, aminoacids and vitamins and ability to restore the soil fertility through symbiotic nitrogen fixation [1]. The study of inheritance of various developmental and productive traits through the estimation of different genetic parameters like components of variances, genotypic and phenotypic coefficients of variability, heritability and genetic advance is helpful for framing the effective breeding programme. Inability to visually recognize small differences in quantitative traits among single plants have led to frequent attempts to find associated traits more amenable to visual selection. The correlation coefficient gives a measure of the relationship between traits and provides the degree to which various characters of crop are associated with productivity. Selection based on yield components is advantageous if different yield related traits have been well documented [2, 3]. Path coefficient analysis, on the other hand, is an efficient statistical technique specially designed to quantify the interrelationship of different components and their direct and indirect effects on seed yield.Through this technique yield contributing characters can be ranked and specific traits producing a given correlation can be heeded [4].

## MATERIALS AND METHODS

The present investigation was conducted at Regional Agricultural Research Station, Lam, Guntur with 16 genotypes of blackgram during *Kharif* season, 2009. The experiment was laid out in randomized block design with three replications. Each genotype was grown in a plot of four rows of 4m length each with inter-row spacing of 30 cm and intra-row spacing of 10 cm.

All recommended management practices were followed during the crop period. Observations were recorded on days to 50 per cent flowering, days to maturity, plant height(cm), pods per plant, 100 seed weight, grain yield per hectare (kg/ha). Standard statistical procedures were used for the analysis of variance [5], genotypic and phenotypic coefficients of variation [6], heritability [7] and genetic advance [8]. Correlation coefficients were calculated as per [5] and path analysis as per [9] and as per [10].

## RESULTS AND DISCUSSION

Data on mean, variability, heritability and genetic advance as percent of mean are presented in (Table 1). The analysis of variance revealed significant differences among the genotypes for all the traits.

The character plant height showed moderate PCV and GCV indicating that there is scope for improvement of this trait. The genotypic coefficients of variation for all characters studied were lesser than phenotypic coefficient of variation indicating masking effects of environment. (Table 2). The highest phenotypic coefficient of variability was recorded for grain yield (40.08%) and pods per plant (34.87%). The highest genotypic coefficient of variability was recorded for grain yield (39.39%) and pods per plant (33.30%) that indicates the presence of exploitable genetic variability for these traits.

**Table 1. Variability, heritability and genetic advance for yield and yield components of blackgram**

| Characters | **Plant height (cm)** | **Days to 50% Flowering** | **Days to Maturity** | **Pods per plant** | **100 seed weight (g)** | **Grain Yield kg/ha** |
|---|---|---|---|---|---|---|
| Plant height (cm) | --- | **0.4802*** ** | **0.3132*** | **0.7741*** ** | **0.5640*** ** | **0.2017** |
| | --- | (0.5777) | (0.3281) | (1.0054) | (0.6514) | (0.2371) |
| Days to 50% Flowering | | ---- | **0.0871** | **0.4239** ** | **0.2989*** | **0.2476** |
| | | ---- | (0.1161) | (0.6090) | (0.3775) | (0.3555) |
| Days to Maturity | | | --- | **0.4797*** ** | **0.0160** | **0.3110*** |
| | | | --- | (0.5915) | (0.0094) | (0.3106) |
| Pods per plant | | | | --- | **0.5573*** ** | **0.2342** |
| | | | | --- | (0.6194) | (0.2616) |
| 100 Seed Weight (gm) | | | | | --- | **0.1342** |
| | | | | | --- | (0.1325) |

PCV= Phenotypic coefficient of variation; GCV = Genotypic coefficient of Variation; $h^2$(b) = Heritability (broad sense); GAM = Genetic Advance as percent of mean; GA= Genetic Advance

Heritability estimates were greater for traits like grain yield (97%, pods per plant (91%), 100 seed weight (88%), plant height (78%) and days to maturity (69%). In general all traits except days to 50% flowering had higher heritable variation. Hence it can be assumed that phenotypes of almost all the traits except days to 50% flowering are mainly determined by their genotypes. Higher estimates of genetic advance were observed for grain yield (79.73%), pods per plant (65.50%) and plant height (31.74%). High heritable values coupled with high genetic advance were observed for grain yield, pods per plant and plant height (31.74%). High heritable values coupled with high genetic advance were observed for grain yield/plant, pods per plant and plant height. From the results it can be concluded that all these traits are controlled by additive type of gene action as reported by [8-11]. Similar results were also obtained by [12] in blackgram (*Vigna mungo* L.Hepper) who reported high heritability coupled with high genetic advance for most of the quantitative characters. High values of heritability and genetic advance for grain yield, pods per plant and plant height showed that all these traits are controlled by additive type of gene action. Similar have been reported by [13].

**Table 2: estimates of Phenotypic and genotypic correlation coefficient between yield and yield components in 16 genotypes f blackgram.**

| Components | Mean ± Sem | Range | | Variance | | | PCV % | GCV % | $h^2$(b) | GA | GAM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | $\sigma^2 G$ | $\sigma^2 p$ | $\sigma^2 E$ | | | | | |
| Plant height (cm) | 26.21 ± 0.87 | 20.67 | 34.34 | 16.41 | 18.68 | 2.27 | 16.49 | 15.46 | 0.88 | 7.82 | 29.84 |
| Days to 50% flowering | 35.94 ± 0.53 | 33.67 | 39.00 | 1.61 | 2.44 | 0.84 | 4.35 | 3.53 | 0.66 | 2.12 | 5.89 |
| Days to Maturity | 67.56 ± 0.62 | 65.00 | 71.67 | 4.37 | 5.51 | 1.14 | 3.47 | 3.09 | 0.79 | 3.84 | 5.68 |
| Pods per plant | 26.33 ± 1.00 | 21.00 | 32.00 | 12.13 | 15.15 | 3.02 | 14.78 | 13.23 | 0.80 | 6.42 | 24.39 |
| 100 seed weight (g) | 4.56 ± 0.103 | 3.81 | 5.06 | 0.25 | 0.28 | 0.03 | 11.57 | 10.88 | 0.88 | 0.96 | 21.07 |
| Grain Yield (kg/ha) | 1001.52 ± 22.35 | 719.67 | 1438.34 | 30174.7 | 31673.38 | 1498.70 | 17.77 | 17.34 | 0.95 | 349.27 | 34.87 |

* significant at 5% level ** significant at 1% level values in the parenthesis are genotypic correlation coefficients

The estimates of Correlation coefficient between grain yield and yield related traits indicated that in general genotypic correlation coefficients were higher than their corresponding phenotypic correlation coefficients (Table.2). The results revealed that grain yield was significantly and positively correlated with pods per plant ($r_p$=0.8665 $r_g$=0.9301) plant plant height ($r_p$=0.2251 $r_g$=0.2371) and 100 seed weight ($r_p$=0.0317 $r_g$=0.0291). Hence, these traits could be utilized in indirect selection so as to improve the seed yield per plant. Similar kind of positive association of pods per plant with seed yield was reported earlier by [14, 15]. Similarly, Plant height showed significant positive association with pods per plant ($r_p$=0.2693$r_g$=0.2893), days to 50% flowering ($r_p$=0.1784 $r_g$=0.3296) and days to maturity ($r_p$=0.1430 $r_g$=0.1517). Similar results were also reported by [16] for plant height with 100 seed-weight and with days to maturity by [17], it indicates that selection of tall plants could result in attaining more number of pods increased seed weight and also increased in days to maturity.

The Path coefficient analysis (Table 3) revealed that the highest positive direct effect on grain yield per plant was recorded by pods per plant ($r_p$=0.9420 $r_g$=1.1396) followed by 100 seed weight ($r_p$=0.1088 $r_g$=0.1345), days to maturity ($r_p$=0.0915 $r_g$=0.1143) and days to 50% flowering. Hence selection based on these traits would be effective in increasing the seed yield. Similarly, the direct effect of pods per plant on yield was reported earlier by [18] and [19] while [20] for days to maturity [21] and [22] for 100 seed weight. Hence simultaneous selection based on pods per plant, 100 seed weight & days to maturity seems to be more promising in improving the grain yield per plant in blackgram.

**Table 3: Estimates of direct and indirect effects of yield components in Blackgram**

| Characters | | Plant height (cm) | Days to 50% Flowering | Days to Maturity | Pods per plant | 100 seed weight (g) |
|---|---|---|---|---|---|---|
| Plant height (cm) | (P) | -0.0221 | -0.0106 | -0.0069 | -0.0171 | -0.0124 |
| | (G) | -0.6981 | -0.4032 | -0.2290 | -0.7018 | -0.4547 |
| Days to 50% Flowering | (P) | 0.1070 | 0.2228 | 0.0194 | 0.0945 | 0.0666 |
| | (G) | 0.1780 | 0.3081 | 0.0358 | 0.1877 | 0.1163 |
| Days to Maturity | (P) | 0.1019 | 0.0283 | 0.3253 | 0.1560 | 0.0052 |
| | (G) | 0.0293 | 0.0104 | 0.0892 | 0.0527 | 0.0008 |
| Pods per plant | (P) | -0.0460 | -0.0252 | -0.0285 | -0.0595 | -0.0331 |
| | (G) | 0.7043 | 0.4267 | 0.4144 | 0.7006 | 0.4340 |
| 100 Seed Weight (gm) | (P) | 0.0609 | 0.0323 | 0.0017 | 0.0602 | 0.1080 |
| | (G) | 0.0235 | 0.0136 | 0.0003 | 0.0224 | 0.0361 |
| Correlation with Grain Yield kg/ha | (P) | 0.2017 | 0.2476 | 0.3110 | 0.2342 | 0.1342 |
| | (G) | 0.2371 | 0.3555 | 0.3106 | 0.2616 | 0.1325 |

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