Correlation and Path Analysis of Yield Contributing Traits and Seed Yield in Greengram [Vigna Radiata (L.) Wilczek]

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Received: 22-11-2018 Accepted: 13-08-2019 DOI: 10.18805/IJARe.A-5174

ABSTRACT

The present investigation was undertaken to study the extent of interrelationship and direct and indirect effect of component characters on seed yield in a set of 20 genotypes of greengram. The material was evaluated in randomized block design with three replications during the Kharif, 2017. Observations were recorded for 13 quantitative characters. Correlation coefficient analysis revealed that seed yield per plant exhibit significant positive correlation with number of pods per plant, biological yield per plant, harvest index, plant height, number of seeds per pod, pod length, number of clusters per plant, seed index. Harvest index, biological yield per plant, number of pods per plant, seed index, number of seeds per pod, plant height and number of clusters per plant exhibited positive direct effect accompanied by significant positive correlation with seed yield. Thus priority should be given to these characters during selection for greengram yield improvement.

Key words: Correlation, Direct effect, Greengram, Indirect effect, Path analysis.

INTRODUCTION

Greengram [Vigna radiata (L.) Wilczek] is an important pulse crop grown extensively in both tropical and subtropical regions of the world. It is also known as mungbean or moong. It is a short duration grain legume with wide adaptability.

Correlation analysis is a biometrical technique to find out the nature and degree of association between various physico-chemical traits indicating yield, while path analysis split the correlation coefficient into direct and indirect effect so as to measure the relative contribution of each variable towards yield. Because yield is a complex trait and its expression is governed by many factors, it is logical to expect that a number of plant traits jointly contribute to enhance yield. Hence, keeping the above aspect in mind, efforts were made to establish interrelationship among various yield contributing traits and also their contribution towards pod yield of greengram. Therefore, the present study was undertaken with an objective to study correlation among the yield contributing traits and direct and indirect effects, among yield contributing traits in greengram.

MATERIALS AND METHODS

The present investigation was carried out at the Field Experimentation Centre, Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, U.P. during Kharif, 2017. The experiment was conducted in randomized block design with 20 genotypes. The genotypes were replicated three times. Genotypes were randomly arranged in each replication divided into 60 plots. The row to row spacing was 30 cm and plant to plant distance was 10 cm. The technique of random sampling was adopted for recording the observations of various quantitative characters of greengram. Five plants of each treatment from each replication were taken at random at the time of recording the data on various characters. Data of five plants were averaged replication wise and mean data was used for statistical analysis.

Following observations of each genotype - plant height (cm), number of primary branches per plant, days to 50% flowering, number of clusters per plant, number of pods per plant, days to maturity, number of seeds per pod, pod length (cm), seed index (g), biological yield per plant (g), harvest index (%), protein content (%) and seed yield per plant (g). The data recorded was subjected to the following analysis.

The phenotypic and genotypic correlation coefficient for all possible character pairs were computed to study inter relationship as suggested by Johnson et al. (1955) and Al-Jibouri et al. (1958) The technique of the phenotypic path coefficient analysis was first used for plant selection by Deway and Lu (1959).

RESULTS AND DISCUSSION

Correlation coefficient analysis (Table 1) revealed that seed yield per plant exhibited positive significant correlation with biological yield per plant, harvest index, number of pods per plant, plant height, pod length, number of seeds per pod, number of clusters per plant, seed index.
### Table 1: Correlation coefficient between seed yield and its component traits in greengram.

| Character                        | Plant Height (cm) | No. of Primary Branches | Days to 50% Flowering | No. of Clusters / Plant | Days to Maturity | No. of Seeds / Pod | Seed Length (cm) | Biological Yield / Plant (g) | Harvest Index (%) | Protein Content (%) | Seed Yield / Plant (g) |
|---------------------------------|-------------------|-------------------------|------------------------|------------------------|------------------|-------------------|------------------|-----------------------------|-------------------|----------------------|---------------------|
| No. of Primary Branches / Plant | -0.430**          | 1.000                   | 0.099                  | -0.088                 | 0.155            | -0.061            | 0.044            | -0.154                      | 0.166             | -0.010               | 0.050               |
| Days to 50% Flowering           | 0.041             | 0.290**                 | 1.000                  | -0.106                 | -0.223**         | 0.290**           | 0.029            | 0.022                       | 0.005             | 0.002                | -0.132              |
| No. of Clusters / Plant         | 0.173             | -0.301**                | -0.141                 | 1.000                  | 0.245**          | -0.239**          | 0.102            | 0.248                       | 0.262**           | 0.160                | -0.089              |
| No. of Pods / Plant             | 0.262**           | 0.200**                 | -0.360**               | 0.241*                 | 1.000            | 0.102            | 0.372**          | 0.305**                      | 0.114             | 0.574**              | 0.439**             |
| Days to Maturity                | -0.497**          | 0.088**                 | 0.480**                | -0.241*                | 0.011            | 1.000            | -0.147           | -0.014                      | -0.131            | -0.024               | 0.150               |
| No. of Seeds / Pod              | 0.389**           | -0.275**                | -0.451**               | 0.157*                 | 0.602**          | -0.400**         | 1.000            | 0.474**                      | 0.300**           | 0.169                | 0.316**             |
| Pod Length (cm)                 | 0.455**           | -0.038                  | 0.098                  | 0.191*                 | 0.386**          | -0.057           | 0.680**         | 1.000                        | 0.648**           | 0.325**              | 0.249**             |
| Seed Index (g)                  | 0.493**           | -0.381**                | -0.1                   | 0.304**                | 0.139            | -0.244**         | 0.551**         | 0.779**                      | 1.000             | 0.332**              | 0.052               |
| Biological Yield / Plant (g)    | 0.670**           | -0.173                  | 0.079                  | 0.192*                 | 0.613**          | -0.076           | 0.247**         | 0.337**                      | 0.407**           | 1.000                | 0.020               |
| Harvest Index (%)               | 0.223*            | 0.305**                 | -0.047                 | 0.304**                | 0.619**          | 0.249**          | 0.527**         | 0.398**                      | 0.058             | 0.198**              | 1.000               |
| Protein Content (%)             | 0.092             | 0.094                   | -0.230*                | -0.03                  | 0.069            | -0.476**         | 0.344**         | 0.193**                      | -0.177            | -0.230*              | -0.066              |
| Seed Yield / Plant (g)           | 0.584**           | 0.06                    | 0.037                  | 0.337**                | 0.790**          | 0.104            | 0.507**         | 0.478**                      | 0.301**           | 0.790**              | 0.757**             |

* and **, significant at 5% and 1% respectively.
Upper and lower diagonals are phenotypic correlation and genotypic correlation respectively.

### Table 2: Path coefficient analysis for seed yield and its component traits in greengram at phenotypic level.

| Character                        | Plant Height (cm) | No. of Primary Branches | Days to 50% Flowering | No. of Clusters / Plant | Days to Maturity | No. of Seeds / Pod | Seed Length (cm) | Biological Yield / Plant (g) | Harvest Index (%) | Protein Content (%) | Correlation with Seed yield / plant |
|---------------------------------|-------------------|-------------------------|------------------------|------------------------|------------------|-------------------|------------------|-----------------------------|-------------------|----------------------|---------------------|
| No. of Primary Branches / Plant | -0.0158           | 0.0039                  | -0.0005                | -0.0028                | -0.0042          | 0.0039            | -0.0045          | -0.0063                      | -0.0066           | -0.0026              | 0.560**             |
| Days to 50% Flowering           | 0.0006            | 0.0019                  | 0.0191                 | -0.0020                | -0.0043          | 0.0055            | -0.0056          | 0.0066                       | 0.0004            | 0.0000              | 0.015               |
| No. of Clusters / Plant         | 0.0039            | -0.0020                 | -0.0024                | -0.0225                | 0.0055           | -0.0054           | 0.0023           | 0.0036                       | 0.0059            | 0.0009              | 0.316**             |
| No. of Pods / Plant             | -0.0035           | -0.0020                 | 0.0029                 | -0.0032                | -0.0129          | -0.0013           | -0.0048          | -0.0039                      | -0.0015           | -0.0074              | -0.0008             |
| Days to Maturity                | 0.0033            | -0.0015                 | -0.0038                | 0.0031                 | -0.0013         | -0.0132           | 0.0019           | 0.0002                       | 0.0017           | 0.0033               | 0.0007              |
| No. of Seeds / Pod              | 0.0043            | -0.0009                 | -0.0044                | 0.0015                 | 0.0056          | -0.0022           | 0.0015           | 0.0072                       | 0.0045           | 0.0026               | 0.0019              |
| Pod Length (cm)                 | 0.0060            | 0.0007                  | 0.0004                 | 0.0037                 | 0.0046          | 0.0002           | 0.0071           | 0.0150                       | 0.0097           | 0.0049               | 0.0009              |
| Seed Index (g)                  | -0.0050           | 0.0011                  | -0.0002                | -0.0019                | -0.0008         | 0.0010           | -0.0022          | -0.0047                      | -0.0073           | -0.0024              | -0.0008             |
| Biological Yield / Plant (g)    | 0.4475            | -0.0484                 | 0.0036                 | 0.1145                | 0.4102          | -0.0177           | 0.1212           | 0.2324                       | 0.2372           | 0.7137               | 0.0149              |
| Harvest Index (%)               | 0.1138            | 0.1140                  | 0.0018                 | 0.1791                 | 0.3017          | 0.1029           | 0.2168           | 0.1713                       | 0.0359           | 0.0143               | 0.6858              |
| Protein Content (%)             | -0.0002           | 0.0000                  | 0.0006                 | 0.0004                 | 0.0003          | -0.0006          | 0.0007           | 0.0002                       | -0.0046          | -0.0013              | -0.135              |

Diagonal values are direct effect.
Residual effects = SQRT(1-1.0018)
* and **, significant at 5% and 1% respectively.
and positive non-significant correlation with days to maturity, number of primary branches per plant and days to 50% flowering, whereas protein content exhibited negative significant correlation with seed yield per plant. The significant correlation coefficient between two characters indicates that the association between these two characters is high. The positive correlation between two characters means that increase in the value of one character will lead to increase in second character. Similarly, the negative correlation means that increase in one variable will lead to decrease in second character and vice versa. The value of genotypic correlation coefficient is higher than the phenotypic correlation value, it means that there is strong association between these characters genetically, but the phenotypic value is lessened by the significant interaction of environment. Positive association of seed yield with number of pods per plant and branches per plant was earlier reported by Eswaran and Kumar (2015), Garje et al. (2014) found that the seed yield per plant was significantly and positively correlated with number of primary and secondary branches per plant, number of cluster per plant, number of pod per plant and number of seed per pod. Anand et al. (2016) reported positive association of seed yield with number of pods per plant and number of clusters per plant.

Path analysis (Table 2) revealed that the characters biological yield per plant and harvest index exhibited positive direct effect with seed yield, whereas number of primary branches per plant and plant height exhibited negative direct effect towards seed yield.

The correlation between biological yield per plant and harvest index is due to direct effect, it reveals true relationship between them and direct selection for these traits would be rewarding for yield improvement. Gadakh et al. (2013) observed that harvest index recorded highest positive direct effect on grain yield per plant followed by biological yield per plant, number of seeds per pod and number of primary branches per plant. Eswaran and Senthilkumar (2015) observed that number of branches per plant, number of seeds per pod, days to first flowering, pod length, number of clusters per plant and number of pods per cluster had maximum direct contribution on seed yield under drought stress in greengram.

**CONCLUSION**

Harvest index, biological yield per plant, number of pods per plant exhibited positive direct effect accompanied by significant positive correlation with seed yield. Thus priority should be given to these characters during selection for greengram yield improvement.

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