BWMRI

Annual Report

2021-2022

Bangladesh Wheat and Maize Research Institute
Nashipur, Dinajpur 5200
13 August 2022

BWMRI Annual Report 2021-22

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BANGLADESH WHEAT AND MAIZE RESEARCH INSTITUTE
Nashipur, Dinajpur-5200

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BWMRI Annual Report 2021-22

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PREFACE

Wheat and maize are the two important cereals next to rice in Bangladesh and playing an important role in attaining food and nutritional security. During 2021-22, 1.17 million ton of wheat was produced from -0.32 million ha that can meet only 20% of the national requirement. On the other hand, demand of wheat has been increasing every year at the rate of 13% due to rapid changes in dietary habit, socio-economic upliftment, enhancement of per capita income, rapid growth of fast food restaurant, establishment of branded bakery and biscuit industries, etc. There is significant increase in wheat productivity of 3.65 t/ha in 2021-22 which was possible through dissemination of high yielding, disease resistant and stress tolerant varieties and improved management practices to the farmers.

Although maize is not a staple food cereal yet in Bangladesh, but presently it is the third most important cereal after rice and wheat. During 2021-22, 5.63 million ton of maize was produced from 0.55 million ha of land, whereas the annual grain requirement is about 7.0 million tons. Current national average yield of maize is 10.2 t/ha which is due to the introduction of hybrids and adoption of appropriate crop management practices. Demand of maize is increasing in Bangladesh day by day due to its' increasing demand for poultry, fish and animal feed and production of different types of processed foods, and also for export.

Bangladesh Wheat and Maize Research Institute (BWMRI) is entrusted to the research works for the improvement of wheat and maize in Bangladesh. This report contains the results of research activities conducted during 2021-22 across the country. Major thrust was given to develop high yielding wheat and maize varieties with resistance/tolerance to ranges of abiotic (heat, drought, salinity) and biotic (diseases) stresses and fitting well to the existing cropping systems. Variations and recombination have been creating through hybridization every year at BWMRI to generate new genetic stocks and select climate resilient and disease resistant varieties. Moreover, Marker Assisted Breeding has been introduced to bring new momentum in the variety improvement programme. Special research programme has been undertaken in collaboration with CIMMYT, KSU, CSIRO, ACIAR, SLU, KGF, UQ-Australia and USAID to develop abiotic (heat, drought, salinity) and biotic (diseases) stresses wheat and maize varieties.

A wheat blast: precision phenotyping platform (PPP) has been established at RARS Jashore with CIMMYT/ACIAR funding for large scale screening of against wheat blast. Three blast resistant/tolerant varieties have been developed by evaluating under this platform. Few blast resistant genotypes also identified for further observation. A large number of germplasms were received from CIMMYT have enriched our wheat genetic stock for proper evaluation and screening. Results of variety development, crop and soil management, participatory variety selection, disease management, farm machinery made the report a valuable document of BWMRI activities.

BWMRI has also been testing exotic hybrids received from CIMMYT through HTMA project, an USAID funded project led by CIMMYT in collaboration with private partners (BRAC, ACI Ltd. & Lal Teer Seed Ltd.). The aim is to identify better performing hybrids, targeted for heat stress prone areas and so far three heat resilient maize varieties have been released under this project and few are in pipeline. Every year a large number of germplasms were received from CIMMYT through HTMA project for phenotyping under heat stress and optimal condition. BWMRI is also collaborating with BRAC & ACI under Bangladesh Coordinated Maize (BCM) Trials with the objectives to join hands with the private maize growing partners to widen the testing network for maize hybrids in the country and to generate robust data through multi location (on-farm/on-station) trials on best-bet/final stage hybrids selected from on-station trials.

Besides, BWMRI produces nucleus, breeders and truthfully labelled seeds of wheat and maize for BADC, NGO, private sectors and farmers; imparts training to DAE, BADC, NGO personnel and farmers; conducts demonstration, workshops, field days, publications etc. All these attempts have been made to transfer the new technologies to the end users to enhance national wheat and maize productivity. In addition, results of different collaborative studies with NGOs and some donor agencies under project-aids have made this report worth.

Emphasis has been given to develop and refine other production technologies especially resource conservation technologies such as zero tillage, strip tillage and bed planting practices, and their economic analyses. Research thrust has also been given to modify and develop appropriate machinery for small farming and expand areas under mechanization.

Nevertheless, limited research works on triticale and durum are also going on to develop new varieties for food and feed.

It is a great pleasure to mention that first blast resistant and zinc enriched wheat variety BARI Gom 33 has been released in 2017 for commercial cultivation. Another two blast resistant/tolerant varieties WMRI Gom 2 and WMRI Gom 3 have also been released in 2020. Few promising blast resistant advanced lines are in the pipe line for release as varieties. Besides these wheat varieties, maize varieties WMRI Hybrid Maize 1; WMRI Hybrid Baby Corn 1 and BWMRI Hybrid Maize 2 were released in 2020 and 2022, respectively.

I convey my sincere thanks and gratitude to the BARI authority, CIMMYT, BGRI, Cornell University, KARLO-Kenya, USDA-ARS, KSU and the donor agencies like University of Queensland, CSIRO, ACIAR, SLU, ARRCC, Cambridge University, USAID, and KGF for their extended cooperation and support for wheat and maize research and development in Bangladesh.

I acknowledge with great thanks, the contributions of the scientists of BWMRI who at the expenses of hard work and sincere devotion have completed this report. Share of thanks also goes to the scientific staffs for their help in collecting field data along with the scientists and office staff to make the research activities successful.

I think this is going to be a valuable documents for those who are concerned with wheat and maize research and development activities in Bangladesh and beyond.

Director General

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Photo: On-going Researches in the Research Field of Bangladesh Wheat and Maize Research Institute

PROJECT 1. WHEAT VARIETY DEVELOPMENT

The main objective of this programme is to develop high yielding bread wheat, durum wheat and triticale varieties with tolerance/resistance to biotic and abiotic stresses and having wide range of adaptability with a view to enhance wheat productivity in Bangladesh. Development of early maturing heat tolerant, wheat blast, BpLB and leaf rust resistant/tolerant variety has been given the highest research priority under the context of global climate change. Due emphasis has also been given to develop varieties against other abiotic stresses like drought, salinity, boron-deficiency, etc. Genetic improvement through incorporating stress adaptive traits into good agronomic background is being duly emphasized in the variety development programme. In addition, research thrust has been put forward towards developing varieties with improved nutritional quality. Efficient deployment of resistance genes into the genotypes with good agronomic background for major diseases like leaf rust, bipolaris leaf blight, stem rust, etc. is also considered as a priority area. The performance of newly developed wheat lines from national and international sources specially CIMMYT is being evaluated under different growing environments across the country and promising lines superior to the standard check varieties are selected.

Photo: Crossing block for development of wheat varieties suitable for changing climate

Apart from that, BWMRI maintains a unique crossing block having germplasm from diverse sources those are utilizing for hybridization. Segregating generations are advanced following selected bulk method. Every year hundreds of new lines are being added in the nurseries/trial for performance evaluation. Wheat research activities on variety development during 2021-22 are described in this report.

HYBRIDIZATION

MA HAKIM, MZ ISLAM, MSN MANDAL, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, MM RHMAN, MA MAMUN AND R ISLAM

Abstract

The hybridization programme has been conducted at three research stations: Dinajpur, Joydebpur, and Jamalpur. A total of 615 single crosses in which 155 crosses were targeted to blast resistance, 114 top and 26 limited back crosses were made this year to incorporate the desired genes in the adapted genotypes. The crosses made will be confirmed in next year.

CONFIRMATION AND SELECTION IN F_1 GENERATION

MZ ISLAM, MSN MANDAL, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSAN, MF AMIN, MM RHMAN, MR ISLAM, MA MAMUN AND R ISLAM AND MA HAKIM

Abstract

On the basis of phenotypic expression of hybrids with their respective female parents 467 F_1 populations derived from single crosses were confirmed as hybrids. In addition, 92 Top cross and 20 Back cross F_1 populations were selected.

EVALUATION AND SELECTION IN DIFFERENT FILIAL GENERATIONS

MA HAKIM, MZ ISLAM, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, MM RHMAN, MA MAMUN AND R ISLAM

Abstract

Selected bulk method was followed during selection in F_2 to F_4 segregating generations. In F_5 pedigree method was followed. Selections were based on good vigor, earliness, medium height, disease and sterility tolerance and resistance, etc. The F_2 families were thoroughly evaluated in the field and 277 families were selected out of 553. One hundred forty three F_3 families and 138 F4 families were selected out of 252 and 181 families, respectively. A total of 90 F_5 families were selected from 155 families from where 1221 individual plants were selected based on field performance and physical grain characteristics. One hundred seventeen F_6 families out of 424 were selected for inclusion them in Bangladesh Wheat Screening Nursery (BWSN) for next season.

GERMPLASM MAINTENANCE

MM HOSSAIN, MA HAKIM, MZ ISLAM, MR KABIR, AA KHAN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, MM RHMAN AND R ISLAM

Abstract

Germplasm collection is maintained in germplasm observation nursery. A total of 211 wheat genotypes were included in this nursery. These materials were collected from different national and international nurseries with special characteristics and are being maintained for future use.

BANGLADESH WHEAT SCREENING NURSERY-I (BWSN-I)

MM RAHMAN (Jam), MR KABIR, MA HAKIM, MM HOSSAIN, M FARHAD, MF AMIN, MAA MAMUN, AA KHAN, R ISLAM

Abstract

Seventy genotypes along with two check varieties BARI Gom 32 and BARI Gom 33 were evaluated in this nursery at Bangladesh Wheat and Maize Research Institute, Dinajpur, Gazipur and Jashore under irrigated timely sown (ITS) and irrigated late sown (ILS) conditions. There was significant difference in yield and other characters between two seeding dates. The genotypes showed significant variation for all the traits. Based on overallperformances, 20 genotypes viz., E-4, E-6, E-14, E-16, E-18, E-19, E-20, E-22, E-23, E24, E-25,E-26, E-27, E38, E-44, E-45, E-51, E-53, E-62 and E-72wereselectedforinclusion in PYT nextyear. The selected genotypes had high yield, bold and plump grains with better tolerance to blast and Bipolaris leaf blight (BpLB) and resistant to leaf rust diseases.

BANGLADESH WHEAT SCREENING NURSERY-II (BWSN-II)

MR KABIR, MA HAKIM, MZ ISLAM, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, MM RHMAN AND R ISLAM

Abstract

Sixty six genotypes selected from different international nurseries and trials including Shatabdi and BARI Gom 33 as local checks were evaluated in this nursery at Bangladesh Wheat and Maize Research Institute, Dinajpur and Jamalpur under irrigated timely sown (ITS) and irrigated late sown (ILS) conditions. There was significant difference in yield and other characters except for maturity days between two locations. The genotypes showed significant variation for all the traits. Based on overall performances nine genotypes viz, E-12, E-26, E-40, E-43, E-46, E-47, E-50, E-53 and E-56 were selected for inclusion in PYT next year. The selected genotypes had high yield, bold and plump grains.

BANGLADESH WHEAT SCREENING NURSERY-III (BWSN-III)

AA KHAN, MM RAHMAN, MA HAKIM, MZ ISLAM, MR KABIR, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, MM RHMAN AND R ISLAM

Abstract

Fifty genotypes selected from different international nurseries and trials along with Shatabdi and BARI Gom 32 as local checks were evaluated in this nursery at Bangladesh Wheat and Maize Research Institute, Dinajpur under irrigated timely sown (ITS) and irrigated late sown (ILS) conditions. There was significant difference in yield and other characters two seeding dates. The genotypes showed significant variation for all the traits. Based on overall performances 5 genotypes viz. E-12, E-27, E-39, E-43 and E-50 were selected for inclusion in PYT next year. The selected genotypes had high yield, bold and plump grains with better tolerance to Bipolaris leaf blight (BpLB) and resistant to leaf rust diseases.

PRELIMINARY YIELD TRIAL (PYT)

MA HAKIM, MZ ISLAM, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, MM RHMAN, R ISLAM AND MA MAMUN

Abstract

Thirty three advanced lines including check varieties Shatabdi, BARI Gom 32 and BARI Gom 33 were evaluated at Bangladesh Wheat and Maize Research Institute, Dinajpur, Gazipur, Jashore and Rajshahi in alpha lattice design with two replications under irrigated timely, irrigated late sown conditions. In Dinajpur the trial was also sown under irrigated very late sown condition. The genotypes were evaluated for yield and yield components, heading, maturity, disease reaction, sterility, visual grain quality, etc. The highest grain yield (5951 kg ha^{-1}) was obtained in BAW 1415 at Dinajpur in ITS condition. The lowest grain yield (1923 kg ha^{-1}) was obtained in BAW 1416 at Rajshahi under ILS condition. Considering mean performance across location and sowing time, out of eight selected genotypes, six produced higher grain yield than check variety Shatabdi (3514 kg ha^{-1}). The highest TGW (61g) was achieved in BAW 1420 in ITS conditions at Dinajpur. The lowest TGW (21g) was found in BAW 1419 in ILS conditions at Gazipur. The selected genotypes showed good level of resistance to both leaf rust and wheat blast. Considering the overall performance, 13 genotypes viz BAW 1426, BAW 1427, BAW 1429, BAW 1430, BAW 1432, BAW 1433, BAW 1434, BAW 1435, BAW 1436, BAW 1438, BAW 1439, BAW 1440 and BAW 1455 were finally selected for testing in AYT next year.

ADVANCE YIELD TRIAL (AYT)

MZ ISLAM, MA HAKIM, MR KABIR, MA ALAM, MM HOSSAIN, MM RAHMAN, MF AMIN, MM HASSAN, MM RHMAN, AA KHAN, MA MAMUN

Abstract

Eight advance lines were evaluated against three check varieties, BARI Gom 30, BARI Gom 32 and WMRI Gom 1 at BWMRI, Dinajpur, Gazipur, Jashore, Rajshahi and Jamalpur in RCB factorial design with three replications. The trial was conducted under irrigated timely sown and irrigated late sown conditions. The genotypes were evaluated for yield and yield components, phenology, disease reaction, visual grain quality, etc. The effect of sowing time, location and genotypes and their interaction was significant for different traits studied. BAW 1425 (4260 kg ha^{-1}) and BAW 1422 (4250 kg ha^{-1}) were out yielded all the checks across location and sowing time. The highest yield was achieved in BAW 1422 (5430 kg ha^{-1}) at Jashore under ITS condition identically similar yield was found at Dinajpur under ITS condition by same genotype (5420 kg ha^{-1}). The lowest yield was recorded in check BARI Gom 30 (2310 kg ha^{-1}) at Rajshahi under ILS condition. Thousand grains weight of selected genotypes were at par check varieties. All the selected lines exhibited equal or lower yield losses due to late seeding condition. Considering the overall yield and other characters the genotypes, BAW 1425, BAW 1411, BAW 1408 and BAW 1407 were finally selected for further evaluation in candidate variety trial next year.

CANDIDATE VARIETY DEMONSTRATION (CVD)

MM HOSSAIN, MA HAKIM, MZ ISLAM, MR KABIR, AA KHAN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, MM RHMAN, R ISLAM AND MA MAMUN

Abstract

Ten advanced lines and check varieties BARI Gom 32 and WMRI Gom 1 were evaluated in CVD under irrigated timely seeding (ITS) and irrigated late seeding (ILS) conditions. The genotypes were evaluated based on yield and yield contributing characters, disease resistance, lodging tolerance, physical grain characteristics etc. Considering overall performance five genotypes BAW 1286, BAW1322, BAW 1340, BAW 1397 and BAW1401 have been selected for same trial and on-farm evaluation in farmers' field next year.

EARLY HEAT TOLERANCE WHEAT SCREENING NURSERY (9thEHTWSN)

MM HOSSAIN , MA HAKIM, MZ ISLAM,MSN MANDAL, MR KABIR, AA KHAN , M FARHAD, MA MAMUN, MM RAHMAN AND R ISLAM

Abstract

Thirty two high yielding spring wheat genotypes including three check varieties BARI Gom 30 and BARI Gom 32 and WMRI Gom1 were evaluated at Bangladesh Wheat and Maize Research Institute, Dinajpur under early sown condition during Rabi, 2021-22. The experiment was undertaken to study the effect of early heat stress for yield and yield components. Significant variations were observed among the genotypes for all the traits studied. Considering plant stature, phenology, grain characteristics and grain yield nine entries (E-5, E-8, E-9, E-10, E-11, E-16, E-21, E-23 and E-24) were selected for further evaluation in the next year. Among the selected entries E-23 and E-8 were found top yielder with other outstanding characteristics.

MOLECULAR SCREENING OF BLAST AND LEAF RUST RESISTANCE WHEAT GENOTYPES USING MOLECULAR MARKERS

M FARHAD, MM HOSSAIN, MA HAKIM, MZ ISLAM, MR KABIR, AA KHAN, MM RAHMAN, MM HASSANN, MF AMIN, MM RHMAN, R ISLAM AND MA MAMUN

Abstract

Wheat blast and leaf rust are the two important biotic threat in Bangladesh. Several wheat varieties developed in Bangladesh have become susceptible for these two diseases. Therefore, development and dissemination of resistant/tolerant wheat varieties would be the most effective way to control these two fearsome diseases. It has been proved that 2NS translocation from *Aegilops ventricosa* expresses resistance to wheat blast in most background. On the other hand, several *Lr* genes have been identified to boost the leaf rust resistance in wheat. A total of 96 wheat genotypes including existing varieties were screened to find out wheat blast and wheat leaf rust resistance. We used *Lr10* and *Lr26* for leaf rust and 2NS marker for the screening. Among our released varieties, BARI Gom 33 and WMRI Gom 3 have shown positive for 2NS segment, Sonora, Inia, Sonalika, Balaka, Pavan, Anando, Kanchan, Akbar, Barkat, Aghrani, Protiva, Sourav, BARI Gom 21, BARI Gom 22, BARI Gom 23, BARI Gom 24, BARI Gom 26, BARI Gom 27, BARI Gom 28, BARI Gom 29, BARI Gom 32, BARI Gom 33, WMRI Gom 01, WMRI Gom 02 and WMRI Gom 03 have shown positive for *Lr10* and Sourav, Gourav, BARI Gom 22, BARI Gom 24 and BARI Gom 29 have shown positive for *Lr26*. Furthermore, it was observed that 36 lines had positive band for *Lr10*, 23 lines had positive band for 2NS and 16 lines had positive band for *Lr26*. Deployment of newer sources of leaf rust were found in the latest genetic materials compared to the old parental stalk or varieties. Harnessing source of wheat blast is continuing to the advanced lines in both national crosses and introduced wheat advanced lines from CIMMYT. Molecular screening for disease resistance will be continuing at the Molecular Breeding Laboratory to support the development of disease resistant wheat varieties in wheat breeding program of BWMRI.

DEVELOPMENT OF BLAST RESISTANT/TOLERANT VARIETY

MR KABIR, MA HAKIM, MZ ISLAM, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, MM RHMAN, R ISLAM AND MA MAMUN

Abstract

Development of wheat blast resistant variety is one of the most effective ways of managing wheat blast. Each year targeted crosses are being made using 2NS based resistant wheat lines and local cultivar. The hybridization was initiated in 2016-17. The most advance cross is in F5 generation. The crosses are advancing and will be evaluated in nurseries and trials.

ACCELERATING WHEAT BREEDING PROGRAM THROUGH CUTTING EDGE GENOMICS AND PHENOTYPIC TECHNOLOGIES

MM RAHMAN (Jam), MA HAKIM, MZ ISLAM, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM HASSANN, MF AMIN, MM RHMAN, R ISLAM AND MA MAMUN

Abstract

Secondary traits such as spectral reflectance and canopy temperature (CT), which are possible to rapidly measure many times throughout the growing season, are frequently correlated to grain yield and could be used for indirect selection on very large populations. The objective of this study was to monitor wheat growth and predict grain yield in wheat using high-density temporal proximal sensing measurements and yield components under extreme terminal heat stress that is common in Bangladesh. We analyzed normalized difference vegetation index (NDVI) and CT measurements collected in two sets of 480 advanced breeding lines from the International Maize and Wheat Improvement Center (CIMMYT) at the BWMRI, Regional Station, Jamalpur. To optimize use of the phenotypic datasets, several variable reduction and regularization techniques followed by using a cross-fold validation approach was explored to predict grain yield. The multivariate models gave higher prediction accuracies for grain yield than the univariate models. Ridge regression performed as well or better in predicting grain yield than other models. Strikingly, when incorporating all secondary traits into the models, we were able to obtain high prediction accuracies of 0.46 for 2021-22 growing season. Our results showed that the optimized phenotypic prediction models can leverage secondary traits to deliver highly accurate prediction of wheat grain yield, allowing breeding programs to make more robust and rapid selections.

ELITE SPRING WHEAT YIELD TRIAL (42thESWYT)

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Abstract

Fifty wheat genotypes selected for mega-environment one and received through CSISA project of CIMMYT, Mexico were evaluated at the Bangladesh Wheat and Maize Research Institute (BWMRI), Dinajpur in Alpha-lattice design. The genotypes were evaluated for yield, heading, maturity, plant height, number of grains per spike, 1000 grain weight, Bipolaris leaf blight, spike sterility tolerance, leaf rust resistance, physical grain characteristics etc. On the basis of overall performance six entries (E-103, E-104, E-133, E-135, E-146 and E-149) had selected for further evaluation in Bangladesh wheat screening nursery next year.

INTERNATIONAL BREAD WHEAT SCREENING NURSERY (54th IBWSN)

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Abstract

The International bread wheat screening nursery was conducted at BWMRI, Dinajpur, during rabi 2021-22 for evaluating the genotypes tolerant to heat. A total of 284 entries were sown in ILS condition and was laid out in augmented design with non-replications. 11 genotypes were selected considering field performance, yield contributing characters, seed color, plant height, heading days in late sowing condition.

HIGH TEMPERATURE WHEAT YIELD TRIAL (20TH HTWYT)

MM RAHMAN(Gazi), R ISLAM, MA HAKIM, MZ ISLAM, MSN MANDAL, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, AND MA MAMUN

Abstract

Fifty genotypes selected by CIMMYT, Mexico for high temperature, irrigated environments were evaluated in a trial at BWMRI, Gazipur and Rajshahi under late seeding condition. BWMRI recommended management was followed to raise the crop. The genotypes were evaluated for yield, heading, plant height, Bipolaris leaf blight and spike sterility tolerance, leaf rust resistance, physical grain characteristics etc. Considering overall performances, sixteen genotypes selected were selected for further evaluation in heat tolerant wheat yield trial next year.

SEMI-ARID WHEAT YIELD TRIAL (29th SAWYT)

MA MAMUN, MM RAHMAN, R ISLAM, MA HAKIM, MZ ISLAM, MSN MANDAL, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, AND MF AMIN

Abstract

A field experiment was conducted as title "Semi-Arid Wheat Yield Trial (29th SAWYT) consisted of 50 advanced, high yield potential wheat lines provided by CIMMYT, Mexico included local check variety Shatabdi at Dinajpur and RS,BWMRI, Rajshahi for evaluation yield potentiality under stress (drought) condition. The experiment was laid out in Alpha Lattice design with two replications. The genotypes were evaluated for yield, heading, sterility tolerance, visual grain quality, boldness of grains etc. On the basis visual grain performance and others yield contribution characters the four genotypes (E-305, E-313, E-319 and E- 344) were selected among the genotypes.

WHEAT YIELD CONSORTIUM YIELD TRIAL (9th WYCYT)

AA KHAN, MM RAHMAN, R ISLAM, MA HAKIM, MZ ISLAM, MSN MANDAL, MR KABIR, , MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, AND MA MAMUN

Abstract

Thirty-five elite wheat lines along with local check Shatabdi were evaluated at Dinajpur during 2021-22 wheat growing season. Among tested genotypes, the genotypes were evaluated for yield, heading, sterility tolerance, visual grain quality, boldness of grains etc. On the basis visual grain performance and others yield contribution characters the six genotypes (E-9, E-10, E-31, E-32, E-33 and E-34 were selected across location.

HIGH ZINC WHEAT YIELD TRIAL (12TH HZWYT)

MM HASSANN, MM RAHMAN, R ISLAM, MA HAKIM, MZ ISLAM, MSN MANDAL, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, , MF AMIN, AND MA MAMUN

Abstract

Forty-nine Zinc enrich wheat genotypes selected from international nurseries along with one check varieties Shatabdi were evaluated in the experimental field of BWMRI Dinajpur, Gazipur and Rajshahi during rabi 2021-22. Genotypes were tested for enriched micronutrient (Zn) concentration at CIMMYT, Mexico and selected for this study. The genotypes were grown under optimum condition with full irrigation. The experimental design was alpha lattice design with 2 replications. Significant variation was observed for most of the traits studied. Eighty percent of the tested genotypes out yielded the check variety Shatabdi (3710 kg ha-1). The genotypes showed a wide range of variation for grain yield ranging from 3580 kg ha-1 to 4290 kg ha-1. Among the genotypes, E-428 yielded the highest (4290 kg ha-1) followed by E-436 (4190 kg ha-1) and E-430 (4170 kg ha-1), respectively. Considering earliness, good agronomic traits; seed quality & yield potential and Zn content 12 genotypes E-410, E-412, E-414, E-417, E-423, E-425, E-427, E-428, E-43,3 E-434, E-444¸ and E-446have been selected for further evaluation. The selected micronutrient enriched lines will be promoted for yield trial across location.

HIGH ZINC ADVANCE NURSERY (13th HZAN)

M FARHAD, MM RAHMAN, R ISLAM, MA HAKIM, MZ ISLAM, MSN MANDAL, MR KABIR, AA KHAN, MM HOSSAIN, MM RAHMAN, MM HASSANN, MF AMIN, AND MA MAMUN

Abstract

Two hundred ninety-six elite genotypes, received from CIMMYT, Mexico were evaluated in Bangladesh Wheat and Maize Research Institute, Dinajpur during Rabi 2021-22. The genotypes were evaluated for yield, heading days, plant height, sterility tolerance, visual grain quality, boldness of grains etc. On the basis of visual grain quality, yield contributing traits and others agronomical performances twenty two genotypes (E-9, E-10, E-16, E-39, E-153, E-154, E-157, E-165, E-185, E-192, E-219, E-231, E-233, E-245, E-248, E-249, E-252, E-253, E-256, E-257, E-259 and E-263) were selected from this nursery for further evaluation in next year.

STRESS ADAPTIVE TRAITS YIELD NURSERY (10th SATYN)

MM RAHMAN(Gazi), R ISLAM, MA HAKIM, MZ ISLAM, MSN MANDAL, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, MF AMIN, AND MA MAMUN

Abstract

The nursery was consisted of 40 elite genotypes of wheat. It was grown under late sowing condition. Considering yield and other yield contributing characters along with different morphophysiological traits three genotypes viz. E-06, E-12, E-16, E-17, E-25, E-26, E-28 and E-37 were finally selected for further evaluation.

INTERNATIONAL DURUM YIELD NURSERY (53rd IDYN)

MF AMIN, MM RAHMAN, R ISLAM, MA HAKIM, MZ ISLAM, MSN MANDAL, MR KABIR, AA KHAN, MM HOSSAIN, M FARHAD, MM RAHMAN, MM HASSANN, AND MA MAMUN

Abstract

Fifty durum genotypes/lines from CIMMYT including BDW8 as check were evaluated at Bangladesh Wheat and Maize Research Institute, Nashipur, Dinajpur in the Rabi season 2021-22. Performances of several durum lines were satisfactory compared to check BDW8. The highest yield (5600 kg/ha) was obtained from the entry E-709 whereas yield of BDW8 was (4200 kg/ha). The highest TGW (48.2g) was recorded in the entry E-721 and the lowest E-722 (30.9 g). On the basis of field performance, disease reaction, grain physical characteristics, and yield, only five durum lines viz. entry E-702, E-709, E-723, E-726 and E-733 were selected for further evaluation over environments.

MAINTENANCE OF FIRST- AND SECOND-YEAR LINES OF RECOMMENDED WHEAT VARIETIES

MSN MANDAL, MM HOSSAIN, MZ ISLAM, M FARHAD AND MA HAKIM

Abstract

In 2021-22, six bread wheat varieties namely BARI Gom 30, BARI Gom 32, BARI Gom 33, WMRI Gom 1, WMRI Gom 2 and WMRI Gom 3 were maintained in first- and second-year lines at BWMRI, Nashipur, Dinajpur. In the first year lines, 50 out of 200 rows, whereas 25 out of 100 rows were selected, harvested and threshed separately to form the source seed of the second year lines for next season. From the second-year lines, a total quantity of 3315 kg seeds was produced out of which 1615 kg seeds from the selected plots of six varieties will be sown in next season for breeder seed production in around 16 ha and the seeds from the remaining plots other than the selected ones will be used for truthfully labeled seed production.

BREEDER SEED PRODUCTION OF RECOMMENDED WHEAT VARIETIES

MSN MANDAL, MM HOSSAIN, MAA MAMUN, MA HOSSAIN, MAA KHAN

Abstract

Breeder seeds of BARI Gom 30, BARI Gom 32, BARI Gom 33, WMRI Gom 1, WMRI Gom 2 and WMRI Gom 3 were produced in large plots at different station of BWMRI under the supervision of wheat breeders during Rabi 2021-22. A total of 57415 kg breeder seed were produced of which 15900 kg was at Nashipur, Dinajpur, 34950 kg (BARI Gom 30, BARI Gom 32 and BARI Gom 33) was at Debiganj, Panchagarh and 6565 kg (BARI Gom 33) was at Thakurgaon. A total of 60870 kg breeder seed was distributed to BADC and Private Seed Companies during November 2021 which was produced in 2020-21. Due to shortage of land, only 21300 kg TLS of different wheat varieties have been produced at different stations of BWMRI during 2021-22. However, 35000 kg TLS of BARI Gom 33 was produced in farmers' field and procured from the relevant farmers to use in different development projects.

Project 2. Maize Breeding Program

Maize (*Zea mays* L.) is the second most important cereal crop in Bangladesh after rice in terms of area and production and 1st in case of production per unit area (10.2 t/ha). Although, the crop can be grown in both *kharif* and *rabi* seasons, but the potentiality of realizing higher yield is possible only during the *rabi* season. Most of the maize fields are irrigated, and farmers cultivate hybrid maize with improved production technology which is the secret behind higher production in Bangladesh. The area under maize has been expanding since the early 2000s, driven by demand from the poultry feed industry and almost 100% maize areas are covered by hybrids. Maize area planted in Bangladesh has risen from just a few thousand hectare in 1993-94 to a total of 0.55 million hectare in the 2021-22 and approximately 5.63 million tons of maize grain was produced in the last year, whereas annual grain requirement is about 7.0 million tons. Maize research in Bangladesh was initiated on a modest scale in the early fifties with the introduction of some composite popcorn and sweet corn varieties with a view to popularize maize in this region. Initial thrust was given for the development of OPVs as it has an advantage over hybrid in greater convenience of seed multiplication. During the period between 1986 and 2013, 9 composites including field corn, popcorn, sweet corn and baby corn have developed and released of which some have got popularity among the farmers. Since early nineties, the research strategy was directed from composite and synthetic towards the development of hybrids. Programs have also been taken up for the development of inbred lines from locally using hybrids and OPVs. Promising commercially cultivated single crosses are being recycled for extraction of superior inbred lines. In the meantime, both exotic and locally developed lines used for development of single cross and a good success have been achieved. Besides inbred line development, maize improvement program of BWMRI has also been testing exotic hybrids received from CIMMYT through project based (HTMA project) international trials in collaboration with private partners (BRAC, ACI Ltd. and Lal Teer Seed Ltd.) with a view to identify better performing hybrids, targeted for stress prone areas (heat). Using introduced and locally developed inbred lines, maize breeding program has so far developed and released 20 hybrids from 2000 to 2022 of various kinds. Now the major objectives of this division is to develop high yielding hybrids of field corn and specialty corn i.e. popcorn, baby corn and sweet corn. Emphasis has also been given for the development of short stature & lodging tolerant hybrids. Breeding for stress tolerance (heat, salt and drought), development of location specific varieties (haor, char, hilly areas) and molecular approach to identify stress tolerant genes has also got due importance. Public & private partnership (PPP) has also strengthened for seed production of the released hybrids and large-scale scale-out among maize farmers.

Photo: On-going maize research for development of maize varieties suitable of changing climate

MAINTENANCE AND CHARACTERIZATION OF LOCALLY DEVELOPED MAIZE INBRED LINES (8 Sets)

M.F. AMIN, A. AHMED, M. A. MIAH, M.M. HOQUE, AND S. AHMED

Abstract

Inbred lines are the prerequisite for hybrid development. Characterization of inbred gives us opportunity to identify a particular variety and maintain seed purity by rouging off type plant. This experiment was conducted at Dinajpur and Gazipur during Rabi season of 2021-22 with 158 inbred lines consisted of eight sets. Each inbred line was selfed by hand pollination and seeds were preserved separately for future breeding program.

MAINTENANCE OF EXOTIC INBRED LINES OF MAIZE

A. AHMED AND S. AHMED

Abstract

Inbred lines are the prerequisite for hybrid development. Characterization of inbred gives us opportunity to identify a particular variety and maintain seed purity by rouging off type plant. This experiment was conducted at Gazipur during rabi 2021-22 with nine fall army worm resistant inbred lines. Each inbred line was selfed by hand pollination and a total of 21.42 kg seeds were preserved separately for future breeding program.

ADVANCING S_2 TO S_3 GENERATION OF FIELD CORN

M.A. MIAH, A. AHMED AND S. AHMED

Abstract

S2 lines extracted from Mohabir were advanced from S_1 to S_2 generation in order to develop superior inbred lines. Variations were found among the lines for different traits. The 110 S_2 were selected from 21 lines and selfed to get S_3 seeds. Finally, 7.30 kg selfed seeds were harvested. Selected seeds were preserved separately for advancing them from S_3 to S_4 generation in the next year following ear to row method for developing inbred population.

ADVANCING S_3 TO S_4 GENERATION OF XIANG WAXY 2008 AND XIANG WAXY 932 (2 SETS)

A. AHMED AND S. AHMED

Abstract

Two sets of S3 lines extracted from two Xiang Waxy 2008 and Xiang Waxy 932 were advanced to S4 generation to develop superior inbred lines. The balanced bulk seeds of S_3 lines of set I: Xiang Waxy 2008 (21 lines) and set II: Xiang Waxy 932 (13 lines) were advanced from S_3 to S_4 generation. The previously selected S_3 plants in each line of each set were selfed by hand pollination. Variations were found among the S_3 lines for different traits. Finally, 3.75 and 3.02kg selfed seeds were harvested from Xiang Waxy 2008 and Xiang Waxy 932, respectively, and kept them separately for advancing the population to S_7 generation.

ADVANCING S_4 TO S_5 GENERATION OF IM- 8013 (1 SET)

A. AHMED AND S. AHMED

Abstract

One set of S_4 lines extracted from IM-8013 variety were advanced to S_5 generation to develop superior inbred lines. The balanced bulk seeds of S_4 lines of IM-8013 (23 lines) were advanced from S_4 to S_5 generation. The previously selected S_4 plants in each line of each set were selfed by hand pollination. Variations were found among the S_4 lines for different traits. Finally, 5.39kg selfed seeds were harvested from IM-8013 and kept them separately for advancing the population to S_5 generation.

ADVANCING S_6 TO S_7 GENERATION OF SWEET CORN (2 SETS)

A. AHMED AND S. AHMED

Abstract

Two sets of S_6 lines extracted from two sweet corn variety Dream sweet-2 and Dream sweet-3 were advanced to S_7 generation to develop superior inbred lines. The balanced bulk seeds of S6 lines of set I: Dream sweet-2 (10 lines) and set II: Dream sweet-3 (11 lines) were advanced from S_4 to S_5 generation. The previously selected S_6 plants in each line of each set were selfed by hand pollination. Variations were found among the S6 lines for different traits. Finally, 2.18 and 1.26 kg selfed seeds were harvested from Dream sweet-2 and Dream sweet-3, respectively, and kept them separately for advancing the population to S_7 generation

STUDY ON COMBINING ABILITY AND HETEROSIS IN MAIZE OVER LOCATIONS

A. AHMED, M.M. ROHMAN, M.F. AMIN, J.B. AZIM AND S. AHMED

Abstract

The aim of this study was to isolate superior inbred lines and better combining parents for suitable hybrids and determines percent of heterosis using standard commercial checks in a 7 × 7 diallel analysis excluding reciprocals over three environments. The mean sum of square obtained from combined analysis of variance showed the presence of genetic variability among the crosses, environment and crosses × environment interaction for all of the characters under studied. The variances for general combining ability (GCA) and specific combining ability (SCA) of variance were found significant for all the characters except the trait FAW attack at different stages. However, variances due to GCA were much higher in magnitude than SCA for all the characters except plant height and yield indicating prevalence of additive gene effects for the inheritance of these traits. GCA/SCA ratio was less than unity for plant height and yield indicating non additive gene action in controlling the traits. Parents with good positive GCA for yield (P4 and P7); good negative GCA for early maturity (P1 and P3), good negative GCA for plant and ear height (P7) may be extensively used in hybridization program as a donor. The better performing two crosses (P3× P7 and P5× P7) can be utilized for exploiting hybrid vigor as well as for developing high yielding hybrid varieties. These crosses also need to be evaluated further in wider agro-climatic conditions.

DEMONSTRATION TRIAL OF RELEASED AND PROMISING HYBRIDS AND OPVS WITH COMMERCIAL HYBRIDS OVER LOCATIONS

M.A. MIAH, A. AHMED, M.M. HOQUE, M.F. AMIN, M.R. ISLAM AND S. AHMED

Abstract

Twenty maize (Zea mays L.) genotypes (hybrids and OPVs) along with five commercial check varieties were evaluated for kernel yield and yield contributing traits over three locations (Dinajpur, Gazipur and Jashore) during rabi season of 2021-22. The mean performance of yield and its contributing traits of the genotypes over three locations were analyzed to identify the best hybrid(s). The hybrid BWMRIHM-2 produced maximum kernel yield (16.96 t ha-1) and Khoibhutta the lowest (5.71 t ha-1) across locations. The hybrid BWMRIHM-2 (16.96 t ha-1) had the above average kernel yield exceeding all five check varieties viz. 9120 (16.57 t ha-1), P3355 (15.90 t ha-1), Juboraj (15.66 t ha-1), NH7720 (15.50 t ha-1) and Don-111 (15.31 t ha-1) across the three locations and expecting to be profitable for commercial cultivation in Bangladesh.

EVALUATION OF SELECTED SINGLE CROSS HYBRIDS OF FIELD CORN

M.M. HOQUE, F. AMIN AND S. AHMED

Abstract

An experiment was carried out at Regional Station, Bangladesh Wheat and Maize Research Institute (BWMRI), Gazipur with 22 maize hybrids including 2 local checks viz. BHM16 and 981 to identify desirable hybrid(s) during rabi 2021-22. Highly significant differences were found for all the studied characters. Considering yield and other traits four entries E1 (13.22 t/ha), E3 (12.03 t/ha) E4 (12.71 t/ha) and E6 (12.11 t/ha) were found promising among the tested material and selected for next year evaluation.

EVALUATION OF PROMISING HYBRIDS OF FIELD CORN AT DIFFERENT AGRO-ECOLOGICAL REGIONS (SET-I)

A. AHMED, M.M. ROHMAN, M.F. AMIN, J.B. AZIM, M.M. HOQUE, M.A. MIAH AND S. AHMED

Abstract

One hundred and thirty locally developed hybrids have been evaluated over three locations namely Dinajpur, Gazipur and Jamalpur with five check varieties during rabi 2021-22. There were significant variations among genotypes which also responded variously according to environments. The environment of Gazipur and Jamalpur were poor, but Dinajpur was rich for hybrid maize production. Among the locally developed hybrids only two namely 122 (Ag-322×Ag-234) and 27 (Ag-30×Ag-230) showed higher overall mean yield than the third highest yielder check variety Don-111. The genotype 27 (Ag-30×Ag-230) was much stable than the other.

EVALUATION OF FAW RESISTANT FIELD CORN HYBRIDS AT DIFFERENT AGRO-ECOLOGICAL REGIONS (SET-II)

A. AHMED, M.M. ROHMAN, M.F. AMIN, J.B. AZIM, M.M. HOQUE, M.A. MIAH AND S. AHMED

Abstract

Fall armyworm (FAW) resistant germplasm (inbred lines) received from CIMMYT Mexico were crossed to develop FAW resistant/tolerant hybrid (s) locally. Twenty-three hybrids developed locally were evaluated along with three checks (BHM 16, Palowan 9120 and P3355) across three regions (Dinajpur, Gazipur and Jamalpur) to select hybrids against FAW resistance and to observe its' yield potentiality during rabi 2021-22. The mean sum of squares for the genotypes was highly significant for all the traits except FAW attack which revealed the presence of genetic variability in the materials. The attack of fall armyworm was highest at Jamalpur and the environment of Jamalpur was also found poor for hybrid maize production. Considering the yield potentiality, insect resistance, stability parameter and AMMI biplot, it is clear that the check varieties Palowan 9120 (14.38 t/ha), P3355 (13.86 t/ha) and locally developed hybrid 17 (CML 70×CML 71) (14.25 t/ha) are higher yielder than any of the hybrids with responsive to environment. As the incidence of FAW attack is also low in the entry 17 (CML 70×CML 71), the cross could be selected for further evaluation.

EVALUATION OF SINGLE CROSS FIELD CORN HYBRIDS AT DIFFERENT LOCATION (SET-III)

M.M. HOQUE, A. AHMED, M.A. MIAH, F. AMIN, M.R. ISLAM AND S. AHMED

Abstract

Forty-eight crosses of maize and two check varieties (BHM16 and Palowan) were assessed for genotype environment interaction (GEI) and stability for the selection of promising hybrid(s) in three agro-ecological zones of Bangladesh. The AMMI (additive main effects and multiplicative interaction) model was used to analyze the genotype-environment interaction over three locations to select desired hybrid having higher yield and other potential attributes. Regarding genotypes (G), significant variation was found in all the characters except plant height and ear height. Regarding environments (E), significant variation was found in all the characters. The environment of Gazipur and Jashore were poor whereas Dinajpur was rich environments for hybrid maize production. Considering bi~1 and (regression co-efficient), S2di~0 (deviation from regression) hybrids E3 (13.41t/ha), E6(13.14 t/ha), E13 (12.70 t/ha) and E17 (12.98 t/ha) exhibited the higher grain yield as well as stable across locations but E7(13.71 t/ha), E10 (13.37 t/ha), E11(13.04 t/ha), E15 (13.60 t/ha) E16(13.59 t/ha) and E50 (Palowan 13.31 t/ha) showed higher yield but was responsive to specific environment.

EVALUATION OF PROMISING HYBRIDS OF POPCORN AT DIFFERENT AGRO-ECOLOGICAL REGIONS (SET-IV)

A. AHMED, M.M. ROHMAN, M.F. AMIN, J.B. AZIM, M.M. HOQUE, M.A. MIAH AND S. AHMED

Abstract

Seven popcorn genotypes were found as promising from previous evaluation which has been further evaluated over three locations (Dinajpur, Gazipur and Jamalpur) with one commercial check variety (American popcorn) during rabi 2021-22. Significant variations for genotypes (G) and environment (E) were observed for the character yield. The environment of Jamalpur was poor, but Dinajpur and Gazipur were rich for hybrid popcorn production. The check variety (American Popcorn) is higher yielder and stable than any of the promising hybrids. Among the promising hybrids entries Thai-26-2×PCB-7, Thai-26-1×PCB-7 and Thai-17×PCB-7 have higher yield potentiality in different environments. However, hybrid Thai-20×PCB-7 shows stable but moderate yield potentiality.

COMPARATIVE YIELD TRIAL OF IMPORTED AND LOCAL MAIZE HYBRIDS

A. AHMED, M. M. HOQUE, M. R. ISLAM, M. M. RAHMAN, F. AMIN AND S. AHMED

Abstract

The present study assessed genotype × environment interaction for grain yield, days to pollen shedding, days to silking, plant height and ear height and stability for grain yield with twenty-four hybrids across four different locations of Bangladesh during rabi 2021-22. The AMMI model (additive main effects and multiplicative interaction) was used to analyze the genotype-environment interactions over four locations to select the hybrid having higher yield and other potential attributes. Highly significant variation for genotypes (G), environment (E) and GEI were observed for the character yield. The environment of Gazipur and Jashore were poor, but Dinajpur was found highly suitable for hybrid maize cultivation followed by Jamalpur. Considering the mean, bi and S2di, NH7720 (E16) produced the highest yield and was found stable over all environments. Among other hybrids, Palowan 9120 (E22), Samrat (E23), Kohinur 1820 (E14), Everest (E12) and 900M Gold (E2) exhibited higher yield as well as stable over all environments. BHM-9 (E8), Pac339 (E19) and Pac984 (E20) were stable with moderate yield. BADC Hybrid 2 (E5), Sunshine (E24), Don111 (E11), P3355(E18) were higher yielder but responsive to specific environments.

PHENOTYPING OF THE HTMA HYBRIDS DURING RABI SEASON (HY2114-1, HY2113-1, HY2112-1, HY2112-2, HY2111-1, HY2111-2 and HY2111-3)

A. AHMED, M.M. HOQUE, J.B. AZIM, M.F. AMIN, S. SULTANA, R. ISLAM, M.A. MIAH, AND S. AHMED

Abstract

Five hundred and twenty-two maize hybrids of different stages (stage I-IV) received from CIMMYT, India under HTMA project and comprised of seven trials (HY2114-1, HY2113-1, HY2112-1, HY2112-2, HY2111-1, HY2111-2 and HY2111-3) were evaluated at three different stations of BWMRI (Dinajpur, Gazipur and Jashore) and three partner seed companies collaborating with HTMA project (BRAC, ACI seeds and Lal Teer Seed Ltd.) during rabi season of 2021-22. Five characters namely anthesis days, anthesis silking interval (ASI), plant height, ear height and yield were closely observed and different characters showed variations among entries in different trials. Entries evaluated at Dinajpur, generally produced highest average yield i.e., its environment was more favorable for hybrid maize production. From the seven trials several crosses were selected for further evaluation which are entries VH19488 (11.53 t/ha) and VH1862 (10.73 t/ha) fromHY2114-1, entries ZH19961 (10.51 t/ha) and ZH19940 (10.43 t/ha) from HY2113-1, entries ZH20392 (13.09 t/ha) and ZH20306 (12.52 t/ha) from HY2112-1, entry ZH20320 (10.99 t/ha) from HY2112-2, entry ZH2182 (12.12 t/ha) from HY2111-1, fifteen entries from HY2111-2 and entries ZH201571 (10.93 t/ha), ZH201530 (10.48 t/ha), ZH201506 (10.43 t/ha) and ZH201527 (10.34 t/ha) from HY2111-3.

EVALUATION OF SOME RELEASED AND PROMISING HYBRIDS AND OPVS OF MAIZE OVER LOCATIONS FOR FODDER PURPOSE

A. AHMED, M.M. ROHMAN, M.F. AMIN, M.R. ISLAM, J.B. AZIM AND S. AHMED

Abstract

Four open pollinated viz. Shuvra, BARI Maize 6 (BM 6), BM 7 and Color and three hybrid maize varieties BARI hybrid maize 9 (BHM 9), BHM 13 and BHM 17} were evaluated with one check NH7720 to observe their performance as green fodder and silage purpose during 2021-22 at four locations - Dinajpur, Gazipur, Jamalpur and Jashore. Significant variation for genotypes (G), environment (E) and GEI were observed for most of the characters. The environment of Gazipur and Jamalpur were poor, but Dinajpur and Jashore were rich for fodder maize production. Considering the yield potentiality, stability parameters, AMMI biplot and nutritive value it is clear that color maize genotype was found good with highest crude protein, total ash and gross energy, but it has lowest yield value in both flowering and dough stages. Both BHM 13 and BHM 17 had higher yield at both flowering and dough stages, but only BHM 17 was stable at flowering stage. As the hybrid BHM 17 also had several nutrient components with desirable amount such as high crude protein, total ash, refractive index, optimum crude fiber (<20), it can be selected to recommend as green fodder maize and making silage.

PRODUCTION OF SINGLE CROSS FIELD CORN HYBRIDS THROUGH DIALLEL MATING DESIGN

M.M. HOQUE, F. AMIN AND S. AHMED

Abstract

One set of crosses were made following diallel fashion were made to produce F1‘s hybrid seeds. Total 28 crosses were produced in of diallel crosses. Total 10.15 kg seeds were obtained from 28 crosses. The

produced F1 seeds of each hybrid were stored separately after selection and would be evaluated in the coming rabi season in target areas.

PRODUCTION OF DIFFERENT SINGLE CROSS MAIZE HYBRIDS

A. AHMED, S. AHMED AND M. AMIRUZZAMAN

Abstract

Crosses between inbred lines of 4 popcorn and 40 field corn were made to produce F1's hybrid seeds. Total 35 crosses were made from 2 sets and 31.42 seeds were obtained. The produced F1 seeds of each crosses/hybrid were stored separately after selection and would be evaluated in the coming rabi season in targeted areas.

DEVELOPMENT OF SINGLE CROSS MAIZE HYBRIDS THOUGH LINE×TESTER METHOD IN ISOLATION (3 SETS)

M.M. HOQUE. A. AHMED, F. AMIN AND S. AHMED

Abstract

One hundred and thirty inbreds were crossed in isolation with 3 testers, BIL 157(set I), BIL110 (set II) and BIL 28(set III) to produce 291.43F1's for evaluation in the next rabi season with different objectives. A total of 66.86 kg (set I), 152.4 (set II) and 72.17 kg (set III) seeds were produced.

MAINTENANCE AND SEED INCREASE OF THE PARENTAL LINES OF BARI MAIZE HYBRIDS (2 sets)

S.H. OMY, K. ALAM AND S. AHMED

Abstract

Twelve parental lines of BARI and BWMRI released hybrid varieties were grown at Regional, Joydebpur, Gazipur during rabi 2021-22. Total 5.83 kg seeds were obtained from 12 parental inbred lines and stored for maintenance of those inbred lines in the next rabi season.

SEED PRODUCTION OF THE PARENTAL LINES OF DIFFERENT RELEASED MAIZE HYBRIDS

M. M. HOQUE, A. AHMED, M. R. ISLAM, M. RAHMAN, M. Z. ISLAM AND S. UDDIN

Abstract

Thirteen parental lines of BARI and WMRI released maize hybrid varieties were grown at different locations of BWMRI during rabi 2020-21. Total 391 kg seeds were obtained from fifteen inbred lines and stored in cool room for maintenance and to distribute to BADC seed companies in the next rabi season.

SEED PRODUCTION OF WMRI/BARI HYBRID MAIZE

M. M. HOQUE, A. AHMED, N. ALAM, M.Z. ISLAM AND S. UDDIN

Abstract

Seeds of seven BARI and BWMRI released popular hybrids were produced in isolation at different WMRI Research stations during rabi 2021-22. Total 3471 kg hybrid seeds (F1) were obtained and stored for distribution and experimental use in next rabi season.

MAINTENANCE AND SEED PRODUCTION OF COMPOSITE MAIZE VARIETIES

M. HOQUE, A. AHMED, F. AMIN, N. ALAM AND S. UDDIN

Abstract

Three composite maize varieties were grown in isolation at different locations of Bangladesh during rabi 2021-22 and a total amount of 635 kg seeds were obtained and stored for maintenance distribution in the next rabi season.

BANGLADESH COORDINATED MAIZE (BCM) TRIALS

M.M. HOQUE, A. AHMED. S. AHMED, A. ISLAM, MD. R. ALI, A. A. FAROOQ AND MD. S. RAHMAN

Abstract

An experiment was carried out with fifteen genotypes received from three partners (BWMRI, BRAC and ACI) under Bangladesh Co-ordinated Maize (BCM). Trials were executed with three internal checks (BHM-16, Pillar & Uttoron2) and two commercial check varieties (Don111 & Juboraj) at six different locations of four districts during rab 2021-22. The present study assessed genotype × environment interaction for grain yield, days to pollen shedding, days to silking, plant height, ear height and stability for grain yield across locations of Bangladesh. Significant variation for genotypes (G) and environment (E) were observed for different characters including yield. The environment of Kushtia, Sherpur(Bogura) and Shahzahanpur(Bogura) were poor whereas rest of the environments or management were favorable for hybrid maize production. The environment of Gazipur was highly favorable followed by Nashipur and Sherpur and Bogura1 for hybrid maize cultivation. Considering the yield potentiality and stability parameter and AMMI biplot, it is clear that three genotypes 6) BAM 005 x BIL28 (13.55 t/ha), 7) BAM 008 x BIL28 (112.85 t/ha), 8) BAM 009 x BIL28 (12.34 t/ha) and 10) BAM 015 x BIL28 (13.70 t/ha) were stable across environment with high yield. Genotype 1) BM001 (12.57 t/ha), 2) BM002 (12.10 t/ha), 5) BM005 (12.46 t/ha), 9) BAM013xBIL28 (13.07 t/ha), 11) ACI-JH01 (12.18), 13) ACI-JH03 (12.79 t/ha) and 15) ACI-JH05 (12.85) were also high yielder but responsive to environment.

PROJECT 3. CROP AND SOIL MANAGEMENT

SUB-PROJECT 3.1. CROP MANAGEMENT

Photos: On-going agronomic drought management research at the agronomic research field of BWMRI

Photos: Profitable wheat and maize based cropping patterns

LONG-TERM BED PLANTING TRIAL FOR IMPROVING CROPS PRODUCTIVITY AND SOIL FERTILITY IN WHEAT-MUNGBEAN-RICE CROPPING PATTERN

M. ILIAS HOSSAIN, GOLAM FARUQ, T.J. KRUPNIK, M. K. GATHALA

Abstract

A eighteen years long term bed planting field experiment was conducted to study the productivity, soil fertility and N-use efficiency of intensified RW systems by adding a third pre-rice crop of mungbean. System productivity, fertility and N use efficiency were evaluated under five N fertilizer levels (0, 40, 80, 100 and 120 % N of recommended dose, two straw retention (SR) (0 and 30%) and two tillage options (raised bed and conventional tillage practice (CTP). Permanent beds with 30% straw retention produced the highest productivity for all three crops in the sequence. Within each N rate the total system (rice-wheat-mungbean) productivity was higher with 30% SR on PRB and least in CTP with 0% SR. At 80% of recommended fertilizer N rate, mean annual system productivity was 12.5 t/ha for PRB with 30% SR, 11.2 t/ha with PRB on 0% SR and 10.3 t/ha with CTP without straw. N uptake and use efficiency were increased with increasing N levels with bed planting up to 120% N application (120 kg N ha^{-1}) in wheat, both 100% (80 kg N ha^{-1}) in rice and (20 kg N ha^{-1}) in mungbean for all years. System productivity in N unfertilized plots increased when straw was retained due to increased supply and uptake of N. Reduced rat damage 81.3% by PRB systems over farmer's practices. The results suggest that N fertilizer rates can be reduced when 30% straw is retained both from rice and wheat & full residue retention from mungbean. Soil organic matter in surface soil layers of the PRB had increased by 0.82% after thirteen years (18 rice-wheat-mungbean crop cycles) with 30% SR. Straw retention is an important component of soil management and may have long term positive impacts on soil quality compared with conventional tillage with 0% SR. The combination of PRB with residues retained appears to be a very promising technology for sustainable intensification of RW systems in Bangladesh

EFFECT OF TILLAGE OPTIONS WITH RECENTLY RELEASED VARIETIES FOR SUSTAINABLE CROP PRODUCTION IN WHEAT-MAIZE-RICE CROPPING PATTERN

ILIAS HOSSAIN, GOLAM FARUQ, M A HOSSAIN, TIM KRUPNIK AND M. GATHALA

Abstract

An experiment was conducted at Regional Station, BWMRI, Rajshahi to selection of suitable varieties in wheat–maize-rice cropping system under Conservation Agriculture systems and establish of wheat-maize-rice cropping pattern under CA systems in Rajshahi areas. The trial comprises of five tillage options (zero tillage, strip tillage, permanent raised bed, minimum tillage and conventional tillage practice (CTP) and three varieties in wheat-maize-rice cropping pattern under keeping 30% crop residue retention in strip plot design with three replications. The varieties were evaluated for yield and yield components with some phenological and physiological parameters in all crops sequence. From the study it revealed that both raised bed and strip tillage systems with varieties affected in terms of phonological and physiological parameters with yield and yield components which ultimately produced maximum yield due to its more photosynthesis, chlorophyll content with optimum canopy temperature and border effect. The results indicated that keeping standing 30% crop residue in the field with minimum disturbance of soil had significant contribution on phonological and grain yield of wheat-maize-rice sequence compare to conventional tillage practice. The highest grain yield over tillage methods (among the tested varieties) was produced by variety WMRI Gom 3. This variety produced satisfactory yield under raised bed methods. The lowest yielder variety was WMRI Gom 1. Considering the overall growth, yield and other characters of three varieties under different tillage options WMRI Gom 3 have been provisionally selected under raised bed and strip till method at Rajshahi region as well as in wheat growing areas in Bangladesh.

INTEGRATED FERTILIZER MANAGEMENT ON SOIL FERTILITY AND PRODUCTIVITY OF WHEAT -T. AUS –T. AMAN CROPPING PATTERN

M.M. BAZZAZ, A. HOSSAIN, M.A.Z. SARKER, M. M. AKHTAR, M.N. ALAM

Abstract

The experiment was conducted at the research field of BWMRI, Nashipur, Dinajpur during 2018-19, 2019-20 and 2020-21 to find out a suitable combination of vermicompost with chemical fertilizers for growth and yield of wheat and to sustain the soil fertility and productivity. Seven different treatments were employed in this study viz. T_1= STB chemical fertilizers; T_2= IPNS with 5 t/ha cowdung based on T_1; T_3= IPNS with 1.0 t/ha vermicompost based on T_1; T4 = IPNS with 2.0 t/ha vermicompost based on T_1; T_5 = IPNS with 4.0 t/ha vermicompost based on T_1; T_6 = IPNS with 0.750 t/ha Farha based on T_1 and T_7 = Native fertility/control. From three crop cycles result, it was found that yield of wheat, T. Aus and T. Aman rice significantly increased with vermicompost and other organic fertilizers. However, T_3 produced the maximum 18.28 t ha^{-1} Rice Equivalent Yield followed by T_2 and T_4 and the minimum in control. But the highest gross margin Tk. 246477 ha^{-1} was obtained in the treatment T_2, where cowdung @5 t/ha was applied and the second highest gross margin Tk. 239242 ha^{-1} was observed in T_3 treatment, where vermicompost @1 t/ha was applied. Organic based treatments showed better performance might be due to improve the soil health by increasing the soil physical and chemical properties. So it can be concluded that application of cowdung @ 5 t/ha or vermicompost @ 1 t/ha with STB chemical fertilizer might be increased the crop yield by increasing soil fertility and productivity.

DETERMINATION OF SEED RATE OF WHEAT FOR LATE SOWN CONDITION

M.M AKHTER, A. HOSSAIN, M.M. BAZZAZ, M.N. ALAM AND M.A.Z SARKER

Abstract

A field experiment was conducted at the Research Field of BWMRI, Dinajpur to find out the optimum seed rate and sowing time during 2020-2021 and 2021-22. The research was consisted with two wheat varieties viz., BARI Gom 32 and WMRI Gom 1, two seed rates viz., 120 and 140 kg $ha^{-1}$and three sowing times viz., November 30, December 15, and December 30. The experiment was laid out in Split-split-plot design with three replications, keeping sowing times in main plots, variety in sub-plots and seed rates in sub-sub plots. The spikes length (cm) and number of grains $spike^{-1}$were increased from 30 November and the values were decreased after 15 December sowing in both years. In contrary, the number of spikes m^{-2} were increased and 1000-grain weight were decreased gradually from 30 November to 30 December. The highest yield was observed in BARI Gom 32 at 30 November sowing followed by WMRI Gom 1at 15 December sowing with 140 kg ha^{-1}.The variety BARI Gom 32 performed better at late sown condition with the seed rate of 140 kg ha^{-1} and WMRI Gom 1 can be cultivated up to 15 December as normal sowing time. BARI Gom 32 showed highest gross margin at 30 November as well as 30 December sowing condition, with 140 kg ha^{-1} seed rate and WMRI Gom 1 showed highest gross margin at 15 December sowing with 140 kg ha^{-1} seed rate.

RESPONSE OF NEWLY EVOLVED WHEAT VARIETIES TO SOWING DATES

AKBAR HOSSAIN, AJ AONTI, MM RAHMAN, MM BAZZAZ, MM AKHTER (Dinajpur), MD. ILIAS HOSSAIN (Rajshahi), RABIUL ISLAM (Jashore) and TIMOTHY J KRUPNIK (CIMMYT)

Abstract

Optimum seeding time is an important management strategy for increasing wheat production in short and mild winter conditions like Bangladesh. Temperature above optimum leads to hider the physio-biochemical activities of plants. Too early sowing produces weak plants with poor root systems, while late-planted wheat shortens the duration of the life cycle for escaping high-temperature stress at the flowering to the grain-filling stage. In the last few years, Bangladesh Wheat and Maize Research Institute (BWMRI) released some new varieties. These were developed testing in optimum (Nov. 15-30) as well as late (Dec. 20-25) sown conditions. The performance of these varieties in the intermediate time of seeding and their location-specific performance is not known. In this context, the experiment was conducted in three Agro-ecological zones of Bangladesh i.e., BWMRI-Dinajpur; RWRC-Rajshahi; RARS-BARI, Jashore in consecutive five wheat seasons (2017-18, 2018-19, 2019-20, 2020-21 and 2021-22) to evaluate the performance of these varieties under different dates of sowing, to find out their optimum sowing time, variety location interaction and wheat blast response for a specific variety. In the first two seasons six existing elite wheat varieties i.e., 'BARI Gom 26', 'BARI Gom 28', 'BARI Gom 30', 'BARI Gom 31', 'BARI Gom 32' and 'BARI Gom 33', in the third year (2019-20) seven wheat varieties (six + newly released 'WMRI Gom 1') and in 4th and 5th years (2020-21 and 2021-22) seven wheat varieties ('BARI Gom 26', 'BARI Gom 30', 'BARI Gom 32', 'BARI Gom 33', 'WMRI 1', 'WMRI 2', 'WMRI 3') were evaluated in five sowing conditions started from 25 November to 4 January with 10 days interval. Under the environmental condition of Dinajpur, it was found that all of the wheat varieties sown at optimum sowing condition (25 Nov.) produced the maximum yield and also escaped the wheat blast (WB) disease in all five years in all locations. While the yield of all varieties was decreased, when sown at late in all three locations in all five seasons. Although, no WB incidence was recorded in the environmental condition of Dinajpur in all five sowing conditions, but in the location of Rajshahi and Jashore, WB infection was found in the last three sowings (i.e., 15 Dec., 25 Dec. and 04 January in the first two seasons; while WB was recorded in all sowing conditions in Jashore and Rajshahi in third, fourth and fifth seasons. Considering the yield performance of all varieties, 'BARI Gom 30' performed the best in all sowing conditions as well as late sown heat stress condition in Dinajpur, followed by 'BARI Gom 26', 'BARI Gom 32', BARI Gom 33, 'WMRI 1',WMRI 2 and 'WMRI 3'. Whereas, in the environmental condition of Rajshahi and Jashore, BARI Gom 33 performed the best, followed by 'BARI Gom 30', 'BARI Gom 32', 'WMRI 1', 'WMRI 3' and 'WMRI 2'. The maximum wheat blast severity in the location of Rajshahi and Jashore were observed with the variety 'BARI Gom 26', while the lowest wheat blast disease severity was found with the variety 'WMRI 3' and 'BARI Gom 33'. Variety 'WMRI 3', 'BARI Gom 30', 'BARI Gom 32' and 'WMRI 2' were also showed comparatively lower disease severity when exposed to high disease pressure at late sown condition in all three locations. After five years of observation, the CSISA research team, and BWMRI are provisionally able to conclude that there is a remarkable variety of location interaction with yield and disease incidence; as such, location- and sowing-date specific variety recommendations will be needed for optimal cropping. These results will be shared with the DAE in the next reporting period, and are anticipated to form the basis of new management recommendations that can be provided to farmers throughout Bangladesh.

EVALUATION OF WHEAT GENOTYPES AGAINST SALINITY AT SEEDLING STAGE

MM KHAN, MM RAHMAN AND G FARUQ

Abstract

An experiment was conducted by growing wheat seedlings in hydroponic system at Regional Station, BWMRI, Gazipur from January 17 to February 14, 2022 to select the wheat genotypes tolerant to salt stress. One hundred wheat genotypes collected from different nurseries of wheat breeding division, BWMRI, Dinajpur and ACIAR project were evaluated under two salinity levels of solution namely i. control (tap water) and ii. 15 dS m^{-1}. Salt solutions were made through diluting the sea water (32 dS/m) with tap water. Hog land solution was used with salt solution as nutrient solution. Seeds were randomized in hydroponic system using factorial completely randomized design with four replications. Data were recorded on seedling dry weight. A wide range of variation was found among the genotypes in the production of seedling dry weight in both the treatments and relative value of seeding dry weight at 15 dS/m compared to control. Considering higher relative value twenty two genotypes namely BAW 1431, BARI Gom 25, G82, BARI Gom 32, BAW 1290, BAW 1430, BAW 1455, G99, BAW 1454, BAW 1340, BAW 1435, BAW 1438, G91, G78, G89, G94, Bio 27, BAW 1446, BAW 1286, BAW 1451, Bio 31 and Bio 23 were selected as good performer against salinity. But to be confirmed, further such screening and field trial will be required in the saline southern Bangladesh.

PERFORMANCE OF SELECTED WHEAT GENOTYPES FOR SALINITY TOLERANCE IN SOUTHERN BANGLADESH

MM KHAN, MM RAHMAN AND G FARUQ

Abstract

The experiment was conducted under ACIAR funded project with 20 wheat genotypes in three locations; Doulatpur, Kolapara, Patukhali; 5 no. Koyra, Koyra, Khulna and Birsingh, Shymanagar, Sakhira to find out Nax wheat lines yielded over parents with salinity tolerance adapted to Southern Bangladesh. Among the 20 genotypes the first 12 genotypes were salt tolerant Nax gene enriched developed by Biotechnology Division, BARI, Gazipur. These lines were developed by following back cross method where BARI Gom 25, BARI Gom 26 were crossed as recurrent parents with two salt tolerant Australian wheat lines as donor parent (Nax1 and Nax2 lines). Six lines (BAW 1147, BAW 1290, KRL 19 as best performer and BAW 1295, Shatabdi, KRL 210 as worst perform lines) were used from the first two years' wheat benchmark trials in southern Bangladesh under ACIAR funded project. The genotypes were randomized separately in each trial following the latinised 4 x 5 RCB design with four (4) replications (blocks). The seeds were sowing continuously in line maintaining 20 cm from line to line distance. The seed rate was 120 kg ha^{-1}. Unit plot size was 2.5 m long x 0.8m (4 rows). The sowing dates were 22 November; 16, 18 December 2021 at Birsingh, Shymnagar, Satkhira; 5 no. Koyra, Koyra, Khulna and Doulatpur, Patuakhali respectively. Lands were fertilized @ 100-26-50-20-1 kg ha^{-1} N-P-K-S-B. Two irrigations were applied in each location. Required intercultural operations were done. Soil salinity was measured by soil sampling and using duel EM device. Data were recorded on yield and yield attributes. The soil salinity roughly varied from 4-6 dS/m at the time with few exceptions and it increased to 10-12 dS/m at anthesis with some exceptions. There was a negative relationship between individual plot grain yield and ECa and ECe measured on the same plots at anthesis at all the sites, thus confirming that the salinity levels indicated by ECe and ECa measurements were high enough to substantially impact on grain yield. Among the Nax lines BARI Gom 25 background Nax lines Bio 6, Bio 12, Bio 13, Bio 31 and BARI Gom 26 background Nax lines Bio 41, Bio 46 and Bio 68 were better than their parents.

SUB-PROJECT 3.2. SOIL MANAGEMENT

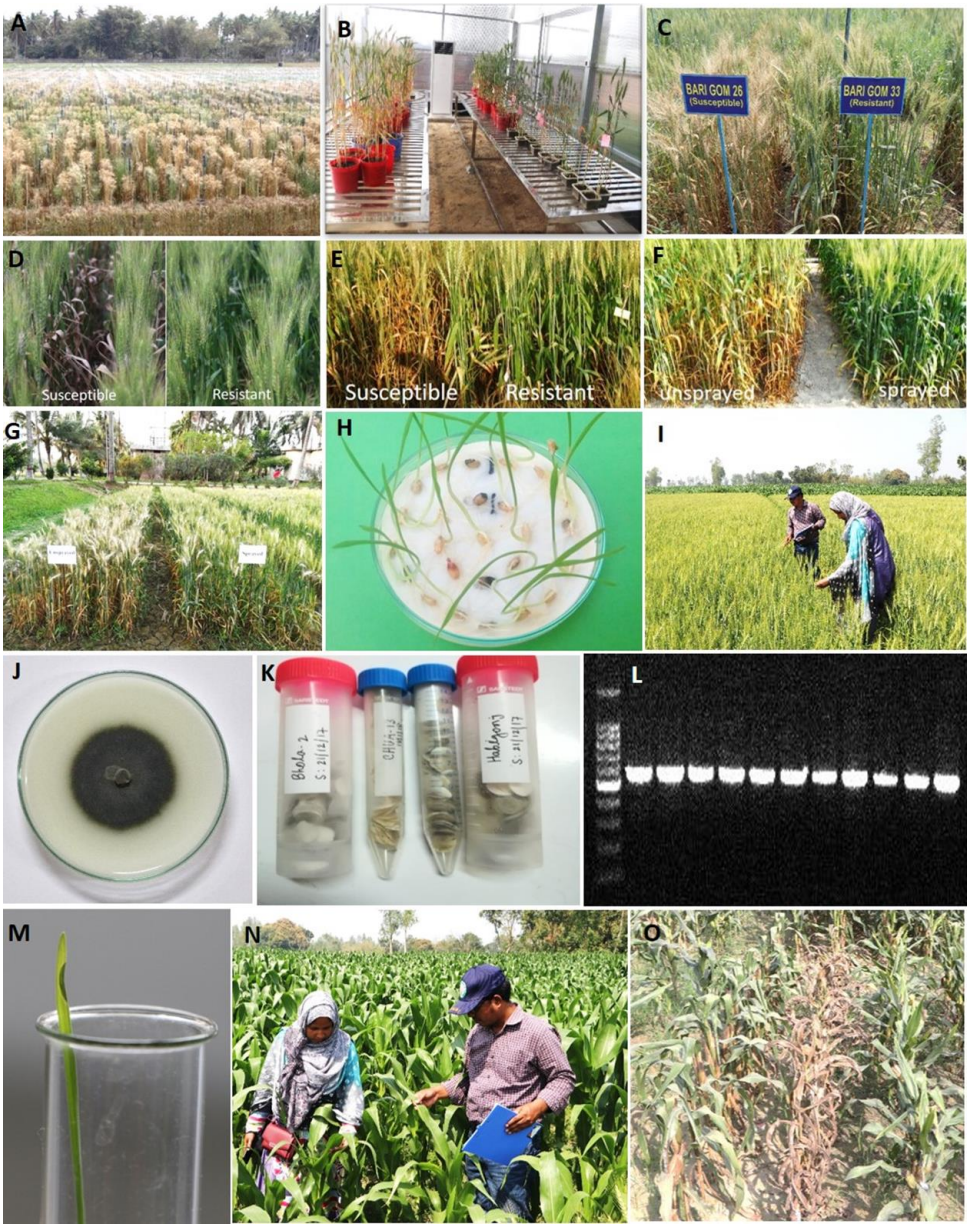
YIELD, SYSTEM PRODUCTIVITY AND PROFITABILITY OF RICE-MAIZE CROPPING SYSTEM ARE INFLUENCED BY TILLAGE OPTIONS IN COMBINATION WITH DIFFERENT LEVELS OF IRRIGATION AND NITROGEN

AKBAR HOSSAIN, AJ AONTI, MM RAHMAN, MM BAZZAZ, MM AKHTER AND MAZ SARKER

Abstract

Due to the changing climate, the sustainability of rice-maize cropping systems is fundamental to food security and livelihood of farmer's community of South Asian countries including Bangladesh also. On the other hand, to meet the food security of the increasing population, the cropping intensity is increasing day by day. As a result, inorganic fertilizers including N and also water demand have been increased at an alarming rate. The current knowledge of N and water management in CA identifies research gaps that need to be addressed to optimize N and water management with the ultimate goal to minimize N and water losses to the environment and reduce farmers´ input costs. Keeping the above issues in mind, a rice-maize cropping system was established in different tillage systems in combination with different levels of irrigation and nitrogen to find out the best option for higher yield, system productivity and profitability of this cropping system. From the rice-maize cropping pattern result, it was found that yield of both rice and maize significantly increased with a full dose of nitrogen and irrigation in combination with traditional tillage operation. The rice equivalent yield (REY) was considered as system productivity. The REY in different treatments significantly differed due to different tillage systems in combination with nitrogen and irrigation. Among these treatments combination, T2×N3 (PTR Rice - Conv. Maize (3 Irrigations: 45, 90 and 120 DAS + Rice: 65.3 kg N /ha) (1^{st}, 2^{nd} and 3^{rd} doses) and Maize: 173.3 kg N /ha (1^{st} and 2^{nd} doses)) produced the maximum REY (16896 kg/ha), followed by T1×N3 (PTR Rice - Conv. Maize (4 Irrigations: 15-20, 45, 90 and 120 DAS) + Rice: 65.3 kg N/ha) (1^{st}, 2^{nd} and 3^{rd} doses) and Maize: 173.3 kg N /ha (1^{st} and 2^{nd} doses)) (16124.88 kg/ha) and T3×N3 (13802.03 kg/ha) (DSR Rice (Irrigated) – Strip-till Maize (4 Irrigations: 15-20, 45, 90 and 120 DAS) + Rice: 65.3 kg N /ha) (1^{st}, 2^{nd} and 3^{rd} doses) and Maize: 173.3 kg N /ha (1^{st} and 2^{nd} doses)). On the other hand, minimum rice equivalent yield (1525.01 kg/ha) was obtained from T4×N1 (DSR Rice (Irrigated up to reaching the reproductive stage)–Strip-till Maize (3 Irrigations: 45, 90 and 120 DAS + 0 kg N /ha)) combination. If we consider the economic benefit of the system, the maximum gross margin was recorded in the treatment combination of T2×N3 (PTR Rice - Conv. Maize (3 Irrigations: 45, 90 and 120 DAS + Rice: 65.3 kg N /ha) (1^{st}, 2^{nd} and 3^{rd} doses) and Maize: 173.3 kg N /ha (1^{st} and 2^{nd} doses)) produced the maximum REY (16896 kg/ha) (475204 Tk/ha), followed by T1×N3 (PTR Rice - Conv. Maize (4 Irrigations: 15-20, 45, 90 and 120 DAS) + Rice: 65.3 kg N/ha) (1^{st}, 2^{nd} and 3^{rd} doses) and Maize: 173.3 kg N /ha (1^{st} and 2^{nd} doses)) (452246 Tk/ha), T2×N2 (PTR Rice - Conv. Maize (3 Irrigations: 45 DAS, 90 DAS and 120 DAS) + Rice: 3.2 kg/ha) (1^{st}, 2^{nd} and 3^{rd} doses) and Maize: 86.6 kg/ha) (1^{st} and 2^{nd} doses) (412844 Tk/ha), T3×N3 (DSR Rice (Irrigated) – Strip-till Maize (4 Irrigations: 15-20, 45, 90 and 120 DAS) + Rice: 65.3 kg N /ha) (1^{st}, 2^{nd} and 3^{rd} doses) and Maize: 173.3 kg N /ha (1^{st} and 2^{nd} doses)) (398110 Tk/ha). The minimum gross margin was recorded in the treatments combination of T4×N1 (DSR Rice (Irrigated up to reaching the reproductive stage)–Strip-till Maize (3 Irrigations: 45, 90 and 120 DAS) + 0 kg N/ha for both crops (35869 Tk/ha), T6×N1(DSR Rice (Rainfed)–Strip-till Maize (Rainfed) + 0 kg N/ha for both crops (42529 Tk/ha), T5×N1 (DSR Rice ((Irrigated up to the maximum vegetative stage) – Strip-till Maize (2 Irrigations: 50 DAS and 100 DAS) + 0 kg N/ha) (43644 Tk/ha). This is a one-year observation, it will be continued next year to make a conclusion.

SUB-PROJECT: 4.1. DISEASE MANAGEMENT



Photos: on-going disease management wheat and maize researches in BWMRI, Dinajpur

Major activities of the Plant Pathology Division of BWMRI are: (A) germplasm screening under inoculated conditions; (B) screening of elite genotypes under greenhouse conditions; (C) response of resistant and susceptible varieties against wheat blast; (D) Bipolaris leaf blight resistance in elite wheat genotypes; (E) resistance of germplasm against leaf rust of wheat; (F) efficacy of fungicide against leaf rust disease; (G) fungicidal efficacy against wheat blast; (H) seed health test for determining seedborne pathogens of wheat; (I) survey and monitoring of wheat diseases in farmers field; (J) pure culture of wheat blast pathogen on PDA medium; (K) long-term storage of wheat blast fungus by culturing on filter paper; (L) molecular detection of wheat blast fungus by PCR analysis; (M) epidemiology study of wheat blast pathogen; (N) surveillance of maize diseases and (O) screening of maize germplasm against leaf blight. Below are the current activities of the Plant Pathology Division of BWMRI:

EVALUATION OF WHEAT GERMPLASM AGAINST BIPOLARIS LEAF BLIGHT UNDER FIELD CONDITIONS

K. MUSTARIN, K. K. ROY AND M. M. HOSSAIN

Abstract

An experiment with 60 advance wheat genotypes including checks were evaluated against Bipolaris leaf blight under natural field conditions in three different locations of Bangladesh. Among the entries evaluated, 8 lines were selected based on Area under Disease Progress Curve (AUDPC), 1000-grain weight, grain yield and other agronomic characters assessed over locations. The AUDPC of the selected lines ranged from 69 to 121, while those of the check varieties ranged from 59 to 109. Grain yields of the selected entries varied from 471 to 553 g/plot, whereas 338 to 520 g/plot were obtained from the check varieties. Blast severity (disease index) of the selected entries recorded in Jashore varied from 1.25 to 12.50%.

EVALUATION OF WHEAT GENOTYPES FOR RESISTANCE TO BIPOLARIS LEAF BLIGHT UNDER INOCULATED CONDITIONS

K. MUSTARIN, K. K. ROY AND M. M. HOSSAIN

Abstract

An effort was made to evaluate the reactions of 56 wheat genotypes including advanced lines and check varieties against Bipolaris leaf blight under inoculated field conditions during 2021-22 crop season. The tested varieties and lines showed different levels of resistance against the disease. The lines were graded into different categories and among them, 2 were found resistant, 14 moderately resistant, 17 moderately susceptible, 16 susceptible and 7 as highly susceptible.

EVALUATION OF WHEAT GENOTYPES FOR RESISTANCE TO LEAF RUST UNDER INOCULATED FIELD CONDITIONS

K. MUSTARIN, K. K. ROY AND M. M. HOSSAIN

Abstract

Eighty (80) wheat genotypes were screened against leaf rust to find out resistance sources under inoculated field conditions conducted during 2021-22 cropping season at Bangladesh Wheat and Maize Research Institute, Dinajpur. In order to assess disease severity, modified Cobb scale was followed. From the study, a good number of lines/varieties (57) were found resistant and among them, five were completely free from leaf rust infection. Disease development was comparatively lower due to unfavorable weather conditions which ranged from 0 to 60% with different types of disease responses in the advanced lines, while 80% severity was observed in susceptible variety Prodip (used as susceptible check).

HELMINTHOSPORIUM LEAF BLIGHT SCREENING NURSURY

K. MUSTARIN, K. K. ROY, M. M. HOSSAIN, M. R. ISLAM AND M. M. RAHMAN

Abstract

A field experiment was conducted to screen 52 bread wheat lines including checks against Helminthosporium leaf disease under natural field conditions of disease development in three different locations of Bangladesh. Among the entries evaluated, three were selected based on AUDPC (BpLB), disease index (Blast), 1000-grain weight, grain yield and other agronomic characters assessed over locations. The AUDPC of the selected lines ranged from 92 to 115, while those of the check varieties ranged from 128 to 227. Grain yields of the selected entries varied from 446 to 589 g/plot, whereas 394 to 418 g/plot were obtained from the checks. Blast severity of the selected entries recorded in Jashore varied from 0.8 to 10%. Days to heading, plant height and 1000-grain weight of the selected lines were within the acceptable range.

STEM RUST RESISTANCE SCREENING NURSERY

K. MUSTARIN, K. K. ROY, M. M. HOSSAIN, M. R. ISLAM AND M. M. RAHMAN

Abstract

A nursery from CIMMYT having 140 wheat entries including local checks were evaluated for their response to stem rust and other diseases under field conditions in three different locations of Bangladesh. Among the entries evaluated, 4 lines were selected based on blast disease index, grain yield and agronomic performance assessed over locations. Stem rust was not noticed over the locations. The area under disease progress curve (AUDPC) of the selected lines ranged from 157 to 254, while the check varieties showed 118 to 247. Grain yields of the selected entries varied from 435 to 509 g/plot, whereas 339 to 495 g/plot observed in check varieties. Blast severity of the selected entries recorded in Jashore varied from 0 to 10%. Days to heading, plant height and 1000-grain weight of the selected lines were within the acceptable range.

FUSARIUM HEAD BLIGHT SCREENING NURSURY

K. MUSTARIN, K. K. ROY AND M. M. HOSSAIN

Abstract

A nursery from CIMMYT with 52 wheat entries including local checks was evaluated for their response to Fusarium Head Blight (FHB) under natural conditions conducted during 2021-22 cropping season at Bangladesh Wheat and Maize Research Institute, Dinajpur. Among the entries evaluated, five were selected based on area under disease progress curve (AUDPC), 1000-grain weight, grain yield and other agronomic characters. The incidence of FHB was not observed in the screened materials. The AUDPC of the selected lines ranged from 112 to 160, while the check varieties ranged from 154 to 180. Grain yields of the selected entries varied from 410 to 510 g/plot, whereas 398 to 422 g/plot were obtained from the checks. Days to heading, plant height and 1000-grain weight of the selected lines were within the acceptable range.

EFFICACY OF NEW FUNGICIDES IN CONTROLLING BIPOLARIS LEAF BLIGHT AND LEAF RUST OF WHEAT

K. MUSTARIN, K. K. ROY, M. T. A. TAUHID AND M. M. HOSSAIN

Abstract

Seven fungicides of different groups including three new were evaluated for their effectiveness in controlling Bipolaris leaf blight (BpLB) and leaf rust diseases of wheat under field conditions. Among the new tested fungicides, Folla 52.5 EC (Tricyclazole 40% + Propiconazole 12.5%) and Metapro 10 GR (Prothioconazole 5% + Metalaxyl 5%) were found effective for controlling Bipolaris leaf blight and leaf rust of wheat. These two fungicides controlled BpLB by 87-97% while for leaf rust 95-100% over unsprayed plot. Grain yield increases of 54% was obtained from Folla 52.5 EC while 36% by Metapro 10 GR in case of BpLB, and 31% by Folla 52.5 EC and 34% by Metapro 10 GR for rust disease. The check fungicides Nativo 75 WG, Amister Top 325 SC and Tilt 250 EC controlled disease severity by 99-100% with increased yield of 37-59% for both the diseases.

SURVEILLANCE OF RUSTS AND BLAST OF WHEAT IN BANGLADESH

K. MUSTARIN, K. K. ROY, M. R. KABIR, A. A. KHAN, M. F. AMIN, M. R. ISLAM. M. M. RAHMAN (RAJ), M. M. RAHMAN (JAM) AND M. M. HOSSAIN

Abstract

A total of 31 districts were surveyed during 2021-22 cropping season. The survey was conducted following BGRI protocols developed for cereal rust assessment. Disease severity was estimated using the modified Cobb scale and 0-100 scale for rust and blast diseases, respectively. Out of 138 fields surveyed, 42 fields were noticed with leaf rust incidence which was 30% of total fields while 58 fields were found with the infection of wheat blast which was around 43% of total surveyed fields. In case of rusts disease, stem rust and yellow rust was not observed throughout the country's wheat fields, but leaf rust was noticed. Among 30% of leaf rust infected fields, almost 81% of the infected fields had low (<20%) levels of infection, 7% moderate level (20-40%) and 12% with higher (more than 40%) severity. Regarding varietal response, the older varieties like BARI Gom 24 and BARI Gom 26 were found higher levels of incidence and severity with susceptible reaction but another older variety BARI Gom 21 had found comparatively low level of incidence with moderately susceptible reaction. The latest varieties BARI Gom 28, BARI Gom 29, BARI Gom 30, BARI Gom 32 and BARI Gom 33 were found comparatively lower levels of incidence and severity with mostly moderately susceptible to moderately resistant reaction over the surveyed fields. The newly released variety WMRI Gom 3 was found with no rust infection. The varieties Mixture and Unknown were found low level of incidence with moderately susceptible reaction. Regarding of wheat blast disease, among the 31 surveyed districts, 16 districts were identified with blast infection and out of them, 2 were newly affected (Shariatpur and Jhalokathi districts). Infected fields of southern and south-western districts were found with higher levels of blast infection in the late planted fields. The lowest level of blast infection was observed in two districts, Jhalokathi and Faridpur. Among the surveyed fields, the overall disease incidence was comparatively lower with insignificant yield loss incurred.

EVALUATION OF WHEAT GERMPLASM AGAINST WHEAT BLAST UNDER INOCULATED/FIELD CONDITIONS

K. K. ROY, K. MUSTARIN AND M. M. HOSSAIN

Abstract

The most effective physical tool for getting resistant sources seems to be provision of genotypes to artificial inoculation against a disease under high disease pressure. A cohort of 400 entries were screened against wheat blast under inoculated conditions at Regional Station, Bangladesh Wheat and Maize Research Institute (BWMRI), Jashore and field conditions at BWMRI, Dinajpur during 2021-22 crop growing season. Disease rating was done based on the standard scale of 0-100. Blast severity was recorded only in Jashore. Among the entries evaluated, 18 lines were selected based on disease index, 1000-grain weight, grain yield and other agronomic characters. The percentage of blast disease index of the selected lines ranged from 0 to10%, while those of the check varieties ranged from 3.2 to 100%. Grain yields of the selected entries varied from 482 to 803 g/plot, whereas 510 to 593 g/plot from the check varieties.

EVALUATION OF ELITE WHEAT GENOTYPES FOR RESISTANCE TO WHEAT BLAST UNDER INOCULATED FIELD CONDITIONS

K. K. ROY, K. MUSTARIN, M. R. ISLAM AND M. M. HOSSAIN

Abstract

Wheat blast has been considered one of the main biotic stress to food security in the world. The experiment was aimed to evaluate the resistance of wheat cultivars to the disease at reproductive stage. A bunch (40) of elite bread wheat genotypes from diverse sources including susceptible/resistant checks were evaluated under inoculated conditions at Regional Station (RS), Bangladesh Wheat and Maize Research Institute (BWMRI), Jashore during 2021-22 cropping season. The design of the study was randomized complete block (RCB) with 3 replications and seeds were sown under late seeding conditions. The nursery was artificially inoculated with *M. oryzae* (MoT) spore suspension @ 40,000 spore/ml of water at heading stage. Both incidence and severity of the disease were recorded to calculate disease index (DI). From the results, the genotypes demonstrated varying levels of resistance against the disease. Out of 40 genotypes, 20 genotypes were found resistant (0-10% DI) and among them, BAW 1394 and BAW 1399 were free from blast infection. The resistant varieties BARI Gom 33 and WMRI Gom 3 were displayed resistant reaction (4.1 and 2.7% DI respectively), while the susceptible variety BARI Gom 26 demonstrated the highest disease index (88.6% DI). Resistant cultivars shown potential will be confirmed their resistance further in coming year and after confirmation to be used as source of resistance in wheat breeding programs.

WHEAT BLAST: PRECISION PHENOTYPING PLATFORM

K. K. ROY, M. R. KABIR, R. BEGUM, T. ROY, K. AKHTER, M. A. A. KHAN, M. R. ISLAM, K. MUSTARIN, M. M. HOSSAIN AND P. K. SINGH

Abstract

Four thousand one hundred seventy (4170) wheat genotypes consisted from different sources including resistant/susceptible checks were evaluated against wheat blast under inoculated field conditions at Regional Station, Bangladesh Wheat and Maize Research Institute, Jashore to identify resistance sources against the disease. Favorable environment for disease development was created by providing mist irrigation and hand inoculation of *Magnaporthe oryzae* (MoT) spores to the materials. Disease severity/index was recorded as percentage of spike infected and percentage of diseased area on infected spike based on 0-100 scale. As per the results obtained, varying levels of disease severity was recorded among the lines evaluated. Among the screened genotypes, 40% were found resistant, 4% moderately resistant, 4% moderately susceptible, 7% susceptible and the rest of 45% as highly susceptible. Among 40% of resistant lines, 17% were completely free from blast infection. The resistant variety BARI Gom 33 demonstrated <11% disease index while the susceptible variety BARI Gom 26 with >80% infection.

EFFECT OF SOWING DATES AND GENOTYPES ON THE SEVERITY OF WHEAT BLAST CAUSED BY MAGNAPORTHE ORYZAE PATHOTYPE TRITICUM

K. K. ROY, K. MUSTARIN, M. R. ISLAM AND M. M. HOSSAIN

Abstract

A field study on sowing dates and genotypes was conducted at Regional Station, BWMRI, Jashore during 2021-22 crop growing season. The objective of the work was to assess the effect of sowing time on the severity of wheat blast in different adapted wheat varieties. The evaluated genotypes were BARI Gom 26, BARI Gom 30, BARI Gom 32, BARI Gom 33, WMRI Gom 1, WMRI Gom 2 and WMRI Gom 3 while the five sowing dates were commenced from 25 November 2021 to 4 January 2022 with 10 days interval. The experimental design was spilt-split plot with three replications. Disease index (DI) was calculated based on the disease incidence on spike and the diseased area on the infected spike under the scale of 0-100. Results revealed that sowing time and genotypes sole had impact in reducing disease severity, and in combined of them were also significantly affected on spike infection, spike area damaged and percent disease index. Wheat planted at optimum time (25 November and 5 December) had minimum disease or no disease at all, but it increases with delay of sowing. The highest percentage of disease index was observed in very late seeding conditions (04 January) than other sown dates. In considering genotypes, the upmost disease index was observed in the variety BARI Gom 26 (susceptible) which was up to 89% under 04 January sown plots, while the lowest disease index was found for the varieties BARI Gom 33 and WMRI Gom 3 (1.6 to 5.4% disease index) under late seeding conditions However, the blast tolerant variety WMRI Gom 2 also showed a good level of tolerance under late planted conditions.

EFFICACY OF NEW FUNGICIDES IN CONTROLLING WHEAT BLAST

K. K. ROY, K. MUSTARIN, M. R. ISLAM AND M. M. HOSSAIN

Abstract

Wheat blast, caused by the fungus *Magnaporthe oryzae* MoT), establishes one of the major obstacles to the expansion of wheat production in Bangladesh. In the absence of resistant variety, fungicide control is the first-hand effort. Therefore, the efficiency of seven fungicides applied as foliar sprays was evaluated for the control of wheat blast at Regional Station, Bangladesh Wheat and Maize Research Institute, Jashore during 2021-22 cropping season. The evaluated fungicides were Nativo 75 WG, Amister Top 325 SC, Cabrio Top 60 WG, Autostin 50 WDG, Folla 52.5 EC, Metapro 10 GR, and Euron 70 WP. The design of the experiment was randomized complete block (RCB) with 3 replications. From the result it was found that two new fungicides (Cabrio Top 60 WG and Folla 52.5 EC) including checks (Nativo 75 WG and Amister Top 325 SC) can controlled the disease effectively. The fungicide Cabrio Top 60 WG was found the utmost effective in controlling wheat blast with least disease index (2%) followed by Nativo 75 WG (3%). The maximum yield increases of 176% was obtained from the same fungicide Cabrio Top 60 WG, which followed by Nativo 75 WG (155%). The highest and lowest net profit was obtained from spraying with Cabrio Top 60 WG (Tk. 49,288/ha) and Autostin 50 WDG (Tk. 31,036/ha) respectively. Considering benefit-cost ratio (BCR), the maximum BCR was observed by spraying Amister Top 325 SC (7.70) followed by Nativo 75 WG (6.97) while the minimum for Cabrio Top 60 WG (4.88).

SPORULATION CAPACITY OF MAGNAPORTHE ORYZAE (MoT) IN DIFFERENT CULTURE MEDIA AND IDENTIFYING VIRLUENT RACE

K. K. ROY, K. MUSTARIN, R. BEGUM, T. ROY AND M. M. HOSSAIN

Abstract

The current experiment was conducted under laboratory and greenhouse conditions of Bangladesh Wheat and Maize Research Institute (BWMRI)'s Plant Pathology Division conducted during 2021-22 crop cycle. Our results demonstrated that the most suitable sporulating medium was oat meal agar (OMA) followed by wheat leaf agar (WLA) and corn meal agar (CMA). Among the evaluated six isolates, the isolates CHA210002 and JAS210002 were found high sporulating one as compared to others. Variations in morphological characters was observed among the isolates cultured on potato dextrose agar (PDA) medium. The front colony for most of the isolates was grey to white colored, but for some of them had different colored. The colony surface of different isolates varied from smooth flattened and fluffy mycelia, and some were with the presence of concentric rings. On the other hand, the present investigation revealed that the isolates with high virulence were prevalent in the studied *M. oryzae* populations. The isolates JAS210002, GOP210001 and BHO210001 were identified as more virulent compared to others which can be used for germplasm screening to find out resistant sources.

DETERMINING STATUS OF SEED-BORNE FUNGI INCLUDING MAGNAPORTHE ORYZAE CAUSING WHEAT BLAST

K. MUSTARIN, K. K. ROY, T. ROY, R. BEGOM AND M. M. HOSSAIN

Abstract

An effort was made to determine the incidence of *Magnaporthe oryzae* and seed borne fungi associated with wheat seeds of eight varieties named BARI Gom 26, BARI Gom 28, BARI Gom 30, BARI Gom 32, BARI Gom 33, WMRI Gom 1, WMRI Gom 2, and WMRI Gom 3 collected from four different locations of Bangladesh (Dinajpur, Jashore, Joydebpur and Jamalpur). A total of 20 fungi were identified from seed samples of different locations. Among them, prevalence of *Bipolaris sorokiniana* (8.36%) was maximum. Results showed that *M. oryzae* incidence and seed borne prevalence of two predominant fungi *B. sorokiniana* and *Alternaria* sp. varied among different locations, varieties and time of sowing. The overall *M. oryzae* incidence was estimated very low (0.17%). Seeds infected with *M. oryzae* was recorded only in Jashore both timely and late sown conditions but seeds collected from Dinajpur, Jamalpur and Joydebpur were completely free from *M. oryzae* infection under both the conditions (ITS & ILS). The lowest incidence of *B. sorokiniana* was observed in BARI Gom 33 (6.12%) while the highest (10.64%) was recorded in WMRI Gom 1, which was followed by BARI Gom 26 (9.83%) and BARI Gom 28 (9.11%). When location is considered, the overall minimum and maximum incidence of *B. sorokiniana* were observed in Jashore and Jamalpur respectively. Incidence of *Alternaria sp.* was found highest in Dinajpur and the lowest in Jamalpur. In case of variety, the highest prevalence of this fungus was observed in BARI Gom 32 and the lowest was in WMRI Gom 3.

MOLECULAR DETECTION OF WHEAT BLAST PATHOGEN MAGNAPORTHE ORYZAE PATHOTYPE TRITICUM (MoT) USING MoT3 ASSAY AND NUCLEOTIDE SEQUENCING

K.K. ROY, K. MUSTARIN AND M. M. HOSSAIN

Abstract

Wheat blast is a devastating disease persistent in South America, Bangladesh and Zambia, and now becoming a global concern. *Magnaporthe oryzae* is a fungal plant pathogen causing blast disease in several species of the Poaceae family. It includes several genetic lineages, including one that is pathogenic on wheat and belongs to the *Triticum* lineage of *M. oryzae*. Confirmation of plant pathogen can be done by various way and among the, molecular testing is one of the best. Last year, a total of 17 isolates were successfully amplified by the MoT3 markers confirming as *Triticum* pathotype of wheat blast. These isolates were also amplified for ITS region using ITS4 and ITS5 primer sets, and used for sequencing. After sequencing, a neighbor joining phylogenetic analysis was done for the mentioned isolates sequences with other publicly available ITS sequences of *Pyricularia* spp. Phylogenetic tree results demonstrated that our isolates were identical to wheat blast isolates from South American sources.

SURVEY AND MONITORING OF MAIZE DISEASES IN BANGLADESH

K. MUSTARIN, K. K. ROY AND M. M. HOSSAIN

ABSTRACT

Surveys were conducted during 2021-22 cropping season to obtain recent information on maize diseases in different districts of Bangladesh. On the basis of prevalence in field, seven (7) diseases had been identified and among them, leaf blight, Fusarium stalk rot, leaf rust and sheath blight were found as major diseases with varying levels of incidence. Some other diseases such as cob rot, seedling blight, bacterial stalk rot, and mosaic diseases were observed with lower levels of disease severity in some of surveyed fields. The disease severity was comparatively higher in Kharif season to Rabi.

DISEASE EVALUATION OF MAIZE GENOTYPES IN DIFFERENT TRIALS OF BWMRI MAIZE BREEDING DIVISION

K. K. ROY, K. MUSTARIN, A. AHMED AND M. M. HOSSAIN

Abstract

Number of maize diseases is increasing day-by-day in Bangladesh and thus becoming a challenge for its successful cultivation. To identify the sources of disease resistance in maize genotypes, five disease screening nurseries was conducted under natural epiphytotic conditions at Bangladesh Wheat and Maize Research Institute, Dinajpur during 2021-22 cropping season. The genotypes were mainly evaluated against leaf blight, Fusarium stalk rot (FSR) and leaf rust diseases. Diseased leaf area (DLA) for leaf blight and disease severity for Fusarium stalk rot and leaf rust was recorded to categorize their resistance. A significant variation in disease severity was observed among the evaluated genotypes. Mostly low to moderate level of DLA was observed among the screened genotypes. The genotypes viz. 987K, CML 121, CML 70, Sal-4, Sal-17, Sal-21, Sal-23, Sal-29, Mah-9 and Alm-3 were found free from both Fusarium stalk rot and leaf rust diseases. The latest released variety BARI Hybrid Maize 17 demonstrated excellent against Fusarium stalk rot disease with no disease infection or had minimum in different nurseries. The commercial varieties like P3355, Palowan, Don, and few others have shown good level of resistance against the disease FSR.

SUB-PROJECT: 4.2. INSECTS MANAGEMENT

Division of Entomology, BWMRI is mandated for monitoring and surveillance insects and natural enemies of wheat and maize in Bangladesh. This division principally conduct research to develop eco-friendly management option(s) through Integrated Pest Management strategies for pest insects of wheat and maize. Collection, identification and molecular characterization of devastating insect like Fall Armywrom, *Spodoptera frugiperda* also have in this divisional program. The scientists of the division provide training and suggestions to the farmers for the safe crop protection from insects and mites.

Photo: Laboratory based Fall Armyworm management activity at BWMRI

Current activities

Recently a new invasive insect pest Fall Armyworm, *Spodoptera frugiperda* has notified in Bangladesh in 2018. This insect infests maize voraciously across the country. The division of entomology doing research on the insect especially monitoring, scouting, yield loss assessment and finally development of bio-rational management approach.

Development of bio-rational management package to control Fall Armyworm, *Spodoptera frugiperda* on maize

M MOSTAFIZUR RAHMAN SHAH & MOST SIRAJUM MUNIRA

Fall Armyworm (FAW), *Spodoptera frugiperda* (Lepidoptera: Noctuidae) is a new invader in Bangladesh since late of 2018. FAW's major preference for maize is a deep concern as it is the second most important cereal crop in Bangladesh. The study has been carried out in the Rabi season of 2021-2022 at Bangladesh Wheat and Maize Research Institute research field to develop a management approach to controlling FAW. Hybrid maize variety, pioneer-3355 was grown in randomized block with three replications as host plant of FAW in this study. Seed treatment with Cyantraniliprole, Bio-pesticide, and less hazardous chemicals in a combination of intercropped with cowpea was studied to find out a bio-rational management approach. Though all the applied management options reduced FAW infestation effectively but due to low infestation at the vegetative stage and on cobs, yield did not vary among the treatments.

Yield loss assessment due to Fall Armyworm, *Spodoptera frugiperda* attack on maize

M MOSTAFIZUR RAHMAN SHAH & MOST SIRAJUM MUNIRA

Fall Armyworm (FAW), *Spodoptera frugiperda* (Lepidoptera: Noctuidae) is a new insect pest in Bangladesh since late of 2018 and from that period its infestation area increased in different districts. It can infest about more than 84 crop species where maize is one of the most preferred crops. The study has been carried out in Rabi season of 2021-2022 at Bangladesh Wheat and Maize Research Institute research field to estimate yield loss due to the attack of FAW on maize. Hybrid maize variety, pioneer-3355 was grown in split plot with three replications in October, November, December, February, and March. Only two treatments were considered each month i.e. T_1 = treated (maize seed treated with Cyantraniliprole + alternate foliar spray with bio-pesticide and chemical pesticides) and T_2 = untreated control. The objective of the study was to compare the yield of the treated plot with that of the untreated plot which was exposed to natural FAW infestation. Another objective was to observe which month is more favorable for FAW infestation. Results revealed that highest yield loss was observed in March planted maize i.e. 39.50%. The month of October, February, and March are more favorable for FAW infestation.

Agro-ecological management of Fall Armywrom, *S. frugiperda* on maize

M MOSTAFIZUR RAHMAN SHAH & MOST SIRAJUM MUNIRA

This experiment have been conducted in two locations viz. Dinajpur site and Rajshahi site. In this study maize was grown as monoculture and as intercropped with cowpea in 60 cm and 90 cm row to row distances with four replications. Leaf infestation, cob infestation, predators, parasitoids, yield data were collected from this study. Results revealed that maize intercropping with cowpea reduced Fall Armyworm infestation on maize either in 60cm or 90cm row to row distances. Results also showed that more return was obtained from intercropped plots. Very interestingly, more number of predators and parasitoids observed in the cowpea intercropped plots than that of mono culture maize plots. More number of hymenopteran insects was observed through yellow sticky trap in cowpea intercropped plots where very little number was found in mono culture maize plots i.e. conserving many natural beneficial insects in intercropped plot. In agronomic concern, we also observed that moisture content preserved in intercropped plot soil than that of mono culture maize plot soil. Suggesting from this experiment that maize intercropped with legume crops reduced fall armyworm and getting extra income from intercropped grains.

PROJECT 5: AGRICULTURAL ENGINEERING

Photos: The redesigned parts of four wheel tractor operated seeder

Photos: On-going Agricultural Engineering research for Improvement of four-wheel tractor operated seeder

IMPROVEMENT OF A FOUR WHEEL TRACTOR OPERATED SEEDER

M S B EKRAM

Abstract

The current improvement of the previously developed four-wheel tractor operated seeder is done in context of combining separate attachments for wheat and maize. Fluted type seed meters are suitable for small grain cereals like wheat, rice, rey etc. and inclined plate type seed meters are more suitable for broad grains like maize, chickpea, cowpea etc. The newly improved machine has a provision for both the types of seed boxes. It can sow maximum 9 line wheat and plant up to 4 line maize in a single run and tilling width is 180 cm. Seeding depth, seeding distances and number of seeding lines are adjustable. It's a ready to use service simplified mechanism very suitable to the end users. It enables cultivating, seeding in separate furrows and levelling the land at a single pass. The earlier designed four-wheel tractor operated seeder showed a field capacity of 0.24 ha/h and efficiency was 79.2% for wheat plantation. The latest design is still in trial. The working performance of the machine during idle run was satisfactory. Field test with maize plantation will be done next year. The uniformity of seed distribution was found 78.7% which needs a more precise remark. The mean emergence time and emergence rate index for maize were 5.06 days and 0.93 respectively. The plant emergence degree was 97%. The experiment will be conducted in the next year to evaluate the performance of the improved machine.

DEVELOPMENT AND PERFORMANCE EVALUATION OF DIFFERENT TYPE OF WEEDERS FOR MAIZE

M.Z HOSSAIN, M.S.B EKRAM

Abstract

Weed is the biggest problem in the crop production. Different weeds are responsible for reducing the quality and yield of crops as well as farmer's income. Manually operated different types of weeder were fabricated in regional station, BWMRI, Shyampur, Rajshahi for weeding of different upland crops 2022. The blades and the depth of weeding is adjustable. Fabrication is just completed and fine tuning and field performance evaluation of the weeder to be conducted next cropping season.

IMPROVEMENT AND FINE TUNING OF TWO WHEEL TRACTOR OPERATED STRIP TILL OF CONSERVATION AGRICULTURAL MACHINERY FOR CEREAL CROPS

MD. ZAKIR HOSSAIN, MD. SARIFUL BIN EKRAM

Abstract

Two-wheel tractors (2WTs) are the common means of soil tillage and other farm operations in Bangladesh due to easy access in fragmented land size with affordable price by resource-poor farmers. This experiment demonstrates that improved tillage disc type blade can enhance cereal crops establishment under strip tillage, which falls under the law of conservation agriculture (CA). In order to get this objective, it is necessary to identify appropriate blade improvement and rotational speed for power tiller or PTOS or bed planter, which can be attached to 2WTs and that are increasingly popular in Bangladesh. Disc type blade for strip tillage would be improved in regional station, BWMRI, Shyampur, Rajshahi for cereal crops and its fine tuning and field performance evaluation to be conducted next cropping season.

STUDY ON PERFORMANCE OF MIXED RATIO OF WHEAT, MAIZE, RICE FLOUR FOR VAPA PITHA MAKING PURPOSE

MD. ZAKIR HOSSAIN, MD. SARIFUL BIN EKRAM

Abstract

The present study was undertaken to develop proper ratio mixture of three major cereals commonly consumed in Bangladesh like rice, wheat and maize flour for vapa pitha making purpose in food value and prospect for change for food habits. The experiment was conducted in regional station, BWMRI, Rajshahi. The samples were collected from local area, cleaned of foreign materials, milled and sieved. Manual procedures by making meal for getting required mixture ratio by Sensorial testing of its taste, quality, softness, hardness and so on. This experiment was performed in six treatments with three replications. This experiment revealed that rice, maize and wheat flour for ratio mixture of making vapa pitha are 60% rice flour+ 20% wheat flour + 20% maize flour + salt + water and 50% rice flour+ 25% wheat flour + 25% maize flour + salt + water formulation is extremely like. The taste was decreased with decreased of heat or temperature of vapa pitha.

Photos: Rice, Maize and Wheat flour sample in different ratio mixture

PROJECT 6: TECHNOLOGY VALIDATION AND TRANSFER

6.1 VARIETY AND MANAGEMENT TECHNOLOGY TRANSFER

MM HOSSAIN, MA HAKIM, MZ ISLAM, MSN MANDAL, MR KABIR, MAA KHAN, M FARHAD MI HOSSAIN, MR ISLAM, M BAZZAZ

Abstract

Technology transfer programmes were undertaken by Bangladesh Wheat and Maize Research Institute during 2021-22 to enhance technology adoption, get feedback from farmers and extension officials and increase wheat yields reducing yield gap by minimizing farmers' knowledge gap. Technologies were transferred through demonstrations, seed dissemination, trainings, field days, visits, publications, etc. two thousand three hundred twenty demonstrations were conducted with 6 newly released wheat varieties viz., BARI Gom 30, (released in 2014) BARI Gom 32, & BARI Gom 33 (released in 2017), WMRI Gom1(released in 2019), WMRI Gom 2 and WMRI Gom 3 (released in 2020), in the farmers' fields of fifty four districts out of sixty four under 14 agricultural regions in 2021-22. The mean yield of all the six varieties over locations was 4.2t ha^{-1}. The highest mean yield was recorded in WMRI Gom 1 and WMRI Gom 2 (4.4 t ha^{-1}) followed by BARI Gom 33 (4.3 t ha^{-1}) and BARI Gom 30 had the lowest yield (4.1 tha^{-1}). Considering region, the highest yield was obtained from Rajshahi region (4.22t ha^{-1}) followed by Jashore region (4.21 t ha^{-1}) and Rangpur regions (3.13 t ha^{-1}). The yields at Bogura region were lowest (3.49 t ha^{-1}). The mean yield of wheat under farmers' management was 3.12 t ha^{-1} and overall mean yield of the new six varieties was 3.96 t ha^{-1}. The difference between these two yields (yield gap) was 15%. So, the yield gap between block demonstration in farmers' field and neighboring farmers' fields yield can remarkably be eliminated using good seeds of good varieties, seeding in optimum time and using recommended fertilizers, irrigations and other management practices. About 8.2 tons of seed preserved by demonstration farmers and 8170 farmers of the same and neighboring villages visited the demonstrations.

Photo: Newly developed wheat variety BARI Gom 33 in farmer's field

6.2 TRAINING

Farmers and field staffs of BARI, DAE and NGO were trained to make them familiar with the new wheat and maize varieties, modern crop management practices, seed preservation techniques and mechanization in wheat cultivation. Training program for farmers, scientists, BWMRI field staffs and others were conducted through audio-visual aids, demonstrations, lectures, group discussions, training classes, field days, motivational tours etc. by wheat scientists. In a total of 153 batches, 4314 personnel attended the training programs in different aspects during 2021-22. Out of those, 3175 farmers, 682 SAAO/SSA/SA and 457 Officers of BWMRI, DAE and NGO were trained on wheat and maize. Officer and staffs were trained on different aspects of modern office management. Trainings of farmers were imparted on new wheat and maize variety demonstration, participatory variety selection and yield maximization, quality wheat seed production of new wheat varieties, seed production and preservation of new wheat and maize varieties, wheat blast management and introduction of new wheat and maize varieties and modern production techniques etc.

Photo: Farmers' training on management of wheat blast disease

6.3 WORKSHOPS

Bangladesh Wheat and Maize Research Institute (BWMRI) organized eight seminar/workshops at different locations of the country during 2021-22. Among these, three workshops were organized on causes of wheat blast and its management at Dinajpur and Rajshahi regions of Bangladesh, one workshop was conducted on maize fall armyworm outbreak, yield loss assessment, its nature of damage and control measures in different agricultural regions of Bangladesh, two seminars titled achievement of BWMRI in food and nutrition security and strengthening cooperation between GIFS and BWMRI were conducted at BWMRI, Dinajpur, one workshop was conducted on the fourth industrial revolution in Agricultural research and another one workshop was conducted on Annual Research Review and Future Program Planning for the development of both wheat and maize where scientists from different research organizations, officials (UAO, ADD, DTO, DD and AD) from Department of Agricultural Extension, Bangladesh Agricultural Development Corporation, Seed Certification Agency, Non-government organizations, Seed dealers and teachers from public universities were present. Two evaluation workshops of farmers' participatory variety selection were done at Sadar, Dinajpur and BWMRI, where farmers evaluated the advance lines which are in pipeline to be released as variety within 2/3 years.

Photo: Workshop on causes of wheat blast and it's management approaches

6.4 FIELD DAYS, VISITS AND PUBLICATIONS

A group of scientists, DAE personnel and farmers visited the demonstrations and seed production plots several times and were impressed to see the plots. A good number of visitors both from home and abroad also visited the on-station and on-farm activities of BWMRI. BWMRI technologies were presented to the students from different schools, college and universities during their field trip at BWMRI. Seventeen field days were organized by BWMRI about new variety demonstration, modern production technologies, quality wheat and maize seed production, wheat blast management, environment friendly control measures of Fall Armyworm insect in maize, increase soil & crop productivity through climate smart conservation technology in drought-prone areas, salt tolerant wheat varieties in coastal saline area etc. where about 1220 farmers and 75 field staffs of DAE & related personnel were present. The participating farmers in the field days were very much interested to cultivate new varieties of wheat. Huge number of coloured pictorial factsheets (2nd edition) and folders of wheat blast and how to mitigate the disease, both in Bangla and English and booklet of modern wheat cultivation techniques (in Bangla) were published and distributed among the farmers and related personnel.

Photo: Farmers' field day in maize field

TECHNOLOGY VALIDATION AND TRANSFER

1. VARIETY AND MANAGEMENT TECHNOLOGY TRANSFER

Introduction

Wheat is the second most important cereal crop after rice in Bangladesh and its consumption is increasing 3% per year. The tragic irony is that the wheat production in the country 1.4 million tons, which is much bellow than the annual requirement. This deficit accounts about 75% of country's annual consumption and it is met, through imports. Wheat production has increased steadily from around 0.115 million tons in 1971-72 to 1.9 million tons in 1999 and then gradually decreased to 0.763 million tons in 2006-07. This low production is mainly due to the reduction of area under wheat cultivation. The highest wheat growing area was 0.85 million hectares in 1999 which now came down to 0.44 (2015-16) million ha. Wheat is to compete with other profitable crops like Boro rice, corn, potato and winter vegetables which insisting farmers to push wheat crop in marginal lands from fertile ones and this is considered as the main reason for decreasing area under wheat. Yield was also decreasing due to cultivation of old varieties that are susceptible to leaf rust and BpLB, knowledge gap about recommended technologies.

For increasing wheat production in Bangladesh, it is very important to adopt new technologies recommended by BWMRI. Use of power tiller operated seeder (PTOS) to confirm timely seeding and use of wheat thresher is also important to save the quality of seeds from early monsoon. Bangladesh Wheat and Maize Research Institute (BWMRI) has released 33 varieties in conventional breeding approach and most of the later released varieties are better than previous one in respect of yield, disease and terminal heat tolerance. But those varieties and other technologies are not being adopted by the farmers in a satisfactory rate due to their inadequate knowledge about the varieties and technologies and insufficient extension efforts.

Materials and Methods

Bangladesh Wheat and Maize Research Institute, transfers wheat technologies to wheat farmers, DAE and NGO personnel, Imams and other related personnel through demonstrations, training, workshops, field days, seed supply and publications in electronic media. Two thousand three hundred twenty demonstrations were conducted with 6 newly released wheat varieties viz., BARI Gom30 (released in 2014) BARI Gom 32 and BARI Gom 33 (released in 2017), WMRI Gom1(released in 2019), WMRI Gom2 and WMRI Gom3 (released in 2020), in the farmers' fields of 54 districts out of sixty four under 14 agricultural regions in 2021-22 (Table 6.1.1), in collaboration with Department of Agricultural Extension (DAE) and On Farm Research Division (OFRD) of BARI. 2320 demonstrations were conducted in collaboration with DAE and 170 demonstrations by BARI scientists. Each demonstration had a single variety with a plot size 400 sq.m. Each variety was established in one farmer's field. Only seed, fertilizers, signboard and printed documents on wheat production technologies were supplied to farmers. All other management practices were done by farmers. One day training was given to the farmers, related Sub Assistant Agricultural Officer (SAAOs), Scientific Assistance (SA)/ Scientific Assistances (SSAs) and Upazila Agriculture Officers (UAOs) of the respective districts about trials, wheat production and seed preservation technologies. Seeds were sown from 15 November to 23 December 2021. Yields were taken from 4 samples of 5 m^2 (total 20 m^2) areas from each demonstration. A format was supplied to farmers for sending data on yield, sowing & harvesting date, no. of irrigations, seed preservation, overall comments, etc. through supervising officials of DAE and BARI.

Table 1.1 Regional and Institutional distribution of wheat trials in the year 2021-22

Sl #	Region	Conducted through		Total
		DAE	OFRD	
1	Dinajpur	200	-	200
2	Rangpur	175	70	245
3	Rajshahi	305	25	330
4	Bogura	125	-	125
5	Khulna	90	-	90
6	Jashore	130	-	130
7	Mymensingh	100	-	100
8	Dhaka	70	20	90
9	Sylhet	125	-	125
10	Faridpur	160	20	180
11	Barishal	65	35	100
	Other Regions	605	-	605
Total		2150	170	2320

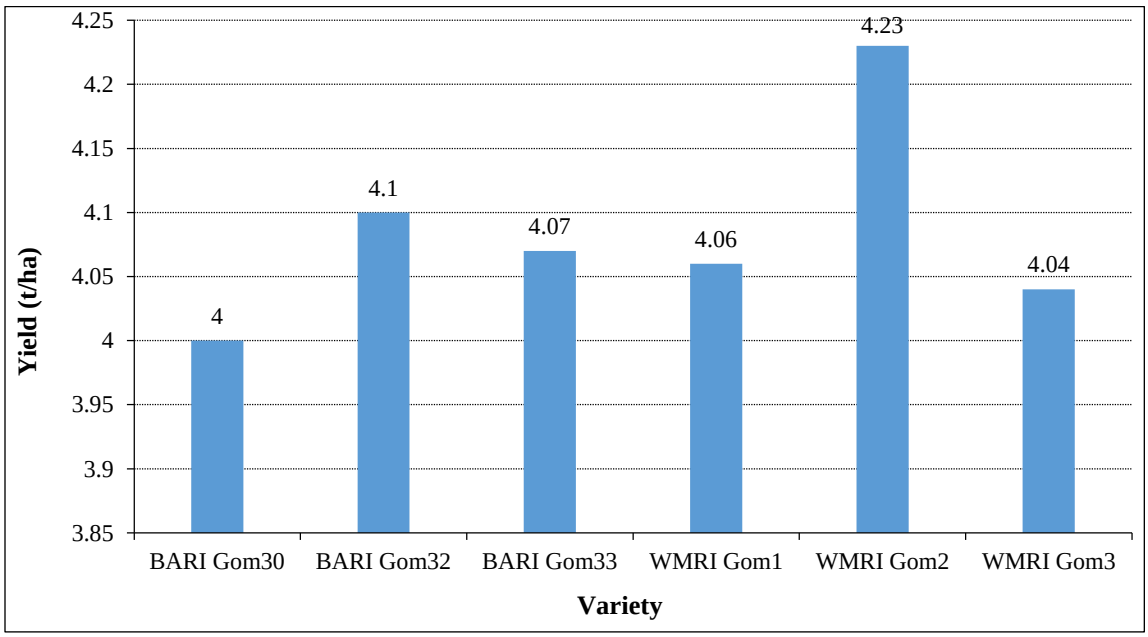


Figure.1. Variety-wise yield performance of wheat obtained from variety demonstration, 2021-22

Results and Discussion

The mean yield of all the 6 varieties was 4.2 t ha^{-1}. The highest mean yield was recorded in WMRI Gom 1 and WMRI Gom 2 (4.4 t ha^{-1}) followed by BARI Gom 33.The lowest yield was recorded BARI Gom30 (4.1t ha^{-1}). The highest yield was obtained from Panchagarh district (5.3 t ha^{-1}) and the lowest was recorded in Joypurhat district (3.5 t ha^{-1}).

Table 1.2 District-wise results so far obtained from variety demonstrations in 2021-22 conducted through DAE OFRD and BARI (Yields in t ha^{-1})

District	BARI Gom30	BARI Gom 32	BARI Gom33	WMRI Gom 1	WMRI Gom 2	WMRI Gom 3	Mean
Kurigram	4.1	4.3	4.4	4.6	4.8	-	4.4
Dinajpur	3.7	3.7	4.0	3.8	3.5	-	3.7
Panchagarh	5.2	4.9	5.9	5.3	5.0	-	5.3
Thakurgaon	4.3	4.4	4.12	5.2	5.0	-	4.6
Naogaon	3.9	4.3	4.1	4.2	4.5	4.3	4.2
Jhenaidah	-	-	4.2	-	4.2	-	4.2
Narail	-	-	3.6	-	-	3.8	3.7
Chuadanga	-	-	4.0	-	-	4.3	4.1
Rajshahi	4.2	4.5	4.7	4.5	4.4	4.6	4.5
Joypurhat	3.3	3.4	3.7	3.2	3.7	-	3.5
Average	4.1	4.2	4.3	4.4	4.4	4.2	4.2

Region-wise mean yields of all the varieties have been presented in table 5.1.3. The highest mean yield was obtained from Rajshshi region (4.22) followed by Jashore region (4.21t ha^{-1}), and Rangpur region (4.13 ha^{-1}) , the lowest yield was recorded by Bogura region (3.49t ha^{-1}).The mean yield of wheat so far obtained from the demonstration results indicated that it has difference from the mean yield of neighboring plots of the farmers' field.

Table 1.3 Region-wise yield (t ha^{-1}) of variety demonstrations conducted in 2021-22

Region	BARI Gom 30	BARI Gom 32	BARI Gom 33	WMRI Gom 1	WMRI Gom 2	WMRI Gom 3	Mean	Seed preserved (kg)	No. of Visitors
Rangpur	4.03	4.12	4.44	4.06	4.01	-	4.13	1200	855
Dinajpur	3.98	3.98	4.25	4.08	3.86	-	4.03	1680	2360
Bogura	3.48	3.56	3.7	3.19	3.50	-	3.49	340	325
Rajshahi	3.97	4.12	4.24	4.23	4.43	4.32	4.22	2750	1657
Khulna	-	-	3.60	-	-	3.78	3.69	610	1770
Jashore	-	-	4.14	-	-	4.28	4.21	1578	1203
Mean/total	3.87	3.95	4.06	3.89	3.95	4.13	3.96	8158	8170

About 8.2 tons of seeds of different varieties have been preserved by the demonstration farmers though data about seed preservation is not representative to all the demonstrations as the data of seed preservation were missing from many reports. In total 8170 farmers of the same and neighboring villages visited the demonstrations and expressed their interest to collect seeds of new varieties in next year. The results demonstrated that all the new varieties were preferred by the farmers.

2. TRAINING

Farmers and field staffs of BARI, DAE and NGO were trained to make them familiar with the new wheat and maize varieties, modern crop management practices, seed preservation techniques and mechanization in wheat cultivation. Training program for farmers, scientists, BWMRI field staffs and others were conducted through audio-visual aids, demonstrations, lectures, group discussions, training classes, field days, motivational tours etc. by wheat scientists.

In a total of 153 batches, 4314 personnel attended the training programs in different aspects during 2021-22 (Table 6.2.1). Out of those, 3175 farmers, 682 SAAO/SSA/SA and 457 Officers of BWMRI, DAE and NGO were trained on wheat and maize. Officer and staffs were trained on different aspects of modern office management. Trainings of farmers were imparted on new wheat and maize variety demonstration, participatory variety selection and yield maximization, quality wheat seed production of new wheat varieties, seed production and preservation of new wheat and maize varieties, wheat blast management and introduction of new wheat and maize varieties and modern production techniques etc.

Table 2.1 Training imparted by different Wheat and Maize Research Station of BWMRI during 2021-22

Name of the station	Title of the Training	No. of Batch	No of Farmers	No. of SAAO/SA	No. of Officer/ staff	Total trainee
BWMRI Dinajpur	e-filling (nothi) management	1	-	-	36	36
	The fourth industrial revolution in Agriculture	1	-	-	36	36
	Information right laws	3	-	-	88	88
	National Integrity Strategy	1	-	-	31	31
	Use of Officia e-mail	1	-	-	36	36
	Grievance Redress System & GRS software	1	-	-	17	17
	Environment friendly control measures of Fall Armyworm insect in maize crop	2	60	8	-	68
	Officer and staffs training on Citizen Charter	4	-	-	144	144
	Annual Performance Agreement	1	-	-	34	34
	SA training on seed production and field management of maize	2	-	25	-	50
	Demonstration of new wheat varieties	39	1020	204	-	1224
	Demonstration of new maize varieties	8	120	24	-	144
	Seed production tactics of Hybrid maize	5	-	30	-	150
	Scientists training on modern production technology of wheat and maize	2	-	-	35	70
	Management of wheat blast & multiplication of new variety seeds	8	240	48	-	288
	Pest management in maize	1	30	2		32
	Production enhancement of wheat varieties through modern technology in Non-traditional adverse areas	8	240	48	-	288
RS,BWMRI, Jamalpur	Demonstration of new wheat varieties	06	130	26	-	156

RS, BWMRI, Rajshahi	Demonstration of new wheat varieties	21	500	100	-	600
RS, BWMRI, Gazipur	Demonstration of new wheat varieties	26	555	111	-	666
RS, BWMRI, Jashore	Demonstration of new wheat and maize varieties	12	280	56	-	336
Total		153	3175	682	457	4314

3. WORKSHOPS

Bangladesh Wheat and Maize Research Institute(BWMRI) organized eight seminar/workshops at different locations of the country during 2021-22 (Table 6.3.1).Among these, three workshops were organized on causes of wheat blast and its management at Dinajpur and Rajshahi regions of Bangladesh, one workshop was conducted on maize fall armyworm outbreak, yield loss assessment, its nature of damage and control measures in different agricultural regions of Bangladesh, two seminars titled achievement of BWMRI in food and nutrition security and strengthening cooperation between GIFS and BWMRI were conducted at BWMRI, Dinajpur, one workshop was conducted on the fourth industrial revolution in Agricultural research and another one workshop was conducted on Annual Research Review and Future Program Planning for the development of both wheat and maize where scientists from different research organizations, officials (UAO, ADD, DTO, DD and AD) from Department of Agricultural Extension, Bangladesh Agricultural Development Corporation, Seed Certification Agency, Non-government organizations, Seed dealers and teachers from public universities were present. Two evaluation workshops of farmers' participatory variety selection were done at Sadar, Dinajpur and BWMRI, where farmers evaluated the advance lines which are in pipeline to be released as variety within 2/3 years.

Table 3.1 Workshop and seminar organized by BWMRI, Dinajpur during 2021-22

Sl. #	Date	Title	Location	Participants
1	06/11/2021	Annual Research Review and Program Planning	BWMRI, Dinajpur	67
2	22/11/2021	Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh	BWMRI, Dinajpur	42
3	17/02/2021	Inception Workshop on Managing Wheat Blast in Bangladesh: Identification and Interrogation of Wheat Blast Resistant Gene(s) into Varietal Development and Rapid Varietal Dissemination	BWMRI, Dinajpur	20
4	21/03/22	The fourth industrial revolution in Agricultural research	BWMRI, Dinajpur	31
5	27/03/2022	Achievement of BWMRI in food and nutrition security	BWMRI, Dinajpur	35
6	10/05/2022	Strengthening cooperation between GIFS and BWMRI	BWMRI, Dinajpur	40
7	15/05/2021	Wheat Blast: Causes and its management	RS, BWMRI, Rajshahi	45
8	28/06/2021	Yield loss assessment due to attack of Fall Armyworm on Maize and its management	BWMRI, Dinajpur	38
Total				318

4. FIELD DAYS, VISITS AND PUBLICATIONS

A group of scientists, DAE personnel and farmers visited the demonstrations and seed production plots several times and were impressed to see the plots. A good number of visitors both from home and abroad also visited the on-station and on-farm activities of BWMRI. BWMRI technologies were presented to the students from different schools, college and universities during their field trip at BWMRI. Seventeen field days were organized by BWMRI about new variety demonstration, modern production technologies, quality wheat and maize seed production, wheat blast management, environment friendly control measures of Fall Armyworm insect in maize, increase soil & crop productivity through climate smart conservation technology in drought-prone areas, salt tolerant wheat varieties in coastal saline area etc. where about 1220 farmers and 75 field staffs of DAE & related personnel were present. The participating farmers in the field days were very much interested to cultivate new varieties of wheat. Huge number of coloured pictorial factsheets (2nd edition) and folders of wheat blast and how to mitigate the disease, both in Bangla and English and booklet of modern wheat cultivation techniques (in Bangla) were published and distributed among the farmers and related personnel.

Table 4.1 Field days organized by BWMRI, Dinajpurduring 2021-22

Implemented by	Date	Venue	Participants		
			Farmers	SAAO/SA	Total
BWMRI & Regional Station	Combat wheat blast disease and multiplication of new variety seeds				
	24/01/2022	Madargonj, Sadar, Thakurgaon	80	6	86
	23/03/2022	Ranisankail, Thakurgaon	80	6	86
	27/03/2022	Ghatail, Tangail	80	6	86
	28/03/2022	Munshirhat, Sadar, Thakurgaon	80	6	86
	28/03/2022	Bhuapur, Tangail	80	6	86
	30/03/2022	Debigonj, Panchagarh	80	6	86
	Production Enhancement of Newly Developed Wheat Variety Through Modern Technology in Non-Traditional Adverse Areas				
	07/03/2022	Cinirpotol, Shaghata, Gaibandha	70	6	76
	14/03/2022	Kalikapur, Sadar, Dinajpur	70	6	76
	Increase soil & crop productivity through climate smart conservation technology in drought-prone areas				
	06/03/2022	Bijoynagar, Godagari, Rajshahi	70	2	72
	08/03/2022	Lohagara, Narail	70	2	72
	24/05/2022	Paba, Rajshahi	100	4	104
	Environment friendly control measures of Fall Armyworm insect in maize crop				

Implemented by	Date	Venue	Participants		
			Farmers	SAAO/SA	Total
	29/05/2022	Nashipur, Sadar, Dinajpur	50	2	52
	13/05/2022	Baduria, Charghat, Rajshahi	50	2	52
	Demonstration of new wheat and maize varieties				
	29/03/2022	RS, BWMRI, Jamalpur (wheat)	70	6	76
	28/04/2022	Dhonbari, Tangail (Maize)	45	2	47
	11/03/2022	Deuli, Shibrampur, Birganj, Dinajpur	100	5	105
	20/06/2022	Nashipur, Sadar, Dinajpur	45	2	47
Total=			**1220**	**75**	**1295**

Conclusions

Rajshahi and Jessore regions followed by Rangpur, Khulna and Dinajpur regions had higher yields than other regions. Though, there were some variations in yields among the genotypes, the farmers preserved seeds of all new varieties for next year. This will increase wheat yield and varietal diversity which are also important from the view point of disease epidemic. Yield maximization/block demonstration in large plots in farmers' fields proved that potential yield of a variety can also be achieved in farmers' field and near about 1 t ha^{-1} yield can be increased in farmers' field by using good seeds of new varieties, recommended fertilizers use with irrigation, etc. Good quantity seeds of new varieties have been made available to the farmers through different technology transfer activities. This will help rapid dissemination of new varieties of wheat.

INFORMATION REGARDING ON GOING PROJECTS OF BWMRI

Serial No.	Project Title	Duration	Funded by		PI	Project activities
			Gob	Others		
1.	Heat Tolerant Maize for Asia (HTMA-II)	01 August 2018 to 31 July 2023	USAID through CIMMYT-India		Dr. Salahuddin Ahmed Chief Scientific Officer Maize Breeding Division Bangladesh Wheat and Maize Research Institute (BWMRI) Nashipur, Dinajpur-5200 Cell:+8801715213768; Tel:+880-2-588817732(O);+880-2-48034478(R) Email:su_ahmed66@yahoo.com; dirplanbwmri@gmail.com; salahuddin.ahmed@bwmri.gov.bd	**Main Activities:** The hybrids will be extensively tested by the alliance partners under managed stress screening for the target traits (heat; combined heat and drought tolerance), along with yield potential and other adaptive traits, and top-ranked high yielding and stress tolerant maize hybrids will be identified for the rgetagroecologies in South Asia.The best-bet hybrids will be channelized in national variety release system for testing and release through the alliance partners.The products will be deployed in climate-change vulnerable target environments in South Asia. **Project Objective:** Implement rapid-cycle genomic selection for generating open-source multi-parental synthetic (MAGIC) populations and for further deriving doubled haploid (DH) lines with resilience to heat stress.Develop high-yielding and heat tolerant tolerant maize hybrids through managed stress screening and multi-location trials in India, Pakistan, Nepal, Bhutan and Bangladesh.Initiate deployment of heat stress resilient elite maize germplasm in the target agro-ecologies in South Asia through a regional alliance of public and private sector partners.

					Strengthen capacity of alliance partners, including South Asian maize breeding programs and local seed companies to sustainably serve climate change-vulnerable maize production system in the tropics.
2.	Production Enhancement and Extension Program of Newly Developed Wheat and Maize Varieties Using Modern and Improved Technology in Rajshahi, Rangpur and Dinajpur Region	01 July 2021 June 2024	GOB	Dr. Md, Ilias Hossain, Principal Scientific Officer, Bangladesh Wheat and Maize Research Institute (BWMRI), Shampur, Rajshahi. Cell:+8801712632167; Tel:+880-2-588866395(O); +880-2-5888866462 Email: iliasrwrc@gmail.com	**Main Activities:** Production Enhancement and Extension Program of Newly Developed Wheat and Maize Varieties Using Modern and Improved Technology in Rajshahi, Rangpur and Dinajpur Regions **Project Objective:** Expansion of wheat and maize in Rajshahi, Rangpur and Dinajpur Regions through modern technologies.
3.	'Accelerating genetic gain in wheat through hybrid breeding in Bangladesh, Ethiopia and Pakistan'	1 December 2021 to 30 June 2026	ACIAR (ACIAR Project No: CROP2020-167)	Dr. Md. Abdul Hakim (PSO and Head, Plant Breeding Division)	Increasing yield potentiality of wheat through introduction of hybrid wheat and thus establish hybrid wheat seed industry in Bangladesh.
4.	Combat wheat blast disease and multiplication of new variety seeds in Bangladesh	January 2021 to October 2023	GOB and USAID	Dr. Md. Mahfuz Bazzaz	Seed production/procurement, Demonstration, Training, Workshop, Field day, Purchase of Lab. Office and Filed equipments

5.	Production enhancement of newly developed wheat variety through modern technology in Non-traditional adverse areas of Bangladesh	July 2020 to June 2023	GOB	Dr. Md. Mahfuz Bazzaz	Development of wheat production technology, Seed production/procurement, Demonstration, Training, Field day, Purchase of Lab. and Office equipments
6.	Determination of maize crop damage by Fall Armyworm insect and development of its environment friendly management	July 2021-June 2024	GoB	Dr. Md. Mostafizur Rahman Shah	i) Determination of maize crop damage due to attack of FAW ii) Development of environment friendly management package against FAW on maize iii) Up scaling and validation of FAW management strategies iv) Training and knowledge sharing with maize growers, extension personnel, NGOs etc.
7.	Accelerating the Mainstreaming of Elevated Zinc in Global Wheat Breeding	Oct. 2019 to Sept. 2024	CIMMYT, Mexico	Dr. Md. Siddikun Nabi Mandal	To evaluate some Biofortified advance lines and select the promising ones for Bangladesh environment.
8.	Managing wheat blast in Bangladesh: Identification and introgression of	From 28 December 2021 to 27 December 2026	KGF and ACIAR	Dr. Muhammad Rezaul Kabir	**i)** Screening diverse wheat germplasm to identify blast resistant sources **ii)** Development of wheat blast resistant varieties/ lines **iii)** Identification of aggressive isolates

	wheat blast resistant gene(s) into varietal development and rapid varietal dissemination				and study their population biology and development of potential differential lines **iv)** Dissemination of resistant varieties seeds to reach farmers' fields
9.	Understanding and managing wheat blast in Bangladesh	1st July 2022-30th April 2023	CIMMYT-PHI	Krishna Kanta Roy	i) Wheat disease survey ii) Wheat blast pathogen characterization for virulence and molecular diversity iii) Monitoring, identification and characterization of new isolates of wheat blast

জনবল সম্পর্কে তথ্য

ক্রমিক নং	বিজ্ঞানী/ কর্মকর্তা	পদ সংখ্যা	কর্মরত	মন্তব্য
১	মহাপরিচালক	১	০	চলতি দায়িত্ব
২	পরিচালক	২	০	১ জন অতিরিক্ত দায়িত্ব
৩	মুখ্য বৈজ্ঞানিক কর্মকর্তা	৭	৫	
৪	প্রধান বৈজ্ঞানিক কর্মকর্তা	২০	৯	
৫	ঊর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা	৩০	১৮	
৬	বৈজ্ঞানিক কর্মকর্তা	৩৪	১৮	
৭	খামার তত্ত্বাবধায়ক	৭	৬	
৮	প্রশাসনিক কর্মকর্তাবৃন্দ:			
	উপপরিচালক	১	১	
	সিনিয়র সহকারী পরিচালক	২	২	
	সহকারী পরিচালক	৩	২	
	হিসাবরক্ষণ কর্মকর্তা	১	০	
	প্রশাসনিক কর্মকর্তা	১	১	
৯	অন্যান্য কর্মকর্তাবৃন্দ:			
	মেডিকেল অফিসার	১	১	
	সহকারী প্রকৌশলী	২	১	
	সহকারী প্রোগ্রামার	১	১	
	সহকারী মেইনটেনেন্স ইন্জিনিয়ার	১	১	
	উপ-সহকারী প্রকৌশলী	৩	১	
	লাইব্রেরিয়ান	১	১	
১০	তৃতীয় শ্রেণীর কর্মচারী:			
	বৈজ্ঞানিক সহকারী	৪০	৩৬	
	অন্যান্য তৃতীয় শ্রেণীর কর্মচারী	৫০	৩৮	
১১	চতুর্থ শ্রেণীর কর্মচারী	২৮	৮	
	মোট	২৩৬	১৫০