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The Author

BIOGRAPHICAL SKETCH

The author was born on 15 May, 1969 in Zinor, Muraripur, Bochaganj, Dinajpur, Bangladesh. He is son of Hakimuddin Ahamed and Nomiza Begum. He completed his Secondary School Certificate (SSC) education in 1984 from Setabganj Pilot Government High School and Higher Secondary Certificate (HSC) education in 1986 from Dinajpur Goverment College under Board of Intermediate and Secondary Education, Rajshahi. He obtained his B. Sc. Ag. (Hons.) Degree in 1991(Held in 1995) from Bangladesh Agricultural University, Mymensingh and his Master of Science (M.S) in Agronomy from the same University in 1997.

He joined at Rangpur Dinajpur Rural Service (RDRS) as Extension Officer (Crop) in April, 1998. He joined at the Department of Agriculture Extension (DAE) as Agriculture Extension Officer On 31 May 2001. He was promoted as Additional Agriculture Officer in 2008. Next he was promoted as Upozilla Agriculture Officer in August, 2010. Then he was promoted as Deputy Director, Horticulture Wing, Department of Agriculture Extension (DAE). He is a Life Member of Bangladesh Agronomy Society and General Member of Krishibid Institution of Bangladesh. He has three research publications in national and international journals.

He is married to Umme Habiba Begum and blessed with two sons Niloy and Nilav.

MD. AZAMUL HAQUE

MORPHO-PHYSIOLOGICAL CHARACTERIZATION OF WILD RELATIVES OF RICE CONFERRING TOLERANCE TO SALINITY AND DROUGHT

Abstract

Varietal breakthrough in rice contributed very significantly to the increased rice production in Bangladesh over the years despite of many challenges including abiotic stresses like salinity and drought. However, the recent trend shows a yield ceiling of the varietal improvement of rice, especially under stress condition. The use of untapped resources of wild species of rice against biotic and abiotic stresses is still largely unexplored under Bangladesh context. This study evaluated 40 accessions of wild species of rice through assessing their morpho-physiological behaviors and allelic diversity conferring tolerance to salinity and drought stresses. The whole work consisted of four pot experiments and one laboratory experiment conducted during 2018-2020. In the 1st pot experiment 40 accessions under 10 wild species of rice namely *Oryza rufipogon*, *O. alta*, *O. nivara*, *O. latifolia*, *Poterecia coarctata*, *O. glaberrima*, *O. longistaminata*, *O. officinalis*, *O. punctata* and *O. barthii* were tested to assess their morpho-physiology and yield performance under normal environment where all the accessions showed variable morpho-physiological and yield performances. Based on their morpho-physiological parameters the accessions were distributed into five clusters where cluster IV included the maximum number of accessions (17) followed by clusters III (11), cluster II (5), cluster V (4) and cluster I (3). The principal component analysis (PCA) clearly and concisely explains the genetic diversity of wild rice genotypes. Based on the cluster grouping ten accessions from the ten wild species were further evaluated in the 2ndexperiment under normal condition and their morpho-physiological features were identified. The results summarized that the wild rice genotypes exerted fluctuating result for different morpho-physiological traits. The maximum grain yield hill^{-1} (101.90 g) was distinctly produced by wild rice genotype *O. nivara* and the minimum grain yield hill^{-1} (9.00 g) was produced by wild rice genotype *O. latifolia*. In the 3rd pot experiment the performance of these ten wild species of rice along with two checks FR13A (check variety as drought tolerant) and BRRI dhan29 (check variety as drought sensitive) were evaluated under drought condition of 40-45 % field capacity. Among the tested genotypes *O. punctata* and *O. barthii* showed more susceptibility under drought stress. On the other hand, *O. latifolia*, *O. nivara*, *Poterecia coaractata*, *O. officinalis* and FR13A showed more tolerance capability against drought stress. The 4th experiment was comprised of two factors: 12 rice genotypes (10 wild rice genotypes along with two checks Pokkali as salinity tolerant and BRRI Dhan 29 as salinity sensitive) and 3 salinity levels *viz*. 0 mM NaCl, 50 mM NaCl and 100 mM NaCl. *Potericia coaractata* and *O. latifolia* showed the most tolerance among all the wild rice genotypes used. The allelic diversity analysis of the 10 wild species of rice concluds that the polymorphism information content (PIC) value of each primer pair ranged from 0.16 (*O. rufipogon*) to 0.37 (*O. alta, O. latifolia, O. offficinalis, Portericia coactata and O. nivara*) with an average of 0.31. The results reveal that *O. alta, O. latifolia, O. offficinalis, Portericia coactata and O. nivara* would be the best salt tolerant wild rice genotypes among 12 wild rice genotypes used in the study. The identified traits of the wild species of rice for salinity and drought tolerance would be a valuable resource for their introgression into the modern rice cultivars for future breeding programs to develop salinity and drought tolerant rice cultivars.

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LIST OF ACCRONIMS

AEZ	=	Agro-Ecological Zone
BARI	=	Bangladesh Agricultural Research Institute
BRRI	=	Bangladesh Rice Research Institute
SPAD	=	The Soil and Plant Analyzer Development
ppm	=	Parts per million
et al.	=	And others
N	=	Nitrogen
TSP	=	Triple Super Phosphate
MP	=	Murriate of Potash
G	=	Gypsum
DAS	=	Days after sowing
ha^{-1}	=	Per hectare
g	=	Gram
kg	=	Kilogram
q	=	Quintal
µg	=	Micro gram
SRDI	=	Soil Resources and Development Institute
HI	=	Harvest Index
No.	=	Number
Wt.	=	Weight
LSD	=	Least Significant Difference
^0C	=	Degree Celsius
NS	=	Non significant
cm	=	Centimeter
mm	=	Millimeter
Max	=	Maximum
Min	=	Minimum
%	=	Percent
cv.	=	Cultivar
NPK	=	Nitrogen, Phosphorus and Potassium
CV%	=	Percentage of coefficient of variance
Hr	=	Hour
T	=	Ton
viz.	=	Videlicet (namely)
LAI	=	Leaf area index
CGR	=	Crop growth rate

LIST OF ACCRONIMS (Cont'd)

RGR	=	Relative growth rate
NAR	=	Net Assimilation Rate
LAD	=	Leaf area duration
AGR	=	Absolute growth rate
SLA	=	Specific leaf area
RWC	=	Relative water content
WSD	=	Water saturation deficit
WRC	=	Water retention capacity
WUC	=	Water uptake capacity
BINA	=	Bangladesh Institute of Nuclear Agriculture
BAU	=	Bangladesh Agricultural University
DAE	=	Department of Agricultural Extension
BBS	=	Bangladesh Bureau of Statistics
OA	=	Osmotic adjustment
OP	=	Osmotic potential
PCR	=	Polymerase chain reaction
SSR	=	Simple Sequence Repeat
RM	=	Random primers
UPGMA	=	Unweighted Pair Group Method with Arithmetic Averages
TBE	=	Tris-borate-ethylene
PIC	=	Polymorphism Information Content
AGE	=	Agarose gel electrophoresis
LSD	=	Least Significance difference
RDRS	=	Rangpur Dinajpur Rural Service