

Research Highlights

2018-2019

Maize Improvement

A. Collection, characterization and maintenance of germplasm

- Seventy five local and exotic inbred lines of field corn (57) and baby corn (18) were maintained through selfing by hand. Total 13.3 kg seed from field corn and 7.98 kg seed from baby corn were preserved for future breeding program.

B. Development of source population and inbred lines

Development of base population: Balanced bulk 7th cycle seeds obtained from forty nine superior hybrids were planted for random mating in isolation as well as selfing for the development of source populations targeting dwarf and earliness in maize. One hundred ears from random mating were selected, balanced bulk and grown for random mating while the other selected selfed 100 ears would be grown separately for advancing to the next generation in isolation through selfing in coming rabi season.

Generation Advancing:

- S₁ to S₂:** Two waxy field corn hybrids namely waxy corn 2008 and waxy corn 932 were advanced to S₂. Fifty eight selfed ear from Waxy corn 2008 and 56 selfed ear from Waxy corn 932 were harvested and preserved separately.
- S₂ to S₃:** Twenty eight S₂ lines of commercial field corn hybrid (IM8119) were advanced to S₃ and 93 selfed ears were harvested and kept separately.
- S₃ to S₄:** Twenty S₃ sweet corn lines for each of Dream sweet 2 and Dream sweet 3 hybrids were advanced to S₄ and 66 and 78 selfed ears were selected respectively, for advancing them to S₄.
- S₄ to S₅:** Eighteen S₄ baby corn lines of Baby star and forty two field corn lines of commercial hybrid IM8013 were advanced to S₅ and 102 and 97 selected selfed ears were harvested, respectively.
- S₅ to S₆:** Two hundred and fifty S₅ lines of field corn, 47 S₅ lines of popcorn and 26 S₅ lines of sweet corn were advanced to S₆ and a total of 45.92 kg selfed seeds were produced.
- S₆ to S₇:** Eighty seven S₆ lines of field corn, 14 S₆ lines of popcorn and 36 S₆ lines of sweet corn were advanced to S₇ and a total of 27.9 kg selfed seed were harvested.

C. Evaluation of inbred lines

- Forty four field corn hybrids were produced through line × tester method and were evaluated with three checks BARI Hybrid Maize 9 (BHM 9) (14.19 t/ha), 981 (12.76 t/ha) and Elite (14.05 t/ha). Two hybrids viz. BIL 79 × CML 429 (13.3 t/ha) and CML 451 × CML 429 (11.3 t/ha) were selected based on yield and yield contributing traits.
- Twenty eight hybrids were produced through 8×8 diallel fashion and were evaluated with two commercial hybrids viz. BHM 9 (11.22 t/ha) and 981 (14.05 t/ha). Three hybrids P₁×P₇ (13.23 t/ha), P₃×P₄ (12.46 t/ha) and P₃×P₅ (12.94 t/ha) showed significant and positive heterosis (18.48%, 11.05% and 15.30%) compare to standard check BHM 9.
- Twenty one hybrids were developed following 7×7 diallel mating design and evaluated with four commercial checks viz. BARI hybrid maize 9 (11.2 t/ha), 981 (12.8 t/ha), Elite (12.8 t/ha) and NK-40 (10.5 t/ha). Hybrids P₁×P₇ and P₁×P₅ showed significant positive heterosis 12.8% and 11.8%, respectively for yield compared to the standard commercial check BARI hybrid maize 9 and selected for further investigation.

- Twenty one hybrids were obtained from 7×7 diallel fashion and evaluated with four commercial checks viz. BARI hybrid maize 9 (11.6 t/ha), 981(13.5 t/ha), Elite (13.8 t/ha) and NK-40(12.09 t/ha). Hybrids P₅ × P₇ (15.0%) showed the highest significant positive heterosis followed by P₅ × P₆ (8.2%) and P₃ × P₇ (7.1%) over commercial check NK-40 for grain yield and both were selected for further evaluation.

D. Evaluation of single cross hybrids

- Twenty three single cross field corn hybrids were evaluated along with two commercial checks viz. BHM 9(11.15 t/ha) and 981(12.57 t/ha). Considering yield, dwarf plant stature and earliness five hybrids i.e. Pinnacle12 × BMZ 9 (10.98 t/ha), BIL 79 × E 34 (10.95 t/ha), BMZ 9 × Pinnacle 3 (9.92 t/ha), CML 465 × CML 480 (9.67 t/ha) and Pinnacle 3 × CML 451 (9.42 t/ha) were found promising and selected for further evaluation.
- Forty four single cross hybrids of field corn consisting of 4 sets experiments were evaluated with four check variety namely BHM9, 981, Elite, NK-40 at Gazipur, Jamalpur, Jashore, Ishurdi, Hathazari, Barishal, Rangpur and Dinajpur with yield ranged from 10.1 to 12.95 t/ha. Considering yield and stability 14 (set I: E5, E7 and E9; set III: E2, E7 and E4; Set IV: 9MG-22 × 9MS-4 and 9MG-12 × 9MS-4; set V: E-1, E-2, E-4, E-8, E-9 and E-10) field corn hybrids were found promising and yield ranged from 10.12 t/ha to 14.35 t/ha.

In set II, 20 baby corn hybrids were evaluated with one check variety namely Baby Star (3 cobs/plant, 26.1 g/plant) at Gazipur, Rangpur, Dinajpur, Jashore and Hathazari. Three baby corn hybrids viz. BCP 271-18×BCP 271-16, BCP 271-18×BCP 271-6 and BCP 271-20×BCP 271-6 were higher number of cob yielder (4 cob/plant) with higher cob yield 34.4, 28.2 and 28.0 g/plant, respectively and 7 hybrids viz. BCP 271-13×BCP 271-7, BCP 271-18×BCP 271-16, BCP 271-20×BCP 271-19, BCP 271-15×BCP 271-19, BCP 271-16 × BCP 271-6, BCP 271-16×BCP 271-9 and BCP 271-21×BCP 271-9 suggested ideal genotype for green fodder yield (563-703 g/plant).

- Nine locally developed selected single cross short stature maize hybrids along with five commercial check hybrids viz. BARI hybrid maize 9 (11.64 t/ha), BARI hybrid maize-16 (11.83 t/ha), 981 (12.82 t/ha), Elite (13.21 t/ha) and NK-40 (11.40 t/ha) were evaluated at BWMRI, Nashipur, Dinajpur. Hybrids F-14×M-10 (13.4 t/ha), F-30×M-10 (12.95 t/ha) and F-14×M-15 (12.39 t/ha) were selected for higher yield and short stature where plant height and ear height ranged from 166 to 173 and 63 to 67, respectively.

E. Stress breeding-abiotic stress tolerant variety development

- Fourteen selected single cross maize hybrids and three local checks viz. BHM9 (9.58 t/ha), BHM7 (9.40 t/ha) and Sunshine (9.71 t/ha) were evaluated at farmers field in Goroi, Nikli, Kishoregonj haor area. Considering yield potentiality, entry E11 (10.05 t/ha) was found promising where E2 (9.13 t/ha) and E3 (8.12 t/ha) were 9-10 days earlier than all commercial check varieties.
- One hundred and sixty maize hybrids including six commercial check varieties received under Climate Resilient Maize for Asia (CRMA) Project from CIMMYT-India were evaluated at the BWMRI, Nashipur, Dinajpur during the late rabi season. Among the tested hybrids the following hybrids, viz. entries VH18103, VH18221 and VH1849 in trial 18K-CRT-118; entry ZH17255 in trial HY18101-114; entry ZH138278 in trial HY18102-128; and entries VH12180 and ZH17373 in strip test were selected for further evaluation.
- Performance of 135 maize hybrids including six commercial check varieties received under Climate Resilient Maize for Asia (CRMA) Project from CIMMYT-India were

evaluated at the BARI, Joydebpur, Gazipur during the late rabi season. Among the tested hybrids the following hybrids, viz. entries ZH161361, ZH161050 and ZH17223 in trial 18K-MLT-117; entries ZH17250, ZH17359 and ZH17366 in trial HY18101-113; entries ZH17379, ZH161330 and ZH17373 in trial HY18102-127; and entries ZH161456, ZH17373 and VH12180 in strip test were selected for further evaluation.

- Performance of 650 maize hybrids including six commercial check varieties received under HTMA project from CIMMYT-India were evaluated at the BWMRI, Nashipur, Dinajpur during Kharif season. Among the tested hybrids the following hybrids, entry ZH16930 (8.86 t/ha) in MLT-239, entry ZH19782 (7.84 t/ha) in HY19101-16 entries ZH191160 (7.58 t/ha) and ZH191225 (7.31 t/ha) in HY19101-44, entries ZH191414 (8.02 t/ha), ZH191353 (7.76 t/ha), ZH191331 (7.72 t/ha), ZH191349 (7.68 t/ha), ZH191314 (7.68 t/ha) and ZH191263 (7.62 t/ha) in HY19101-54 were selected for further evaluation.
- Performance of 300 maize hybrids including six commercial check varieties received under HTMA project from CIMMYT-India were evaluated at the BARI, Gazipur during Kharif. Among the tested hybrids, 28 hybrids from different trials were found promising which are as follows: entries KH15486, VH153492 & VH1851 in CRT-11; entries ZH1774, ZH161003, ZH16930, ZH16399, ZH1770, ZH182087 and ZH16929 in MLT-237; entries ZH191078 & ZH1798 in HY19103-119; entry ZH17445 in HY19102-29; entries ZH19765, ZH19814, ZH19791, ZH19821 and ZH19806 in HY19101-17; entries ZH19973, ZH19881, ZH19971, ZH19984, ZH19987, ZH19953, ZH19846, ZH191003, ZH19903 and ZH19943 in HY19101-27. These hybrids were selected for further.
- Performance of 619 maize hybrids including six commercial check varieties received under HTMA project from CIMMYT-India were evaluated at the Regional Agricultural Research Station, Jashore during the kharif-1 season. Among the crosses considering yield and other yield contributing traits including heat stress tolerance the best hybrids were ZH19821, ZH19797, ZH19796 and ZH19806 in trial HY19101-15; ZH19903, ZH191003 and ZH19983 in trial HY19101-25; ZH17445 and ZH182015 in trial HY19102-210; ZH1798 and ZH17119 in trial HY19103-120; ZH161003, ZH16930 and ZH1768 in trial MLT-238; ZH191085 in CRT-12; Z1217-125, and Z1217-3 in MPSTC-1 and Z1218-257 and Z1218-321 in MPSTC-2.

F. Development of new hybrids

- One hundred and eighty six inbreds were crossed with two testers (set I: BIL 79 in Bogura and set II: BIL 157 in Narshingdi) in isolation following line \times tester fashion to produce 372 F₁'s for evaluation in the next year with different objectives. A total of 141.69 kg (set I) and 96.57 kg (set II) F₁ seeds were produced.
- Two sets of crosses following 6 \times 6 and 7 \times 7 diallel fashion were made to produce total 36 crosses. In set I, 5.6 kg F₁ seeds were obtained from 15 crosses and in set II, 8.3 kg F₁ seeds were produced from 21 crosses for evaluation in the next year with different objectives.
- Selected 80 crosses of field corn and 20 crosses of baby corn were produced. Total 63.23 kg F₁ seeds obtained for next year multilocation trials.

G. Maintenance and seed increase of parental/inbred lines

- Twenty one parental lines (Set I) of BARI released hybrid varieties were grown at BARI, Joydebpur, Gazipur and nine parental lines (Set II) at Nashipur, Dinajpur. Total 5.12 kg seeds were obtained from 21 parental inbred lines and 23.94 kg from

nine parental lines and stored for maintenance of those inbred lines in the next rabi season.

- Ten parent lines of BARI released hybrid varieties were grown at Hathazari, Chattogram, Jashore, Jamalpur, Ishurdi, Gazipur, Rangpur, Cumilla, Bogura, Borishal, Dinajpur, Rajshahi, Kishoregonj and Thakurgaon to maintain and increase seeds. Total 1960 kg breeder seeds were produced.

H. Seed Production of BARI released hybrids

- Parents of six BARI released hybrids (BARI Hybrid Maize 7, BARI Hybrid Maize 9, BARI Hybrid Maize 12, BARI Hybrid Maize 13, BARI Hybrid Maize 15 and BARI Hybrid Maize 16) were grown and produced 5491 kgF₁ seeds at Bogura, Gazipur, Jashore, Panchagor (Debigonj), Thakurgaon and Dinajpur (Rajbari, Nashipur) and stored for distribution and experimental use in the next rabi season.
- Ten promising maize hybrids (BMZ 4 × CML 487, BMZ 15 × CML 487, BMZ 57 × CML 487, BIL 79 × CLO 2450, CML 433 × CLO 2450, BHM 7 × CLO 2450, BIL 79 × BIL 157, CML 465 × BIL 157, ZH15445 and F-14 × M-15) were grown in Ishwardi, Jamalpur, Narsingdi, Thakurgaon and Dinajpur at isolation. Total 168.98 kg hybrid seeds were obtained and stored for further evaluation.
- One composite variety (Khoibhutta) produced 607 kg seeds at Gazipur (HQ), Patuakhali (Labukahli) and Chottogram (Hathazari).

I. Maize biotechnology: molecular breeding

- Antioxidative capacity between C3 (barley) crop, BARI barley-5 (BB-5), BARI barley-7 (BB-7) and C4 (maize) crop, BARI hybrid maize-5 (BHM-5) and BARI hybrid maize-7 (BHM-7) were studied with ROS and their metabolizing enzymatic isozymes analysis. In both crops, ROS (O₂⁻ and H₂O₂) were found to be accumulated enormously under drought, being remarkable higher in barley. Although SOD activity increased in BB-5, SOD activity was abundance in maize in both specific and isozymes analysis. Similar results were found for CAT. However, POD activities increased in only BHM-7. On the other hand, APX activity increased in BHM-7, BB-5 and BB-7). However, APX1 and APX2 increased in maize. GPX activity was increased in BHM-7, BB-5 and BB-7. Considering all, abundance rather induction was responsible for lower ROS in maize.

J. Technology transfer activities

- Twenty five imported hybrids and 4 BARI released hybrids (BHM 7, BHM 9, BHM 12 and BHM 13) were evaluated at six locations viz. Gazipur, Jashore, Jamalpur, Rangpur, Hathazari and Dinajpur. Hybrid 25K60 (12.52 t/ha), 9120 (12.1 t/ha) and Gourob (11.96 t/ha) exhibited as high yielding and stable over all environments where as Pacific 224 (11.95 t/ha) and 987 (12.12 t/ha) gave high yield but unstable over locations. BHM-13 (11.22 t/ha) obtained the highest yield among four BARI released hybrids. Among the six environments, Dinajpur was found suitable for hybrid maize cultivation followed by Jashore and Rangpur.
- One barley variety (BARI Barley 9) is released in 2019. The important features are, **BARI Barley 9**
 - The variety is widely adaptable to the marginal land and barind area, hull less, six row, plant height (100 cm) and high yielding (grain yield 2.2 t/ha and straw yield 4.2 t/ha).
 - The variety takes about 97-99 days to mature.

- Training: Three programs on maize and one program on minor cereal crops were conducted for scientist, seed company, NGOs' and DAE personnel (90 participants), SAAO, SSA, SA (30 participants) and farmers (1140 participants).
- Field days: Fourteen field days of maize (700 participants) and four field days of minor cereals (200 participants) were conducted.
- An adaptive trial was conducted at Faridpur, Pabna, Sherpur and Bogura to evaluate the performance of six BARI Hybrid Maize (BHM) varieties with six imported varieties/lines. Among the BARI Hybrid Maize (BHM) varieties, BHM 7 (10.43t/ha), BHM 12(10.81t/ha) and BHM 13 (10.87t/ha) showed higher yield whereas imported varieties/lines, Elite (11.50 t/ha), Pacific (12.36 t/ha) and HTMA-19 (10.25 t/ha) exhibited higher yield. Among the locations, the highest yield was obtained from Sherpur, followed by Pabna and Faridpur.
- Sixteen advanced lines of hybrid maize were evaluated at Pouli village under Sadarthana of Manikganj district. The trial was laid out in RCB design with three replications. The highest grain yield was obtained by BARI Hybrid 16(13.21 t ha) followed by P9 (12.73 t/ha), P12 (12.47 t/ha), P8 (11.94 t/ha), P10 (11.68 t/ha), P6 (11.35 t/ha) and P13 (11.35 t/ha).
- Four BARI released hybrid maize varieties and five imported varieties were evaluated in an adaptive trial at Cumilla, Tangail, Manikganj and Kushtia. BHM 7 (9.49 t/ha), BHM 9 (11.10 t/ha) and BHM 13 (9.21 t/ha) showed higher grain yield among the BARI Hybrid Maize varieties where as Miracle (14.0 t/ha) and Kaberi 7720 (11.92 t/ha) gave higher grain yield among the imported varieties. The highest yield was obtained from Manikganj followed by Cumilla, Kushtia and Tangail.
- Demonstration program was conducted at the farmers' field of Haripur in Dauadkandi upazilla and Amratali in Barura Upazilla under Cumilla district with BARI Hybrid Maize 9 and NK-40 (check) to evaluate, disseminate and popularize the BARI released Hybrid Maize variety among the farmers and private agencies. BARI Hybrid Maize 9 (9.53 t/ha) showed the highest grain yield over check NK-40 (8.95 t/ha).

Barley, Millets and Sorghum Improvement

A. Barley variety development

Hybridization of barley

- Ten selected genotypes (variety and advanced lines) were crossed in half diallel (10×10) fashion to develop early, dwarf and high yielding hull-less barley variety. Forty five cross combinations produced total 2086 number of seeds and preserved for next year confirmation trial.
- Seven selected genotypes (variety and advanced lines) were crossed in half diallel (7×7) fashion to develop early, dwarf and high yielding hull-less barley variety. Twenty one cross combinations produced total 956 number of seeds and preserved for next year confirmation trial.

Confirmation of F₁ generation

- Among the 28 crosses, 8 combinations were selected for better heterosis of yield and yield contributing traits.

Evaluation

- Eighty eight (88) individual plants/family were selected from 34 crosses/families of four different filial generations (F₂, F₃, F₅, F₆).
- Twenty one hull-less barley lines were evaluated and among them eight barley lines (INBYT-18- E5, INBYT-18 E6, INBYT-18 E14, IBON-18 L-24, IBON-18 L-53,

INBON-HI/18 L-9, INBON-HI/18 L-84 and INBON-HI/18 L-90) were found promising (yield range 2.5 to 3 t/ha) and selected for further evaluation.

- Six hull-less advance barley lines were evaluated with BARI Barley 7 at Gazipur, Jamalpur and Ishwardi. The genotype E2 (2.51 t/ha), E6 (2.33 t/ha) and E7 (2.45 t/ha) are high yielding but responsive to environmental change on the other hand E4 (2.11 t/ha) were found stable over all environments.
- Seven hull-less advance barley lines were tested including check BARI Barley 7 at Gazipur, Jamalpur, Patuakhali and Ishwardi. Genotype E2 (2.97 t/ha), E3 (2.91 t/ha) and E5 (2.93 t/ha) were found desirable and considered as high yielding and stable.
- Four hull-less advance barley lines were evaluated with BARI Barley 6 at Gazipur, Jamalpur and Ishwardi. Among the tested genotypes Esmaralda M-104/12 exhibited higher overall mean grain yield (2.12 t/ha) and showed stability across the environments compared to other genotypes.
- One hundred and thirty eight barley lines received from ICARDA were evaluated at Gazipur. Among them 7 lines viz. E3, E11, E19, E24, E41, E53 and E69 were selected based on yield ranged from 2.20-2.58 t/ha, overall performance and earliness.
- Seventeen barley lines including nine BARI released varieties were tested for saline tolerance at Amtoli, Borguna; Kolapara, Patuakhali and Dakope, Khulna. Salinity level increased with growing period, where 11.72 dS/m, 10.76 dS/m and 8.02 dS/m were recorded at last week of March, 2019. Considering all, Atalpha/12 (199.5 g/m²), BHL-27 (197.7 g/m²), INBON L21/15 (180.7 g/m²) and BARI barley 6 (180.3 g/m²) were selected for further evaluation.

B. Millets and Sorghum Variety Development

- Five finger millet genotypes were evaluated under regional yield trial at Gazipur, Jamalpur, Rangpur and Ishwardi. Genotype E1 (4.36 t/ha) and E3 (4.06 t/ha) were found to be desirable and considered as high yielding and stable.
- Four exotic pearl millet germplasm were evaluated at three different locations (Gazipur, Jamalpur and Rangpur). Considering overall mean yield and other desirable characters all exotic pearl millet germplasm viz., IP3706 (3.05 t/ha), IP5711 (2.78 t/ha), IP5793 (2.77 t/ha) and IP13523 (2.72 t/ha) may be selected for large plot yield trial in the next year.
- Eight advanced sorghum lines were evaluated across three different locations viz. Gazipur, Noakhali and Shatkhira. Considering the mean yield and other desirable characters three lines E6 (1.42 t/ha), E7 (1.31t/ha) and E8 (1.31 t/ha) were found suitable.
- Ten proso millets genotypes including one check variety (BARI Cheena 1) were evaluated under regional yield trial at Rangpur, Gazipur and Jamalpur. Based on overall mean yield and other desirable characters four proso millets genotypes i.e., BD1411 (2.41 t/ha), BD 777 (2.39 t/ha), BD764 (2.34 t/ha) and BD780 (2.31 t/ha) may be selected for large plot yield trial in the next year.
- Thirty five pre-selected early, short stature and high yielding proso millet lines with one check from a previous trial of 116 exotic proso millet germplasm grown under normal condition at Gazipur. Considering all the studied characters 14 germplasm BD-761, BD-791, BD-1398, BD-1399, BD-1400, BD-1405, BD-1436, BD-1437, BD-1446, BD-1454, BD-1459, BD-1486, BD-1487 and BD-1488 were found promising considering earliness, short stature and higher yield.
- Twenty four foxtail millets genotypes with two check varieties (BARI kaon 1 and BARI kaon 2) were evaluated at Gazipur. Considering yield and other yield contributing characters BD-862 (days to heading 70 days and yield/plot 90 g) and BD-

1063 (days to heading 85 day and yield/plot 101 g) for earliness and BD-1259 (220 g) followed by BD-1264 (200g), BD-1256(180g) and BD-1284 (180g) for high yield were selected for next year trial.

- Four genotypes along with two check varieties of foxtail millets viz. BARI kaon 1 and BARI kaon2 was assessed for genotype environment interaction (GEI) and stability for selection of the best foxtail millet lines at four different locations (Gazipur, Jamalpur, Burirhat and Ishwardi). Among the tested foxtail millet lines, E1 (2.90 t/ha) and E4 (2.73 t/ha) showed high yield and are more stable to select for further evaluation and commercialization.

C. Buckwheat and oat variety development

- Four genotypes of buckwheat received from PGRC, along with one check collected from Bogura were evaluated at BARI, Gazipur. Considering yield and yield contributing characters genotype E3(268.8 g/plot) was found promising for next yield trial.
- One oat line BD-4271 was maintained and total 11.0 kg seed was obtained and preserved for future breeding program.

D. Seed production

- Total 738 kg of breeder seed of nine barley varieties viz. BARI Barley 1, BARI Barley 2, BARI Barley 3, BARI Barley 4, BARI Barley 5, BARI Barley 6 BARI Barley 7, BARI Barley 8 and BARI Barley 9 were produced at four different locations (Gazipur, Burirhat, Ishwardi and Debigonj).
- Total 314 kg breeder seed of BARI released foxtail millets and proso millets (BARI kaon 1, BARI kaon 2, BARI kaon 3 and BARI Cheena 1) varieties and 100 kg truthfully labeled seed of BARI Kaon 2 were produced at four locations (Gazipur, Jamalpur, Debigonj and Ishwardi).
- Total 24.9 kg seeds were produced from five selected pearl millet germplasm for next year trial at four different locations (Gazipur, Jamalpur, Burirhat and Ishwardi).
- Total 70kg seeds were produced from 5 selected sorghum germplasm at four different locations (Gazipur, Jamalpur, Burirhat and Ishwardi).

E. Minor cereals biotechnology: molecular biology

- Oxidative stress tolerance in three Kaon (Foxtail millet) varieties BARI Kaon1 (BK 1), BARI Kaon 2 (BK 2) and BARI Kaon 3 (BK 3), was studied in drought condition by analyzing both specific and in-gel activities of ROS metabolizing enzymatic isozymes analysis of SOD, CAT, POD, APX and GPX. 25%FC and 12.5%FC were treated as mild (DR1) and severe stress (DR2), respectively. ROS ($O_2^{\cdot-}$ and H_2O_2) were found to be accumulated remarkably under drought in all the Kaon varieties, being comparatively lower in BK 3. All the varieties maintained almost similar level of SOD activity under stress. On the other hand, CAT, POD and GPX activities increased with stress severity in BK 3. Contrary, higher APX were found in BK 1 and BK 3.
- An attempt was taken to purify glutathione S-transferases (GSTs; EC 2.5.1.18), glyoxalase I (Gly I; EC 4.4.1.5) and catalase (CAT; EC 1.11.1.6) from fresh barley (BARI Barley 6) panicle. GST, Gly-I and CAT were purified from fresh barley panicle. The concentration of the protein was very poor. Therefore, there is still scope to improve the protein concentration. Therefore, the experiment should be repeated.
- Ten barley line and seven sorghum genotypes were screened for salinity tolerance in pots containing three treatments of NaCl (Control, 8 dSm⁻¹ and 12 dSm⁻¹) solution in a completely randomized design with three replications. Among barley genotypes BHL-27, Atalpha/12, Esmaralda M-104/12 and INBON L21/15 and among sorghum

genotypes IS-29468, IS-21891 and IS-9745 showed better performance in 8 dSm⁻¹ and 12 dSm⁻¹ salt concentration.

- Eight hull-less barley lines along with two standard checks BARI Barley 7 and BARI Barley 9 were screened for drought tolerance at greenhouse lab of BARI, Gazipur. Considering all, BHL-25 and BHL-26 were selected for further evaluation in field condition.
- Seventeen genotypes including nine BARI released varieties of barley (*Hordeum vulgare* L.) were screened against spot blotch disease caused by *Bipolaris* under natural condition to find out resistant genotype. Among the 17 tested genotypes only two genotypes viz. Atalpha and E3 were resistant and five genotypes (BB 2, BB 3, BB 5, BB 6 and BB 7) were moderately resistant against barley spot blotch.

F. Technology transfer- minor Cereals

- The adaptive trial was conducted at the farmer's field Basantapur, Godagari, Rajshahi; Koyra, Khulna and Subarnachar Upazilla under Noakhali district with three barley varieties (BARI Barley 6, BARI Barley 7 and BARI Barley 8) and four barley advance lines (BHL-25, BHL-26, BHL-27 and BHL-29) to select high yielding barley advance lines for drought/saline areas. Out of eight barley varieties/lines BHL-27 gave the highest grain yield (2.19 t/ha) in Rajshahi followed by BARI Barley 7 (2.13t/ha) in Khulna.
- An adaptive trial was conducted at Bhuapur, Tangail; Saghata, Gaibandha and Sariakandi, Bogura with two BARI varieties of barley (BARI Barley 6 and BARI Barley 7) and local cultivars to observe the performance and popularize BARI Barley varieties in Char areas. BARI Barley 6 (yield range: 1.65 to 2.50 t/ha) was the most promising variety among all the tested varieties/ local cultivars in all three char areas.
- The adaptive trial was conducted at four farmer's field of Subarnachar upazilla with three BARI developed foxtail millet varieties (BARI Kaon 1, BARI Kaon 2 and BARI Kaon3) to disseminate and popularize BARI foxtail millet varieties in saline area where initial soil salinity level (15 DAS) was below 1 dSm⁻¹. Among the tested varieties the highest grain yield was observed in BARI Kaon2 (1.66 t/ ha).
- An adaptive trial was conducted at the farmer's field of Melandah, Jamalpur and Bhuapur, Tangail under charland; Basantapur, Rajshahi under barind area and Dolupara and Tukhungpara hill valleys in Bandarban district with 3 BARI developed foxtail millet varieties (BARI Kaon 1, BARI Kaon 2 and BARI Kaon3) including one local cultivar only in Bandarban to disseminate and popularize BARI foxtail millet varieties in these areas. Considering the yield potentiality, BARI Kaon3 (3.10 t/ha) was promising in Jamalpur location but BARI Kaon2 (yield range: 0.19-2.64 t/ha) was better in Rajshahi, Tangail and Bandarban district.
- A demonstration trial of BARI Cheena1 (1.21 t/ha) variety was conducted at Basantapur, Godagari, Rajshahi to disseminate and popularize BARI proso millet (Cheena) variety in barind areas.