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Character association and path analysis for seed yield and its component traits in blackgram (*Vigna mungo* L.)

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Abstract
The existing scientific investigation is made of 20 genotypes of Black gram which includes one check. Data were collected for 13 traits to examine the Genetic variability, heritability, correlation, and direct as well as indirect impacts of yield-related factors in the different genotypes of Black gram. Based on the mean overall performance genotype KU 96-1 Followed by NO-766843, IPU-99-40.The following genotypes have been identified as outstanding candidates for achieving a high yield of seed per plant. Substantial and statistically crucial variations were observed across all the studied characteristics. Heritability estimates were significantly observed for various traits, including the height of the plant and seed index. The high values indicate that the considerable contributions of genotypic components play a crucial role in determining traits. The harvest index displayed a notable increase in genetic advance compared to the mean. Traits with peak heritability and a substantial genetic gain indicate the action of additive genes principally on these traits. Both simple gene action and interaction gene actions make equal contributions to the overall manifestation of these traits. The study conducted unveiled an optimistic and remarkable association between the yield of seed by plant and several factors, including the no of plant clusters, no of pods per plant, length of the pod, seed count by pod, total dry mass yield, and yield efficiency. Structural equation modeling at each phenotypic level and genotypic level recognized no of main branches per plant, total dry mass yield, and yield efficiency are crucial direct factors influencing seed yield per plant.

Keywords: Plant breeding, genetic variation, black gram, yield, genetic gain, ANOVA, GCV, PCV

Introduction
Plant breeding, the induced evolution that modified the phytohistory in the recent past, and the enhancement of crop plants are primarily based on the presence of genetic variation the most valuable pulse crop is black with high phosphoric acid content. India is currently the leading producer of black gram globally, contributing over 70% of the total production. Following India, Myanmar, and Pakistan are also significant producers of black gram. As per the 4th Advance Estimates of Food Grain Production for 2021-22, the estimated production of the Black gram of India stood at 2.84 million tonnes, with an average yield of 929 kilograms per hectare. In the existing investigation, the characters confirmed the absolute best genetic gain, which varied from 34.71 (harvest index) to 1.82 (number of seeds per pod). Harvest index (34.71) accompanied by, pod size (27.13) and yield of grain per plant (21.68). The reasonable genetic gain was located for total dry matter yield per plant (15.3¬10) with the yield of seed. The reliability of plant breeder on the existing variation in the material to improve both quantitative and qualitative traits, as well as their interrelationship with seed yield is the most vital monetary character and is a very complicated polygenic character where direct selection would no longer be a dependable strategy on account of being incredibly influenced by means of environmental factors. Hence, solely focusing on the selection of plants directly for yield may not always be advantageous, as specific genes solely dedicated to yield may not exist. Therefore, it becomes crucial to comprehend associations' nature and recognize the straight and implied contributions of individual characters. Command on genetic parameters is critical for interpreting and manipulating them in any crop breeding program. Seed yield in Blackgram is a quantitative trait based on its own component characters. Such interdependence of contributory characters as well as the characters of monetary significance regularly misleads and therefore makes the correlation coefficient largely unreliable all through selection.

There is an exquisite scope for growing yields of blackgram through selecting high-yielding varieties, and it is additionally essential to exercise selection for necessary yield-attributing characters alongside seed yield because selection for yield alone is no longer very effective. The association amongst yield and its contributing characters assist in setting up an appropriate plant type, combining appropriate expression of its extraordinary yield elements to enhance the yield, to decompose the correlational statistics into straight and implied effects variance decomposition is applied to enable the evaluation of the specific contributions of each component to the overall outcome combining appropriate expression of its extraordinary yield elements. It helps in depicting the precise relationships of characters having little or no significance in enhancement via selection.

Materials and Methods

The present study included a total of 20 genotypes of Blackgram, along with a check, cultivated at the Dept. of Genetics and Plant Breeding, field experimentation station Naini Agriculture Institute SHUATS, Prayagraj, in the *Kharif* growing period of 2019. Randomized block experiment with three replications employed. Thirteen contrasting traits were recorded to assess the extent of genetic variance, heritability measure, association ship, and the clear and implied effects of yield-contributing components in Blackgram. Suitable agronomical and pest management practices were adopted to ensure optimum yield. Observations were made at the plot level for various traits, including days till 50% flowering, days till 50% pod maturity, days till maturity, and yield of seed. The final traits, *viz*., the height of the plant, no of clusters and pods by plant, test weight, harvest index, and so forth, had been recorded based totally on 5 randomly chosen plants

Results and Discussion

The ANOVA revealed considerable variation among the experimental plant germplasm for all the studied traits, denoting a substantial variability of genetics within the experimental material. This signifies the potential for selecting propitious lines from the existing gene pool based on yield-attributing traits. The residence of such extensive variability can be attributed to a combination of materials from heterogeneous origins and environmental factors that influence the phenotypic expression on the basis of average performance, the yield of seed by plant was observed in Blackgram. Genotypes KU 96-1 (6.15g), NO-7668.43 (5.82g), IPU-99-40 (5.68 g), and UH817 (5.42 g), which have been determined to be superior in grain yield. In the current inquiry, PCV exceeded the corresponding GCV for all the characters, The examined GCV (%) values in the existing investigation indicated trait expression is determined by environmental factors, with a range of 1.70 (50% pod setting days) to 8.22 (no of clusters per plant). Similarly,

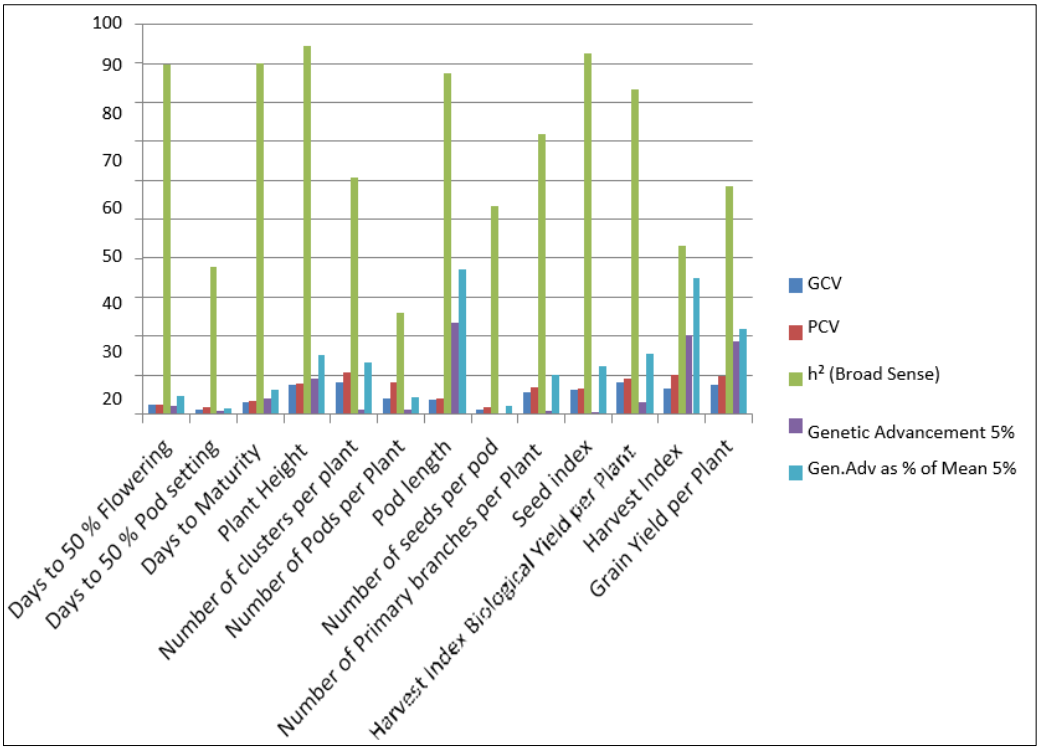

Fig 1: The examined GCV PCV and genetic advancement of gen. (h^2 broad sence)

Histogram depicting GCV, PCV, Genetic advance and h^2 for 13 quantitative characters of Blackgram genotypes

The PCV (%) values showed a similar pattern, ranging from 1.70 (50% pod setting days) to 10.55 (no of clusters per plant). The heritability estimates in the study varied from 94.50% to 25.80%. Among the studied traits, plant height exhibited the highest heritability (94.5%), followed by seed index (92.4%), days to maturity (90.00%), days to 50% flowering (89.60%), pod size (87.55%), total dry matter yield by plant (83.4%), no of main branches by plant (71.8%), and no of clusters by plant (60.8%). Yield of grain by plant (58.4%) and no of seeds per plant (53.3%) displayed moderate heritability, while the harvest index (43.10%), days till 50% pod setting (37.6%), and no of pods by plant (25.6%) projected low heritability measure. Peak heritability measure coupled with high relative genetic gain were the size of the

pod (87.5%) in this study. Among the studied characters, the relative genetic gain is low for no of main branches per plant (9.83) maturity days (6.15), 50% flowering days (4.52), no of pods by plant (4.32), no of seeds by pod (1.87), and days till50% pod setting (1.31). This states that the traits are predominantly influenced by gene action which is additive in nature, indicating that direct selection depending on the expression of phenotype through an easy selection method would be beneficial, as it would steer to the aggregation of more genes that show additive effect and further improvement. The correlation analysis between yield-attributing traits showed that the GCV were generally higher than their PCV, suggesting that the correlation between traits was fundamentally influenced by a genetic component. Important positive correlations were noted for dry matter yield per plant, length of pod, no of pods by plant, and yield efficiency at both the genotype and phenotype levels. Path coefficient analysis revealed that at both phenotype and genotype levels, traits such as no of main branches by plant, no of seeds by plant, no of clusters by plant, dry matter yield per plant, and yield efficiency exerted direct positive outcomes on yield of grain per plant. Therefore, selecting plants depending on these traits would likely derive in improvements in grain yield.

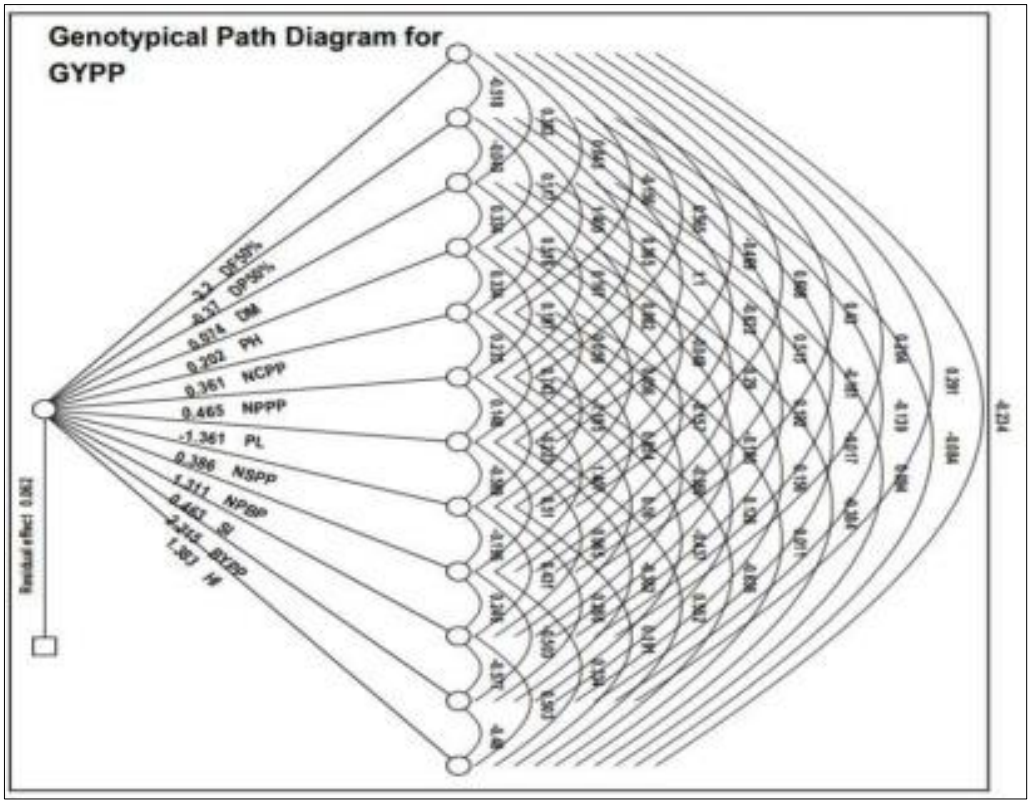

Fig 2: Genotypical path diagram for GYPP

Conclusion

After conducting the investigation, it was determined that among the 20 black gram genotypes, the KU 96-1 candidate had the peak yield of seed (610 kg/ha). The no of clusters by plant depicted high (GCV) and (PCV) estimates. Pod length exhibited a high heritability measure and a high relative genetic gain. At both the genetic and physical levels, the yield of seed per plant had a beneficial and important relation with dry matter yield per plant length of pod, no of pods by plant, and harvest index. Additionally, traits such as the no of main branches by plant, no of seeds by plant, no of clusters by plant, dry matter yield per plant, and yield efficiency had obvious beneficial impacts on the yield of seed by plant at both the physical and genetic degree. By selecting plants based on these traits, it is likely that improvements in the seed yield of Blackgram could be achieved.

References

1. Arameswarappa SG, Kumar DL. Genetic Estimates, Association and Path Coefficient Analysis in Black gram Karnataka Journal of Agriculture Science. 2005;18(1):21-23.
2. Arshad M, Aslam M, Irshad M. Genetic variability and character association among morphological traits of mungbean, [*Vigna radiata* (L.) Wilczek]. genotypes. Journal of Agricultural Research (Lahore). 2009;47:121-126.
3. Burton GW. Quantitative inheritance in grasses Proc. 6th int. Grassland congress. 1952;1:227-283.
4. Chatterjee BN, Bhattacharya KK. Principles and Practices of Grain Legume Production. Oxford and IBH Publication Cooperation New Delhi; c1986. p. 434
5. Das SY, Chakraborthy S. Genetic Variation for seed yield and its component in mungbean (*Vigna radiate* L. Wilczek). Advance in Plant Sciences. 1998;11(1):271-27.
6. Dewey DR, Lu KH. A correlation and path coefficient analysis of component of crested wheat grass seed production. Agronomy Journal. 1959;51:515-518.
7. Fisher RA, Yates. Statistical tables for biological, agricultural and Mendelian inheritance. France Royal Society Edinburgh. 1938;52:399-43.
8. Gill JS, Gumber RK, Verma MM, Rathore P. Genetic estimates of advanced black gram lines derived through different selection methods Crop improvement.

2000;27(1):88-98
9. Hatam M, Khan A. Correlation between grain yield and agronomic parameters in black gram. Sarhad journal of Agriculture. 2001;17(3):317-320.
10. Isaacs SM, Jebaraj S, Ganesh SK. Path analysis in black gram (*Vigna mungo* (L.) Hepper). Research on Crops. 2000;1(3):314-316.
11. Johnson HW, Robinson HF, Comstock RE. Genotypic and Phenotypic Correlations in Soybean and their implications in selection. Agronomy. 1955;47(1):477-438.
12. Kumar GV, Vanaja M, Sathish P, Vagheera P, Shishodia SS, Razak A. Correlation and path analysis of seed yield and contributing components of black gram (*Vigna mungo* (L) Hepper) under rain fed condition Andhra Pradesh. India International Journal of Applied Biology and Pharmaceutical Technology. 2014;5(3):137-140.
13. Kuralarasan V, Vanniarajan C, Kanchana S, Veni K, Anandhi Lavanya. S3 Genetic divergence, heritability and genetic advance in mutant lines of urdbean [*Vigna mungo* (L.) Hepper]. Legume Research; c2018. Print ISSN:0250-5371.
14. Lavanya GR, Srivastava J, Ranade SA. Molecular assessment of genetic diversity in mung bean germplasm. Journal of Genetics. 2008;87(1):65-74.
15. Loganathan P, Sarvanan K, Ganesan J. Genetic variability in greengram. Research Crops. 2001;2(3):396-397.
16. Lush JL. Heritability of qualitative traits in firm animals. Proceedings of eight international congresses genetic. Heidos (Supplements), 1949, 336-357.
17. Sala M, Shunmuga Vadivel T, Sarankumar C, Ashok S, Yuvarani R. Unlocking the Characters Association and Path analysis to Frame Out the Idiotype for a Breeding Program in Black Gram (*Vigna mungo* L. *Hepper*). Biological Forum – An International Journal. 2022;14(4):134-137.