GENETIC ANALYSIS OF PARENTS FOR HYBRID VARIETY DEVELOPMENT IN BITTER GOURD (*Momordica charantia* L.)

A DISSERTATION

BY

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DINAJPUR, BANGLADESH

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A DISSERTATION

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DINAJPUR, BANGLADESH
NOVEMBER, 2021

DECLARATION

This dissertation entitled **Genetic analysis of parents for hybrid variety development in bitter gourd (*Momordica charantia* L.)** submitted to the Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur, Bangladesh for the Degree of Doctor of Philosophy is entirely own research work which is outlined and carried out by me. The full dissertation or its part in any form has not been submitted anywhere else for obtaining any degree nor does it contain results of any collaborative study except where otherwise stated.

November, 2021
HSTU, Dinajpur
Bangladesh

The Author

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Dedicated to My Parents,
My Beloved Wife
Aleya Sharmin Munni

and

Affectionate Daughters
Radi Warisha Khan & Sabira Subah Khan

ABBREVIATIONS AND SYMBOLS

ANOVA	Analysis of variance
AVRDC	Asian Vegetables Research and Development Centre
BAU	Bangladesh Agricultural University
BARI	Bangladesh Agricultural Research Institute
BBS	Bangladesh Bureau of Statistics
CD	Critical difference
CV	Co-efficient of variation
d.f.	Degrees of freedom
et. al.	Et alu = Other people
FAO	Food and Agricultural Organization
HSTU	Hajee Mohammad Danesh Science and Technology University
i.e.,	id est (That is)
σ^2A	Additive variance
σ^2D	Dominance variance
σ^2e	Error variance
σ^2g	Genotypic variance
σ^2ph	Phenotypic variance
h^2b	Heritability in broad sense
h^2n	Heritability in narrow sense
Ha	Hectare
g	Gram
GA	Genetic advance
GCA	General combining ability
GCV	Genotypic co-efficient of variation
Kg	Kilogram
LSD	Least significant difference
LXT	Line X Tester
MOA	Ministry of Agriculture
MP	Mid-parent
NSB	National Seed Board
PCV	Phenotypic co-efficient of variation
pH	Negative logarithm of hydrogen ion (H+) concentration
TSP	Triple super phosphate
RCB	Randomized complete block
R&D	Research and Development
r_{ph}	Phenotypic correlation
r_g	Genotypic correlation
SCA	Specific combining ability
SE	Standard error
Viz.	Namely

GENETIC ANALYSIS OF PARENTS FOR HYBRID VARIETY DEVELOPMENT IN BITTER GOURD (*Momordica charantia* L.)

Abstract

The research program was undertaken to study the genetic analysis of parents for identifying the best cross combination to develop hybrid variety in bitter gourd (*Momordica charantia* L.). All experiments were conducted at R & D Farm, Lal Teer Seed Limited, Gazipur, Bangladesh. Analysis of variance showed significant differences among 27 tested inbred lines, 25 used as parents and 2 used as testers, for all the characters. The genotypic coefficient of variation (GCV) was smaller than corresponding phenotypic coefficient of variation (PCV). Narrow differences between GCV and PCV and high heritability coupled with high genetic advance (GA) were observed for first female flower opening, number of fruits per plant, single fruit weight, fruit length, number of seeds per fruit and yield per plant. It was observed that the magnitude of genotypic correlations was higher than the corresponding phenotypic correlations coefficients between various pairs of characters. Correlation analysis revealed that yield per plant, at phenotypic and genotypic level, was significantly and positively correlated with single fruit weight, number of fruits per plant, fruit length and fruit diameter. Path coefficient analysis showed that single fruit weight had maximum direct effect on yield per plant followed by number of fruits per plant, days at phenotypic and genotypic levels. The heritability in broad sense was ranges from 66.63 to 93.52 % for all the characters. Out of 27 lines, seven diverse inbred lines were selected based on combined ranking value of general combining ability (GCA) from Line x Tester analysis and mean performance. Finally, the parents BT-1, BT-4, BT-7, BT-13, BT-15, BT-18 and BT-19 were selected for 7x7 diallel crossing program. Based on diallel analysis, significant GCA was recorded for days to first female flower opening, fruit length and diameter, single fruit weight, number of fruits per plant, 100-seed weight and yield per plant. Four parents (BT-07, BT-15, BT-18 and BT-19) were selected as good general combiners. Heterosis was studied with standard check variety (Tia) and two cross combinations namely, BT-15 X BT-07 and BT-18 X BT-19 showed better performance having good market value and they were registered as the name of **HSTU-1** (Registration number: 1(27)/293/ 2020) and **HSTU-2** (Registration number: 1(27)/294/ 2020), respectively from National Seed Board (NSB) under Ministry of Agriculture for commercial cultivation in entire Bangladesh. In this experiment, line x tester analysis plays significant role in selecting parents for hybrid. Parents are selected randomly in vegetable for hybrid variety development in public and private sector in Bangladesh but line x tester analysis utilizes genetic background and this method can be utilized in systemic manner for parent selection of hybrid variety development.

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