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# PATH COEFFICIENT ANALYSIS FOR YIELD AND YIELD COMPONENTS IN BLACK GRAM (*VIgna mungo* (L.) Hepper)

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**ABSTRACT**
An experiment was carried out during the *rabi* season of 2017-18 at Research and Education Farm, Department of Agril. Botany, College of Agriculture, Dapoli, Dist. Ratnagiri with Sixty four genotypes of black gram raised in randomized block design with three replications for evaluating the direct and indirect effects for thirteen characters like days to 50 % flowering, days to maturity, plant height, number of primary branches per plant, number of clusters per plant, number of pods per cluster, number of pods per plant, pod length, number of seeds per pod, 100 seed weight, harvest index, protein content and seed yield per plant. The results of path analysis revealed that that positive direct effect on seed yield was exhibited by days to maturity, number of clusters per plant, number of pods per cluster, number of pods per plant, number of seeds per pod, 100 seed weight, harvest index and protein content indicating importance of these characters and can be strategically used to improve the yield of black gram. While the characters *viz.*, days to 50 per cent flowering, plant height, number of primary branches per plant and pod length revealed negative direct effect of given magnitudes towards seed yield per plant.

**KEYWORDS**: Black gram, Path analysis, Seed yield, phenotypic level, genotypic level.

## INTRODUCTION

Blackgram (*Vigna mungo* (L). Hepper, 2n=22), known as urdbean, is an important grain legumes for its nutritional quality and the suitability to cropping system. The major portion of black gram is utilized in making dal, curries, soup, sweets and snacks. Its seeds contain protein (24g), fat (1.6g), carbohydrate (63.4g) and total dietary fibre (16.2) (Anon, 2016) on dry weight basis. It is highly prized pulse, rich in phosphoric acid. It also contributes a major portion of lysine in the vegetarian diet and fairly good source of vitamins like thiamine, niacin, riboflavin and much needed iron and phosphorus. It is extensively used in various culinary preparations and recommended for diabetes. Like other pulses, it also enriches the soil fertility, improves the soil structure and used as green fodder for cattle. India is the world's largest producer as well as consumer of black gram. It produces 18.294 million tons of black gram annually from about 31.285 million hectare area, with an average productivity of 585 Kg/ha (Anon, 2016). Though, India is the world's largest producer of black gram, it imports a large amount to meet the growing domestic needs. But the productivity in India is low as compared with world's average. The breeding progress has been slow and uneven because several desirable traits need to be combined for developing appropriate plant type for a particular growing region and cropping system. Path analysis identifies the yield components which directly and indirectly influence the yield; hence help to combine the desirable traits in single variety. So this research effort is undertaken to ascertain the direct and indirect effects of different traits on seed yield calculated as suggested by Dewey and Lu (1959) among sixty four different black gram genotypes for evolving the superior high yielding ones.

## MATERIALS & METHODS

The material for the present study comprised of 64 lines of black gram collected from IIPR Kanpur and PDKV Akola. The experiment was conducted during *rabi* 2017-18 raised in randomized block design at with three replications in the spacing of 30 cm x 20 cm at Research and Education Farm, Department of Agril. Botany, College of Agriculture, Dapoli, Dist. Ratnagiri and the recommended cultural practices were followed. Each plot had 0.90 m x 2.4m area with three rows for each population. The observations were recorded on five randomly selected plants per cross for thirteen characters like days to 50% flowering, days to maturity, plant height (cm), number of primary branches per plant, number of clusters per plant, number of pods per cluster, number of pods per plant, pod length (cm), number of seeds per pod, 100 seed weight (g), harvest index (5), protein content (%) and seed yield per plant (g).

## RESULTS & DISCUSSION

Path analysis furnishes the cause and effect of different yield components which would provide better index for selection rather than mere correlation coefficients (Arya *et al.*, 2017). Correlation gives only the relation between two variables whereas path coefficient analysis allows separation of the direct effect and their indirect effects through other attributes by partitioning the correlation (Wright, 1921).

**TABLE 1:** Path analysis for different characters at phenotypic level in Black gram

| Sr. no. | Days to 50% flowering | Days to maturity | Plant height (cm) | Number of primary branches per plant | Number of clusters per plant | Number of pods per cluster | Number of pods per plant | Pod length (cm) | Number of seeds per pod | 100 seed weight (g) | Harvest index (%) | Protein content (%) | Seed yield per Plant (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Days to 50% flowering | -0.0239 | 0.0385 | -0.0057 | -0.0018 | 0.0065 | 0.0105 | 0.0397 | 0.0039 | -0.0175 | 0.0737 | 0.0051 | -0.0012 | 0.1276 |
| Days to maturity | -0.0235 | 0.0392 | -0.0051 | -0.0003 | 0.0061 | 0.0085 | 0.0377 | 0.0040 | -0.0141 | 0.0561 | 0.0052 | -0.0019 | 0.1120 |
| Plant height (cm) | -0.0100 | 0.0147 | -0.0136 | -0.0101 | 0.0281 | 0.0248 | 0.1863 | 0.0034 | -0.0231 | 0.1202 | 0.0015 | 0.0013 | 0.3235** |
| Number of primary branches per plant | -0.0006 | 0.0002 | -0.0020 | -0.0686 | -0.0091 | 0.0399 | 0.0172 | 0.0060 | -0.0224 | 0.0463 | -0.0004 | 0.0022 | 0.0088 |
| Number of clusters per plant | -0.0013 | 0.0020 | -0.0033 | 0.0053 | 0.1174 | 0.0211 | 0.5345 | 0.0021 | 0.0456 | -0.0482 | 0.0039 | 0.0025 | 0.6817** |
| Number of pods per cluster | -0.0016 | 0.0021 | -0.0021 | -0.0169 | 0.0153 | 0.1621 | 0.4225 | 0.0061 | 0.0292 | 0.0143 | -0.0039 | 0.0014 | 0.6285** |
| Number of pods per plant | -0.0014 | 0.0022 | -0.0037 | -0.0017 | 0.0916 | 0.1000 | 0.6850 | 0.0044 | 0.0522 | -0.0279 | 0.0016 | 0.0019 | 0.9042** |
| Pod length (cm) | -0.0028 | 0.0046 | -0.0014 | -0.0123 | 0.0073 | 0.0294 | 0.0888 | 0.0336 | 0.1316 | 0.0025 | 0.0030 | 0.0120 | 0.2962** |
| Number of seeds per pod | 0.0016 | -0.0021 | 0.0012 | 0.0059 | 0.0204 | 0.0181 | 0.1366 | 0.0169 | 0.2620 | -0.1319 | 0.0078 | 0.0094 | 0.3458** |
| 100 seed weight (g) | -0.0057 | 0.0071 | -0.0053 | -0.0102 | -0.0182 | 0.0075 | -0.0614 | 0.0003 | -0.1111 | 0.3110 | -0.0062 | 0.0005 | 0.1083 |
| Harvest index (%) | -0.0027 | 0.0046 | -0.0005 | 0.0006 | 0.0101 | -0.0142 | 0.0247 | 0.0023 | 0.0457 | -0.0432 | 0.0448 | -0.0006 | 0.0716 |
| Protein content(%) | 0.0009 | -0.0024 | -0.0006 | -0.0048 | 0.0095 | 0.0070 | 0.0418 | 0.0128 | 0.0788 | 0.0048 | -0.0008 | 0.0314 | 0.1786* |

* Significant at 5 % level  * * Significant at 1% level  Residual effect = (r=0.2437)

**TABLE 2 :** Path analysis for different characters at genotypic level in Black gram

| Sr. no. | Days to 50% flowering | Days to maturity | Plant height (cm) | Number of primary branches per plant | Number of clusters per plant | Number of pods per cluster | Number of pods per plant | Pod length (cm) | Number of seeds per pod | 100 seed weight (g) | Harvest index (%) | Protein content (%) | Seed yield per Plant (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Days to 50% flowering | -0.1175 | 0.1232 | -0.0038 | -0.0048 | 0.0089 | 0.0249 | 0.0703 | -0.0004 | -0.0273 | 0.0936 | 0.0083 | -0.0016 | 0.1738* |
| Days to maturity | -0.1163 | 0.1245 | -0.0035 | -0.0022 | 0.0084 | 0.0211 | 0.0671 | -0.0004 | -0.0221 | 0.0723 | 0.0083 | -0.0025 | 0.1548* |
| Plant height(cm) | -0.0587 | 0.0559 | -0.0077 | -0.0095 | 0.0272 | 0.0261 | 0.1854 | -0.0004 | -0.0325 | 0.1617 | 0.0020 | 0.0032 | 0.3527** |
| Number of primary branches per plant | -0.0065 | 0.0032 | -0.0008 | -0.0873 | -0.0115 | 0.0491 | -0.0189 | -0.0007 | -0.0271 | 0.0638 | -0.0008 | 0.0044 | -0.0331 |
| Number of clusters per plant | -0.0110 | 0.0110 | -0.0022 | 0.0106 | 0.0950 | 0.0360 | 0.5149 | -0.0002 | 0.0752 | -0.0671 | 0.0087 | 0.0032 | 0.6741** |
| Number of pods per cluster | -0.0152 | 0.0136 | -0.0010 | -0.0222 | 0.0177 | 0.1928 | 0.4320 | -0.0007 | 0.0691 | 0.0198 | -0.0074 | 0.0032 | 0.7017** |
| Number of pods per plant | -0.0129 | 0.0131 | -0.0022 | 0.0026 | 0.0767 | 0.1305 | 0.6382 | -0.0005 | 0.0898 | -0.0387 | 0.0039 | 0.0031 | 0.9035** |
| Pod length (cm) | -0.0141 | 0.0151 | -0.0009 | -0.0178 | 0.0070 | 0.0396 | 0.0913 | -0.0033 | 0.1859 | 0.0031 | 0.0052 | 0.0149 | 0.3259** |
| Number of seeds per pod | 0.0100 | -0.0085 | 0.0008 | 0.0073 | 0.0221 | 0.0413 | 0.1775 | -0.0019 | 0.3228 | -0.1763 | 0.0119 | 0.0127 | 0.4196** |
| 100 seed weight (g) | -0.0294 | 0.0241 | -0.0033 | -0.0149 | -0.0170 | 0.0102 | -0.0660 | 0.0000 | -0.1521 | 0.3742 | -0.0090 | 0.0006 | 0.1172 |
| Harvest index (%) | -0.0160 | 0.0169 | -0.0002 | 0.0012 | 0.0134 | -0.0233 | 0.0404 | -0.0003 | 0.0627 | -0.0551 | 0.0613 | -0.0005 | 0.1005 |
| Protein content(%) | 0.0050 | -0.0083 | -0.0007 | -0.0106 | 0.0084 | 0.0168 | 0.0536 | -0.0013 | 0.1113 | 0.0056 | -0.0008 | 0.0367 | 0.2157** |

* Significant at 5 % level  * * Significant at 1% level  Residual effect = (r=0.1807)

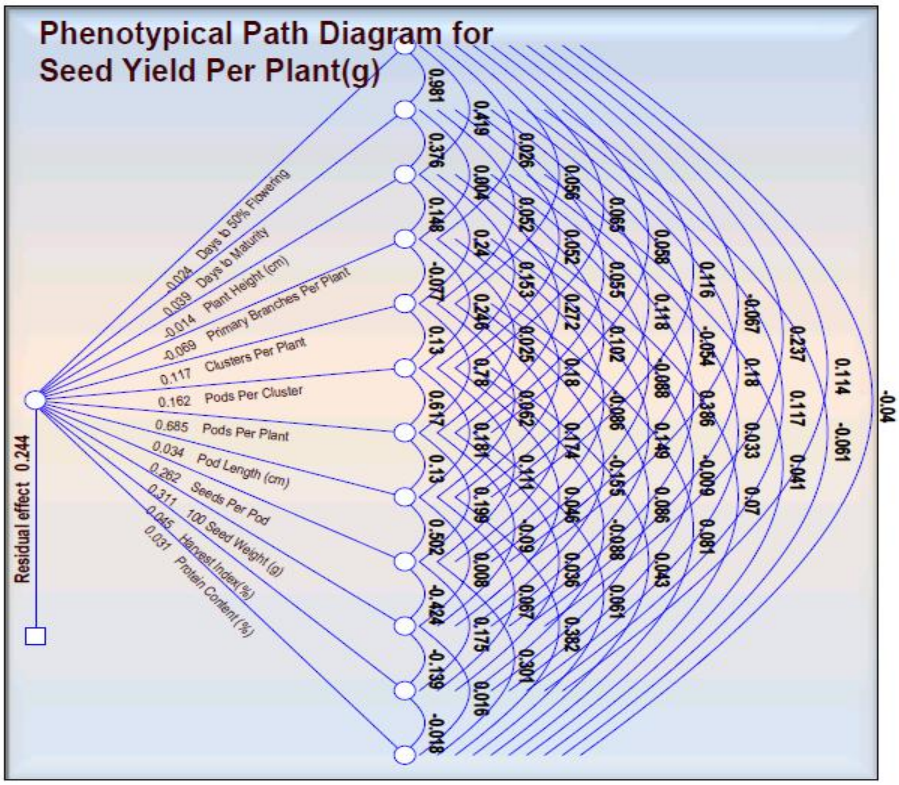


**FIGURE 1:** Phenotypical path diagram for seed yield per plant

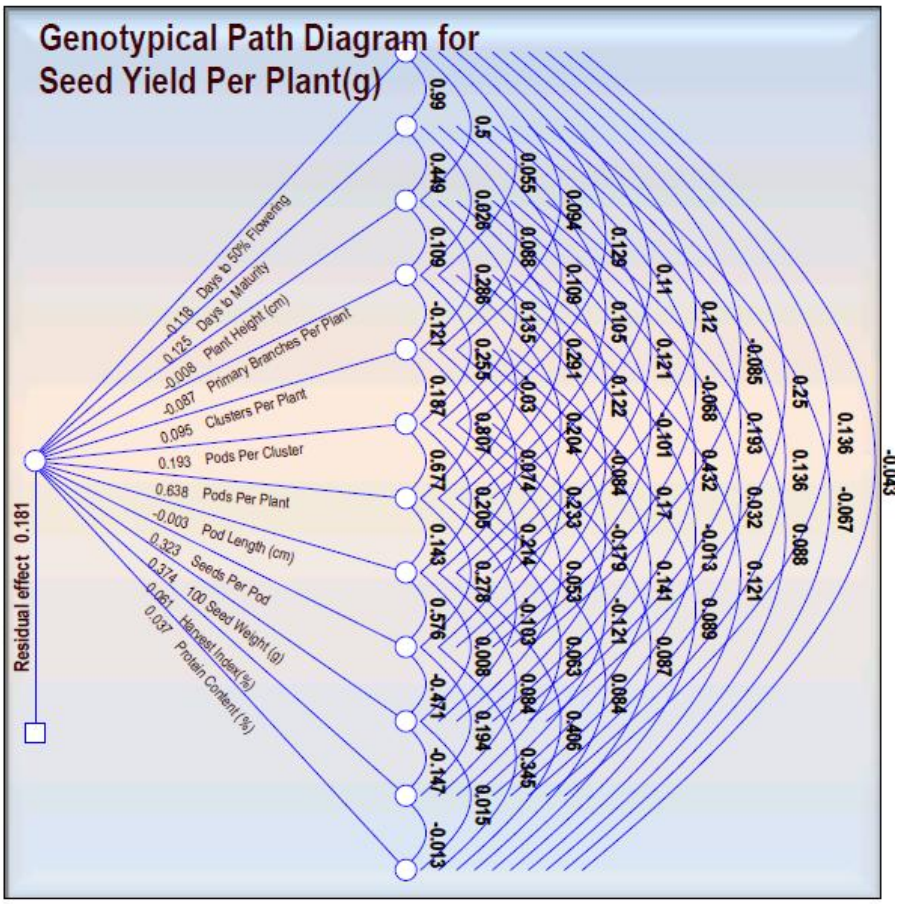


**FIGURE 2:** Genotypical path diagram for seed yield per plant

Path coefficient analysis (Table 1 and 2) results showed that positive direct effect on seed yield was exhibited by days to maturity, number of clusters per plant, number of pods per cluster, number of pods per plant, number of seeds per pod, 100 seed weight, harvest index and protein content. These characters have also been identified as major direct contributors towards seed yield in blackgram by earlier workers Veeramani *et al.* (2005), Shivade *et al.* (2011), Pushpa *et al.* (2013), Panigrahi *et al.* (2014), Yashoda *et al.* (2016) and Sohel *et al.* (2016) .The observation showed the extent of reliability of these traits as a good selection index for grain yield. Hence, selection based on these traits would be effective in increasing the seed yield. Conversely, the other characters *viz.*, days to 50 per cent flowering, plant height, number of primary branches per plant and pod length revealed negative direct effect of given magnitudes towards seed yield per plant. These are in accordance with findings of Sateesh *et al.* (2016) for plant height, Yashoda *et al.* (2016) for number of primary branches per plant and Panigrahi *et al.* (2014) for pod length.

The negative direct effect of days to 50% flowering and plant height were nullified by positive indirect effects through days to maturity, number of clusters per plant, number of pods per Cluster, number of pods per plant,100 seed weight and harvest index which resulted in the positive and significant association with seed yield per plant at genotypic level. Pushpa *et al.* (2013) reported he similar results for days to 50 per cent flowering.

Number of clusters per plant, number of pods per cluster and number of pods per plant had moderate to high positive direct effect on seed yield per plant and positive indirect effect through days to maturity, number of seeds per pod and protein content resulted in in very strong positive association with seed yield per plant. Gowsalya *et al.* (2016) reported positive direct effect of number of pods per cluster and number of pods per plant on seed yield per plant. 100 seed weight and harvest index showed non-significant association with seed yield even though they had positive direct effects. It may be due to their high negative effects through other characters like days to 50 per cent flowering and plant height.

## CONCLUSION

Black gram is grown in varying agro-ecological conditions and cropping systems with diverse cultural practices, so it needs appropriate plant type for each growing situation. The present study revealed that selection based on days to maturity, number of clusters per plant, number of pods per cluster, number of pods per plant, number of seeds per pod, 100 seed weight, harvest index and protein content could help in genetic improvement of seed yield per plant in black gram population under study. So direct selection for these traits can help to improve black gram seed yield per unit area.

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