

Research Highlights

2019 - 2020

A. MAIZE IMPROVEMENT

Maintenance and Seed increase of promising inbred lines of maize (9 sets)

A total of 528 selfed ears (set I-VIII) and 38.36 kg seeds of 48 lines (set-IX) were harvested and preserved separately.

Maintenance and characterization of exotic and locally developed maize inbred lines (3 sets)

From set-I, 18 inbreds from set-II, 21 lines and from set-III, 17 inbreds were characterized based on qualitative and quantitative traits. Harvested selfed seeds of each inbred line were stored separately in cold storage and for future breeding program.

Development of base population in maize

Two hundred and fifteen ears were selected separately in two group viz. 130 ears from random mating and 85 ears from selfing, which were preserved separately.

Advancing S₀ to S₇ generation of field corn

From S₀, 20 S₁ lines were selected. From S₂, based on plant height, ear height and earliness, 133 S₃waxy lines was selected from two sets while 124 S₄field lines were selected. From S₄, 31 S₅sweet corn lines were selected from 2 sets. From S₅ generation, 14 S₆ baby corn lines, 40 S₆ field corn lines were advanced. From S₆ generations, 26 S₇early and dwarf field corn 28 S₇medium height and high yield field corn, 17 S₇ popcorn, 21 popcorn in set-IV, 26 S₇sweet corn, 16 S₇field corn, 28 S₇field corn and 58 S₇ field corn lines were selected.

Evaluation of inbred lines of field corn through Line×Tester method

Based on mean, SCA effects and standard heterosis of yield, four crosses, BML75×BIL79 (12.41 t/ha), E34×BIL157 (12.41 t/ha), BML76×BIL157 (12.74 t/ha) and BML249×BIL157 (15.02 t/ha) were selected.

Study on combining ability and heterosis in maize at different location (2 sets)

In set-I, 15 hybrids resulted from 6×6 diallel cross without reciprocal was evaluated in five locations and, P1×P4 (8.31 t/ha) and P2×P3 (8.61 t/ha) were selected. In set-II, 21 hybrids from a 7×7 half diallel cross were evaluated in three locations and P1 × P5 (11.6 t/ha) and P5 × P6 (11.1 t/ha)were selected.

Evaluation of selected single cross hybrids of field corn, baby corn, popcorn (4 sets)

In set-I, 7 single cross field corn hybrids were evaluated along with three commercial checks viz. BHM-16, 981 and Don 111, and 9MG-12×9MS-12(11.8 t/ha), 9MG-9×9MS-14 (11.5 t/ha) and Pac 60-3× BIL-113 (10.9 t/ha) were found promising for earliness and short stature. In set-II, 12 single cross field corn hybrids were evaluated along with three commercial checks viz. BHM 16, DON 111 and 981, and Pinnacle 10×900M6 (11.33 t/ha), 900M4×E37 (11.23 t/ha) and Pinnacle 10×E37 (11.02 t/ha) were selected. In set-III, 20 BARI developed maize hybrids including five local check varieties were studied at Gazipur, BARI, and two entries E8(11.1 t/ha) and E18(10.5 t/ha) were found better. In set-IV, 16 locally developed hybrids of baby corn hybrid with a commercial check Baby Star, and BCP 271-16×BCP 271-4 and BCP 271-10×BCP 271-3were selected. In set-IV, 8 single cross pop corn hybrids were evaluated along with one commercial check Khoi Bhutta, and PCB-12×T₁₇ (4.29 t/ha), PCB-13×T₁₇ (4.48 t/ha) and PCB-15×T₈ (3.9 t/ha) were found promising.

Evaluation of single cross field corn hybrids at different location (3 sets)

In set-I, 106 hybrids of maize and five check varieties (BHM16, 981, DON111 and Mohabir) were assessed, andE23 (10.6 t/ha), E25 (9.7 t/ha), E29 (11.14 t/ha), E39 (10.2 t/ha), E87(10.3 t/ha) and E88 (10.1 t/ha) exhibited higher grain yield as well as stable across locations. In set-II, 98 hybrids were evaluated at four different locations viz. Gazipur, Jamalpur, Barishal and Rangpur, and M-29, M-31, M-24, M-28 and M-68 were selected as stable across the environments. In set-II, One hybrid, 102 and four check varieties (BHM-

16, 981, Don111 and Mohabir) were assessed in Gazipur, Dinajpur and Rahmatpur, and E108 (12.59 t/ha), E101 (12.46 t/ha) and E118 (12.35 t/ha) were selected as stable across locations.

Evaluation of promising field corn and baby corn hybrids at different agro-ecological regions (4 sets)

In set-I, 8 promising hybrids of maize and 2 check varieties (BHM-16 and 981) were assessed for selection of promising one(s) in three agro-ecological zones (Gazipur, Dinajpur and Jashore) and hybrids E6 (13.4 t/ha) and E2 (12.0 t/ha) selected. In set-II, 4 baby corn hybrids were evaluated at three environments viz. Gazipur, Rangpur and Dinajpur, along with one commercial check Baby Star, and entry 2 (BCP 271-18×BCP 271-16), 3 (BCP 271-20×BCP 271-6) and 1 (BCP 271-18×BCP 271-6) with high baby cob yield per plant while entry 5 (Baby Star), 3 (BCP 271-20×BCP 271-6) and 1 (BCP 271-18×BCP 271-6) were selected for green fodder yield. In set-III, hybrids E3 (11.22 t/ha), E8 (11.26 t/ha) and E10 (10.71 t/ha) were selected. In set-IV, 16 along with 2 checks were evaluated over five locations (Dinajpur, Jashore, Gazipur, Hathazari and Jamalpur), and 981-1-3-1-1-1-7 × BIL 28 (12.77 t ha⁻¹), 981-15-1-1-2-1-1×BIL 28 (12.83 t ha⁻¹) and 981-24-1-1-2-2-4×BIL 28 (13.90 t ha⁻¹) were selected.

Large plot observation trial of maize at different agro-ecological regions

Eleven maize hybrids along with 4 check varieties were evaluated for kernel yield and yield contributing traits over five locations (Dinajpur, Jashore, Gazipur, Hathazari and Jamalpur). The hybrid BAM 015×BIL 28 produced maximum kernel yield (14.77 t ha⁻¹). The hybrids BAM 015×BIL 28 (14.77 t ha⁻¹) and BAM 013×BIL 28 (13.93 t ha⁻¹) had above average kernel yield exceeding checks across the locations.

Development of single cross maize hybrids through Line×Tester method in isolation (2 sets)

Seventy-eight inbreds were crossed in isolation with 2 testers, BIL 28 (set I) and BIL 211 (set II) to produce 143 F₁'s for evaluation in the next rabi season. A total of 41.66 kg (set I) and 62.83 kg (set II) seeds were produced.

Production of single cross field corn hybrids through diallel mating design

One set of crosses following 7×7 diallel fashion were made to produce 21 F₁'s hybrid seeds. Total 4.94 kg seeds were obtained from 21 crosses.

Seed production of selected single cross hybrids of short statured, lodging tolerant, excess soil moisture and saline tolerant field corn and baby corn (4 sets)

A total 17.3 kg seeds of field corn and 16.23 kg baby corn hybrid seeds were produced from 4 sets. In another set, total 25.8 kg seeds from five promising hybrids, BIL207×CML 487, BML77×BML78, BIL106 × CML480, BML75×BIL106, and BAM015 ×BIL28 were obtained.

Maintenance and seed increase of the parental lines of BARI maize hybrids

Twenty two parental lines of BARI released hybrid varieties were grown and 10.12 kg seeds were obtained. In 12 parental lines of BARI released hybrid varieties were grown at different locations of Bangladesh. Total 1437 kg seeds were obtained from twelve inbred lines.

Seed production of parental lines of selected promising maize hybrids

Seven parental lines (BML 78, BML 48, BML 73, BML76, CML 480, BIL 28 and BAM 015) of selected promising maize hybrids were grown at different locations and 143.3 kg seeds were produced.

Seed production of BARI hybrid maize and composite maize varieties

Seeds of 330, 40, 460, 8, 8, 600, 100, 270 and 600 kg were produced from BARI Hybrid Maize 9, BARI Hybrid Maize 13, BARI Hybrid Maize 14, BARI Hybrid Maize 15, BARI Hybrid Maize 16 and BARI Hybrid Maize 17, respectively. In composite varieties, 125, 215, 140, 40, 120 and 35 kg seeds were produced from Shuvra, BARI khoibhutta 1, BM 6, Barnali and BARI sweet corn, respectively.

Comparative study on oxidative stress tolerance mechanism in maize (C₄) and barley (C₃) under drought condition

Comparative ROS (O₂^{•-} and H₂O₂) and their scavenging enzymatic antioxidants were studied in two maize varieties [BARI hybrid maize-13 (BHM-13) and BARI hybrid maize-16 (BHM-16)] as C₄ crop and two barley varieties [BARI barley-8 (BB-8), BARI barley-9 (BB-9)] as C₃ crop to find an antioxidative based comparative adaptive mechanism between them under drought. Substantial higher ROS were observed in barley than maize. Both SOD and APX played important role in both maize and barley. Genotypic variation was found in maize for CAT and GPX. In spite of higher activity of POD showed in maize, higher CAT and GPX could have better role in H₂O₂ metabolism in barley under drought.

Comparative yield trial of BARI released and imported maize hybrids at different locations

Comparative yield trial of 20 imported hybrids and 5 BARI released hybrids was studied at five locations viz. Gazipur, Jamalpur, Rangpur and Moulvibazar. None of the BARI released variety showed better performance than commercial varieties. Among the commercial varieties, Eureky, Mun 4081, Don 111, Samit, Miracle produced 12.18, 12.15, 12.13, 12.04, 11.98 t/ha yield.

Adaptive trial of BARI maize hybrids in Charland of Bogura

Performance of BARI hybrid maize varieties, BHM-5, BHM-7, BHM-9, BHM-12, BHM-13, BHM-14, BHM-15, BHM-16 and BHM-17 along with two locally available commercial cultivar (Don-111 and 981) were evaluated in the farmers' field of at Dhunatin stress prone charl and areas. Maximum grain yield (11.16 t ha⁻¹) was recorded from BHM-9 (9.31 t ha⁻¹) followed 981 (8.17 t ha⁻¹) and BHM-7 (8.14 t ha⁻¹). The highest gross return (Tk. 193640 ha⁻¹) and gross margin (Tk. 87730 ha⁻¹) was recorded from BHM-9 against the cultivation cost of Tk. 105910 ha⁻¹. Farmers showed their interest to grow BHM-9 in next year for its satisfactory yield.

Adaptive trial of BARI maize hybrids in Cumilla region

Seven BARI hybrid maize, BHM-7, BHM-9, BHM-13, BHM-14, BHM-16 and BHM--17 including two commercial checks, Don-111 and 981 were evaluated at farmers' field of Lakhitoli in Dauadkandi upazilla and Bashpurin upazilla under Cumilla district and Kharara in Koshba under Brahmanbaria district. BHM-16 gives highest grain yield (12.9 t/ha). Maximum gross return (Tk. 258000.00) and gross margin (Tk. 303750.00) were occurred from BHM-16. Farmers are interested to grow BHM-16 due to higher grain yield, lower ear and plant height.

Adaptive trial of BARI hybrid maize in Pabna

An adaptive trial was conducted at FSRD site, Ganggarampur, Pabna (AEZ-11) using BHM-7, BHM-9, BHM-13, BHM-14, BHM-16 and BHM-17 including two commercial checks, DON-111 and Pasific-981. The highest grain yield 13.286 t ha⁻¹ was obtained from Pasific-981, statistically similar with DON-111 and BHM-16. Maximum gross margin (Tk. 178557 ha⁻¹) was found in Pasific-981. Farmers showed their keen interest in the BARI developed hybrid maize due to their higher yield potentialities and less disease infestation.

Adaptive trial of BARI maize hybrids in Charland of Dinajpur

Seven BARI released varieties i.e. BHM-7, BHM-9, BHM-12, BHM-13, BHM-14, BHM-15, BHM-16 and BHM-17 including two commercial cultivar (Don-111 and 981) check were in the farmers' field of Khamer Kantobag, Sadar, and Dinajpur under AEZ 1 (Old Himalayan Piedmont Plain). The maximum yield was recorded from control 981 (10.28 ton/ha) which is followed by BHM-16 (8.81). The highest gross return (Tk. 179810.3 ha⁻¹) was amounted from BHM 16 against the cultivation cost of Tk. 105000 ha⁻¹ that together led to higher gross margin (Tk. 74810.3 ha⁻¹). Farmers showed their interest to grow BHM-16, BHM-7 and BHM-9 in next year for its satisfactory yield.

B. MINOR CEREALS IMPROVEMENT

Hybridization of barley

Among 45 crosses from a 10×10 diallel fashion, 42 successfully produced seeds which have been preserved and will be grown for confirmation trial in the next year.

Confirmation of F₁ generation of barley (2sets)

Two sets of F₁s, one from 10×10 another from 7×7 diallel crosses were evaluated, and 9 crosses from Set-I and 11 crosses from Set-II were selected for advancing.

Evaluation of barley germplasm for early and high yield

Twenty previously screened hull-less barley lines received from ICARDA along with three standard checks BARI Barley-7 (BB-7), BARI Barley-8 (BB-8) and BARI Barley-9 (BB-9) were evaluated and considering short stature, yield and yield contributing characters, six lines were selected.

Preliminary yield trial of hull-less barley

Eleven genotypes along with one check variety were assessed to select stable high yielder barley lines over 3 different locations. The genotype G4 (3.32 ton/ha) and G10 (3.01 ton/ha) are high yielding and more stable to environmental change.

International hull less barley yield trial

Twenty-two barley lines with check variety BB-6 were grown to select better performing exotic barley lines in Bangladesh. Considering earliness and yield contributing characters 7 lines (ISB- 20001 E129, ISB- 20002 E2, ISB- 20004 E4, ISB- 20006 E6, ISB- 20012 E-12, ISB- 20022 E136 and ISB- 20010 E10) were selected.

International barley observation nurseries-high input (IBON-HI)

One hundred and fifty six barley lines (including check variety BB-6, BB-7, BB-8 and BB-9) were grown, and considering earliness, yield and yield contributing characters 12 twelve lines (IBON-HI/19 E-111, IBON-HI/19 E-22, IBON-HI/19 E-33, IBON-HI/19 E-87, IBON-HI/19 E-32, IBON-HI/19 E-103, IBON-HI/19 E-54, IBON-HI/19 E-102, IBON-HI/19 E-119, IBON-HI/19 E-55, IBON-HI/19 E-78 and IBON-HI/19 E-28) were selected.

Global spring barley yield trial for low input condition (GSBYT)

Twenty-four barley lines received from ICARDA along with one standard checks BB-8 were evaluated at BARI, Gazipur. Considering short stature, yield and yield contributing characters one line GSBYT/19 E-22 was selected.

Evaluation of foxtail millet germplasm

Twenty foxtail millets lines along with one check (BARI Kaon-2) were evaluated, and considering earliness, plant height and yield and yield contributing traits 12 foxtail millets line were selected.

Large plot yield trial of finger millets

A Combined analysis was carried out across three different locations viz. Rangpur, Gazipur and Jamalpur. Considering overall mean across the locations genotype IE-501 and IE-2043 were selected. Burirhat was the most suitable environment for finger millet cultivation.

Advance yield trial of pearl millet germplasm

Four exotic pearl millet germplasm were grown at 3 locations. Considering overall mean grain yield across the locations, IP3706 (3.1 t/h), IP5711 (3.06 t/h), IP5793 (2.74 t/h) and IP13523 (2.85 t/h) were selected for regional yield trial.

Multilocation trial of selected ICRISAT sorghum lines

Eight sorghum lines were evaluated in Gazipur, Satkhira and Noakhali. Considering the mean yield, three lines, E6 (2.38 t/h), E7 (2.15 t/h) and E8 (2.2 t/h) were selected.

Large plot yield trial of proso millet germplasm (*Panicum miliaceum* L.)

Seven proso millet germplasm including 1 check (BC-1) were evaluated across three different locations. BD-1447, BD-777 and BD-1411 exhibiting higher with higher yield over all environments was selected.

Evaluation of buckwheat germplasm

Four genotypes of buckwheat received from PGRC, along with one check Bog-1 were evaluated. Considering yield and yield contributing characters E3(647.7 kg/ha) was found promising.

Regeneration of oat germplasm

Two genotype of oat BOL-1 and BOL-2 were used to increase seed. Total of 122kg seed was produced.

Collection and maintenance of quinoa germplasm

One genotype of quinoa QU1S2514 was maintained and a total of 3 kg seed was produced and preserved for future breeding program.

Breeder seed production of barley

A total of 1152 kg of breeder seed from five barley varieties viz. BARI Barley 5, BARI Barley 6, BARI Barley 7, BARI Barley 8 and BARI Barley 9 were produced at four different locations.

Breeder seed production of millets and sorghum

A Total of 936 kg breeder seed of four BARI Kaon, one Cheena, one shorgam variety and two Oat lines were produced at four locations in 2019-20 cropping season.

Comparative study on oxidative stress tolerance in sorghum (C₄) and barley (C₃) crops under drought condition

Antioxidative capacity between sorghum, IS-19153 and IS-21891, and barley, BARI barley-8 (BB-8) and BARI barley-9 (BB-9), was studied with ROS and their metabolizing enzymatic antioxidants analysis under drought. A significant difference was found in superoxide (O₂^{•-}) and H₂O₂ between sorghum and barley, being stronger in barley. SOD and APX played important role in both sorghum and barley. CAT can predominantly role in H₂O₂ metabolism while POD was important in sorghum.

Screening of barley genotypes against spot blotch

Eighteen genotypes of barley were screened for spot blotch disease caused by *Bipolaris* under natural condition. Five genotypes (Esmardala, E3, Inbon, BHL-29 and BB-5) showed moderately resistant reaction, two genotypes (BHL-27 and BB-8) showed moderately susceptible.

Validation of promising selected proso millet lines under rainfed condition

Ten proso millets germplasm including one check BARI Cheena 1 (Tusher) were evaluated at Rajshahi, Gazipur and Gaibandha. BD-1488, BD-1446, BD-791 and BD-1402 were selected as higher yielder. Gaibandha was the most suitable environment for proso millet cultivation.