# Program Area: Varietal Development
# Division: Biotechnology Division
# Program for 2021-22

| Sl. no. | Experiments | Specifics Objective(s) | Materials and Method | PI & CI | Location | Tentative Budget (Lakh Tk.) |
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| **1** | **Development of rice variety through anther culture**<br>**Program Leader: EH** | | | | | |
| 1.1 | Development of low glycemic index (GI) rice variety | To generate low glycemic index rice through anther culture | Thirteen anther culture derived materials will be grown in T. Aman 2021 as PYT | PI: JF<br>CI: EH, SS | HQ, BRRI | 1.0 GOB |
| 1.2 | Development of premium quality rice (Kalizira type) variety | To develop premium quality rice DH lines through anther culture | Anthers from eighteen (18) $F_1$s will be used for anther culture. Eleven (11) crosses and sixteen (16) backcrosses will be done for future anther culture. Seeds of regenerated 22 green plants from 4 crosses: BRRI dhan90/ BRRI dhan34, BRRI dhan90/ Kataribhog, BRRI dhan90/Kalizira and BRRI dhan90/Tulshimala will be collected and those will be evaluated during T. Aman 2022. A total of 11 doubled haploid lines selected from anther culture of BRRI dhan38/ Bashful, BRRI dhan50/ Bashful will be evaluated in T. Aman 2021. | PI: NYS<br>CI: EH, JF | HQ, BRRI | 1.0 GOB |
| 1.3 | Development of Aus variety | To develop short duration high yield Aus rice variety through anther culture | Eight parents will be used for crossing program. | PI: SDJ<br>CI: EH, JF, NYS | HQ, BRRI | 1.0 GOB |
| 1.4 | Development of antioxidant enriched black rice variety through anther culture | To develop antioxidant enriched high yielding black rice | A total of 31 homozyzous doubled haploid lines selected from anther culture of BRRI dhan28/ Padi Kool and BRRI dhan28/ Lansan ($DH_2$) will be evaluated in T. Aman 2021.<br>Eight parents will be used for crossing program. | PI: JF<br>CI: EH, SS | HQ, BRRI | 1.0 GOB |

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| 1.5 | Development of high yielding photosensitive rice variety through anther culture | To develop photosensitive rice variety | Anthers from six $F_1$s will be used for anther culture. Five parents materials ie, BR22, BR23, BRRI dhan54, Gainja, Borsha and BRRI dhan87 will be used for crossing | PI: MAH CI: SS, HAR, SDJ, EH | HQ, BRRI | 0.5 GOB |
| 1.6 | Development of high yielding double haploid rice variety | To select high yielding materials having desirable characters | Thirteen anther culture derived materials will be grown as PYT in T. Aman 2021. | PI: JF CI: EH, SS, SDJ | HQ, BRRI | 1.0 GOB |
| 1.7 | Development of high yielding double haploid rice variety | To select high yielding materials having desirable characters | Three anther culture derived materials will be grown as SYT respectively in T. Aman 2021. | PI: SS, CI: JF EH, SDJ | HQ, BRRI | 1.0 GOB |
| 1.8 | Primary yield trials (SYT) | To evaluate initial yield potential in replicated trial | Five entries will be grown in Aus 2021. Each progeny will be grown in a 5.4m X 12 rows plot using single seedling/hill with 3 replications. | PI: JF CI: EH, SS | HQ, BRRI | 0.5 GOB |
| 1.9 | PVT | On farm evaluation of proposed line by NSB team for the recommendation to release as a new variety | One doubled haploid line BR(Bio)8961-AC26-16 will be evaluated in T. Aman 2021 as PVT. Each progeny will be grown in a 5.4m X 12 rows using single seedling/hill in 3 replications at farmers field. RCBD will follow for this expt. Recommended fertilizer dose will be applied and standard agronomic practices will be followed. | PI: EH CI: SS, JF, NYS, HAR, MAH, SDJ | Farmers field (SCA will be conducted ) | 4.0 GOB |
| **2** | **Development of rice variety through somaclonal variation**<br>**Program Leader: EH** | | | | | |
| 2.1 | Development of somaclonal variants using EMS treated rice seed | To develop modern rice varieties for Aus and T. Aman | 50 homozygous lines will be evaluated as OT and 174 $M_1SC_5$ plants will be grown for further evaluation. | PI: SS CI: EH, JF, SDJ | HQ, BRRI | 2.0 GOB |
| 2.2 | Screening of somaclonal variants of BR11 against BB and Sheath blight | To find out BB and Sheath blight resistant lines | 50 homozygous somaclonal variants of BR11 will be screen of against BB and Sheath blight | PI: SS CI: EH, JF, SDJ, SA, RA | HQ, BRRI | 1.0 GOB |

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| 2.3 | Development of Aus variety through somaclonal variation | To create somaclonal variation for developing high yielding Aus rice variety | 9 fixed somaclonnal variants of BRRI dhan48 will be grown as SYT with check | PI: SDJ CI: EH, JF, SS | HQ, BRRI | 1.5 GOB |
| 2.4 | Development of antioxidant enriched black rice variety through somaclonal variation | To create somaclonal variation for development of antioxidant enriched high yielding modern rice variety | 41 and 78 ($SC_3$ and $SC_4$) plants will be grown for further evaluation. | PI: JF CI: EH, SS | HQ, BRRI | 1.5 GOB |
| 2.5 | Development of high yielding short stature aromatic Kilizira type varieties through somaclonal variation | To create somaclonal variation towards development of high yielding premium quality (Kalijira type) rice varieties | 14 somaclonal variants ($SCV_1$ ) of Kalijira will be grown for further evaluation | PI: SS CI: EH, JF | HQ, BRRI | 0.5 GOB |
| 3 | **Development of rice variety through Mutation Program Leader: EH** | | | | | |
| 3.1 | Development of high yielding short stature aromatic Kilizira type varieties using EMS | To develop high yielding short stature aromatic Kilizira type varieties | NMU treated mutant Kalijira ($M_2$) will be grown in the field for selecting desired plants | PI: SS CI: EH, JF, HAR, MAH | HQ, BRRI | 1.0 GOB |
| 3.2 | Development of variants using EMS of BRH-11-9-11-4-5B(CN6) having reduced sterility | To reduced sterility of BRH-11-9-11-4-5B (CN6) | 210 NMU treated mutant BRH-11-9-11-4-5B(CN6) (M2) will be grown in the field for selecting desired plants | PI: SS CI:EH, HAR, MAH | HQ, BRRI | 1.0 GOB |
| 3.3 | Development of Sheath Blight resistant rice through mutation by EMS | To develop Sheath Blight resistant lines | 260 NMU treated mutant BRRI dhan87 (M2) will be grown in the field for selecting desired plants | PI: MAH CI: EH, SS, JF, HAR | HQ, BRRI | 1.5 GOB |
| 3.4 | Development of Premium Quality Rice through Mutation by EMS (Ethyle | To develop high yielding, short stature, aromatic rice lines | Seeds of local variety Kataribhog, Shakkorkhana and Tulshimala will be treated with EMS treatment and will be grown in T. Aman 2021. | PI: NYS CI: EH, SS | HQ, BRRI | 1.0 GOB |

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| | Methanesulfonate) | | | | | |
| **4** | **Development of rice variety through wide hybridization**<br>**Program Leader: EH** | | | | | |
| 4.1 | Developing rice variety through wide hybridization followed by embryo rescue | To develop high yielding variety through wide hybridization followed by embryo rescue technique. | Thirteen (13) wide cross followed by embryo rescue will be done during T. Aman 2021. A total of 38 selected plants will be evaluated during T. Aman 2021 for generation advancement. Five (5) backcrosses were done with previously embryo rescued plants to reduce hybrid sterility and 102 $BC_2F_1$ seeds were harvested. Those will be evaluated during T Aman 2021 for generation advancement. | PI: NYS<br>CI: EH, SS | HQ, BRRI | 2.0 GOB |
| **5** | **Allele Mining:**<br>**Program Leader: EH** | | | | | |
| 5.1 | Identification of QTLs for taller seedling height | To identify QTLs for taller seedling height for developing tidal submergence tolerant rice variety | Genotyping of $F_2$ population consisting of 184 individuals from BR11 x Sadamota (Acc. no. 1576) will be done using polymorphic primers. From mapping population selected four (4) pedigree lines will be evaluated during T. Aman 2021 for further evaluation. | PI: NYS,<br>CI: EH, JF, HAR, MAH | HQ, BRRI | 4.0 GOB |
| 5.2 | Marker assisted selection for fragrance in $F_3$ Population of BRRI dhan87 and Kalijira | To develop high yielding aromatic rice | 69 $F_4$ aromatic lines from BRRI dhan87 and Kalizira will be grown and high yielding aromatic will be selected.<br>BRRI dhan90 and Kalizira cross will be done to introgress *BADH2* gene in BRRI dhan90 | PI: JF<br>CI: EH, HAR,SS | HQ BRRI | 1.0 GOB |
| 5.3 | Marker assisted selection for aromatic and submergence tolerance | To develop high yielding submergence tolerant aromatic rice variety | BRRI dhan87/ kataribhog//BRRI dhan87/BRRI dhan52 and BRRI dhan87/chinigura//BRRI dhan87/BRRI dhan52 cross will be carried out. | PI: JF<br>CI: EH, SS | HQ BRRI | 1.0 GOB |

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| | rice genotype | | Functional marker of *BADH2* gene will be used for foreground selection for *SUB1* and *BADH2* | | | |
| 5.4 | Development of photosensitive high yielding rice variety | To identify genomic location controlling photosensitivity. | An association mapping panel of about 300 accessions will be constructed comprised with strong photosensitive native rice cultivars, moderately and weekly photosensitive along with non-sensitive rice varieties. | PI: HAR<br>CI: EH, MAH, SDJ, MK | HQ<br>BRRI | 1.0<br>GOB |
| **6** | **Gene Cloning**<br>**Program Leader: EH** | | | | | |
| 6.1 | Isolation and cloning of drought tolerant genes from wheat | Isolate and cloning of drought tolerance gene | Targeted genes will be isolated from wheat | PI: SS<br>CI: EH, JF, HAR | HQ,<br>BRRI | 2.0<br>GOB |
| **7** | **Rice Genetic Engineering**<br>**Program Leader: EH** | | | | | |
| 7.1 | Development of salt tolerant transgenic rice | To develop salt tolerant transgenic rice lines | BRRI dhan29 will be used as plant materials and salt tolerant genes *GlyI* (*Glyoxalase I*) and *GlyII* (*GlyoxalaseII*) will be used to make the rice variety salt tolerant through *Agrobacterium*-mediated transformation method. 8 putative $T_4$ transgenic plants will be confirmed by PCR and harvested seed will be screened against salt. | PI: SS<br>CI:JF, SDJ and EH | HQ,<br>BRRI | 5.0<br>GOB |
| 7.2 | Introgression of salt tolerant mangrove *g*ene. | To develop salt tolerance transgenic rice lines | BRRI dhan86 and BRRI dhan92 will be used as recipient parent and MT24 transgenic rice as donor parent. *AcMDHAR* gene from mangrove plant will be used to make the salt tolerant rice variety.<br><br>Population derived from the cross BRRI dhan28 and MT24 will be advanced to get fixed lines. Foreground selection will be | PI: SS<br>CI: JF, SDJ and EH | HQ,<br>BRRI | 5.0<br>GOB |

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| | | | done. | | | |
| 7.3 | Development of salt tolerant transgenic rice | To develop salt tolerant transgenic rice lines | BRRI dhan86, BRRI dhan87 and BRRI dhan89 will be used as plant materials and salt tolerant gene *PVA1* will be used to make the rice variety salt tolerant through *Agrobacterium*-mediated transformation. | PI: SS CI:JF, SDJ and EH | HQ, BRRI | 5.0 GOB |
| 7.4 | Development of high yielding aromatic rice lines through genome editing | To develop high yielding aromatic rice lines using CRISPR-Cas9 technology. | Gene construct will be made to inactivate the *BADH2* for the genetic transformation into BRRI dhan90 | PI: HAR CI: EH, SS, JF, MAH, SDJ | HQ, BRRI | 5.0 GOB |
| 7.5 | To develop high yielding blast resistant lines lines using CRISPR-Cas9 technology. | To develop high yielding blast resistant lines using CRISPR-Cas9 technology. | Gene construct will be made to inactivate the *OsEFR922* for the genetic transformation into BRRI dhan63. | PI: SS CI: EH, JF, HAR SDJ | HQ, BRRI | 5.0 GOB |
| **8** | **C4 rice** | | | | | |
| 8.1 | Identification of *Setaria italica* mutants losing C4 properties. | Characterizing *Setaria italica* mutant population for loss of C4 functions | *Setaria italica* $M_3$ mutant population will be used to detect mutant plant losing $C_4$ photosynthetic property. | PI: HAR CI: EH, SS, MK, MSR | HQ, BRRI | C4 Karmasuchi, Ministry of Agriculture |

PL: Program Leader, PI: Principal Investigator, CI: Co Investigator, EH= Dr. Md. Enamul Hoque, SS= Dr. Shahanaz Sultana, JF = Dr. Jannatul Ferdous, NYS = Dr. Nilufar Yasmin Shaikh, HAR = Dr. Hisam Al- Rabbi, MAH= Md Arafat Hossain SDJ= Shampa Das Joya and concerned regional station scientists, MK= Munnujan Khanam, MSR = Md. Sazzadur Rahman, SA= Dr. Shamima Akter, RA= Romana Akter