CERTIFICATION

This is to certify that the Thesis entitled "DEVELOPMENT AND EVALUATION OF ADVANCED GENERATIONS TO EVOLVE HIGH YIELDING VARIETIES OF JUTE (*Corchorus olitorius* L.)**"** a study on jute prepared by the examinee, bearing the Registration No. 1505306, Session: 2015-16, Department of Genetics and Plant Breeding, Hajee Mohammad Danesh Science and Technology University, Dinajpur, for the award of the degree of Doctor of Philosophy in Genetics and Plant Breeding, is a record of original research work carried out by the author under my supervision. The work is an original and unique one and to the best of my knowledge, no part of the thesis has been produced elsewhere for any degree.

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DECLARATION

I am declaring that the thesis entitled, “Development and evaluation of advanced generations to evolve high yielding varieties of jute (*Corchorus olitorius* L.)” submitted towards the fulfillment for the degree of Doctor of Philosophy (Ph.D) in the Department of Genetics and Plant Breeding, Hajee Mohammad Danesh Science and Technology University, Dinajpur, is carried out by me under the supervision of Prof. Dr. Md. Abul Kalam Azad and Prof. Dr. Md. Hasanuzzaman Department of Genetics and Plant Breeding, Hajee Mohammad Danesh Science and Technology University, Dinajpur. This dissertation is entirely my work and has not been submitted in any form to any other university for any degree.

The Author Date: November, 2021

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DEVELOPMENT AND EVALUATION OF ADVANCED GENERATIONS TO EVOLVE HIGH YIELDING VARIETIES OF JUTE (*Corchorus olitorius* L.)

ABSTRACT

Several experiments were conducted on Tossa jute (*Corchorus olitorius* L) at Jute Agricultural Experimental Station, Jagir, Manikgonj during 2015-2018. A total of 53 diverged genotypes were included to study on 11 characters like plant height (cm), base diameter (mm), green bark thickness (mm), leaf length (cm), leaf width (mm), leaf angle (^{0}), petiole length (cm), green weight with leaves (g), green weight without leaves (g), fibre weight (g) and stick weight (g) to create segregants from where outstanding advanced lines may evolve for the development new varieties. Significant variations were observed for all characters among the genotypes. Simultaneous consideration of high mean performance and high heritability showed by green bark thickness, green weight without leaves, plant height and base diameter are necessary to the breeders for improving Tossa jute through selection breeding. The fifty three genotypes were grouped into five clusters by D^2 statistics which were confirmed through superimposing corresponding PCAs. The cluster III accommodated the highest number of genotypes (18) and cluster I included only three genotypes. Both upper and lower magnitudes of expression for characters like base diameter, plant height, green bark thickness and late flowering were considered to produce diversified segregants. Accordingly 8 parents, O-9897, O-795, JRO-524, Acc-2381, Acc-3423, Acc.-3438 Acc-3533 and Acc-3860 were selected simultaneous consideration of clustering and phenotypic acceptance for full diallel crossing program and 8 x 7=56 experimental hybrids were produced. On the way of evaluation, mean performances, correlation coefficients and path analysis of each character on fibre yield were estimated to assess the nature relation pertained among the characters. In general, genotypic correlation coefficients were higher than concurrent phenotypic correlation coefficients, indicated preponderance effects genetic makeup upon expression of the characters. Out of 8 parents, 4 parents Acc-2381, Acc-3423, Acc-3533 and Acc-3860 produced higher fibre weight but positive and significant GCAs were estimated for O-795, JRO-524 Acc-3533 and Acc-3860. Besides, consideration means and GCAs, two lines Acc-3533 and Acc-3860 also appeared as good combiners in both directions hybridization program. Reciprocal crosses apparently exhibited significant cytoplasmic gene effects to express the selected characters during field evaluation. Seven hybrid combinations from normal and another seven combinations from reciprocal crosses revealed significant and positive SCAs effects for fibre weight/plant. The positive and significant SCAs were resulted due to additive and non-additive interactions of the concerned alleles. The joint consideration of positive and significant GCAs and SCAs the crosses P_2 x P_6 (O-795 x Acc-3438), P_2 x P_7 (O-975 x Acc-3533), P_3 x P_4 (JRO-524 x Acc-2381), P_3 x P_5 (JRO-524 x Acc-3423), P_7 x P_8 (Acc-3533 x Acc-3860), P_5 x P_2 (Acc-3423 x O-975) , P_6 x P_3 (Acc-3438 x JRO-524), P_7 x P_5 (Acc-3533 x Acc-3423, P_8 x P_2 (Acc-3860 x O-975) and P_8 x P_4 (Acc-3060 x Acc-2381) were outstanding for improving fibre yield potential in Tossa jute through cross breeding programs. From each of the F_2 generation against a cross a total of 300 plants were initially selected and then variability parameters based 10% plants (30 plants) were selected to advance in next generation. The segregating populations derived from P_8 x P_4 (Acc-3060 x Acc-2381) and P_3 x P_4 (JRO-524 x Acc-2381) might produce superior segregants in advanced generation, therefore, the breeders may exploit the segregants to operate either pedigree or bulk method to evolve outstanding advanced lines of Tossa jute.

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SYMBOLS AND ABBREVIATIONS

Symbols/Abbreviation	Full meanings
Acc.	: Accession
ANOVA	: Analysis of variance
CV	: Coefficient of variation
DAS	: Days after sowing
e.g.	: For example
et al.	: and his associates
GCA	: General Combining Ability
h^2n	: Heritability in narrow sense
h^2b	: Heritability in broad sense
IJO	: International Jute Organization
mm	: Millimeters
NS	: Non- significant
PCA	: Principal Component Analysis
PCO	: Principal co-ordinate analysis
RCBD	: Randomized Complete Block Design
SCA	: Specific Combining Ability
BBS	: Bangladesh Bureau of Statistics
D f	: Degree of freedom
δ^2 A	: Additive variance
δ^2 D	: Dominance variance
δ^2 e	: Error variance
δ^2 g	: Genotypic variance
δ^2 ph	: Phenotypic variance
GA	: Genetic Advance
PCV	: Phenotypic Co-efficient of Variation
GCV	: Genotypic Co-efficient of Variation
r_{ph}	: Phenotypic correlation
r_g	: Genotypic correlation
SE	: Standard error
Viz.	: Namely