GENETIC EVOLUATION OF PHYTOHAEMAGGLUTININ (PHA) IN DIFFERENT GENOTYPES OF KIDNEY BEAN (*Phaseolus vulgaris* L.) FOR FURTHER IMPROVEMENT OF THE CROP

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Executive Summary

Considering the crucial role of phytohaemagglutinin (PHA) on kidney bean cell metabolism and development of high yielding and disease resistant varieties of the crop, in this study, the genetic evolution of PHA genes, diversity and nutritional traits of available kidney bean germplasm found in Bangladesh have been evaluated during 2016-2017 at Sher-e-Bangla Agricultural University. Twenty-one full length PHA genes were extracted from NCBI gene bank. The homology study revealed that the different PHA genes had 90% to 100% identity. The phylogenic analysis showed the PHA genes were grouped in four clusters indicated that the different PHA genes have evolved differently in respect to their origins and niches. Again, the analysis of genotypic, phenotypic variance and covariance showed that higher environmental influences were found in 1000-seed weight and seed yield/plant than other characters studied. High heritability was observed in dry weight (94.59%), leaf area (96.83%), days to 5 leaves stage (88.80%) and number of pods per plant (87.32%), while high genetic advance was found in leaf area (59.46) and 1000-seed weight (52.80). The collected eighteen genotypes were grouped in four clusters in diversity (D^2) analysis, where clusters I and III consisted of seven and one genotypes, respectively. Furthermore, the highest inter and intra-cluster distance were found between cluster I and cluster III (23.742) and cluster IV (0.900), respectively. Analysis of nutritional components showed that the germplasm of Sylhet region contained more carbohydrate (60.24-64.03%), fiber (2.08-2.46%) and ash (2.31-2.95%), whereas the germplasm of Bandarban had more protein content (23.05-23.11%) than the released varieties used as control. In addition, the genotypes of the Sylhet region e.g. G6 (2.68t/ha), G5 (2.56 t/ha) and G4 (2.49 t/ha) showed the maximum seed yield/ha. The results suggest that the germplasm of Sylhet and Bandarban could serve as valuable genetic resources to breed high yielding and super quality kidney bean varieties.

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