2020
PhilRice R&D Highlights

Crop Protection Division

Contents

Crop Protection Division

Division Head: Genaro S. Rillon

EXECUTIVE SUMMARY

The Crop Protection Division (CPD) aims to prevent yield loss so that abundant rice harvest will be achieved. Specifically, CPD aims to generate, develop, and promote sustainable pest management strategies that will help farmers improve their pest management decision-making. Pest management strategies should be ecosystem-based that promote ecological diversity, environment-friendly, safe, economical, sustainable, and compatible with other management options. Hence, CPD contributes to the achievement of the strategic outcomes of PhilRice: (1) increased productivity, cost-effectiveness, and profitability of rice farming in a sustainable manner; (2) enhanced value, availability, and utilization of rice, diversified rice-based farming products and by-products for better quality, safety, health, nutrition, and income; and (3) advanced rice science and technology as continuing sources of growth.

The division implemented four interrelated projects in 2020. The first project evaluated rice materials for insect pest and disease resistance. Screening is very important in identifying rice lines that will show resistance to major diseases and insect pests and this complements rice varietal development to produce better varieties. The efforts were successful in maintaining disease and insect pest resistance in released varieties. This year, 1,816 entries composed of 463 inbreds, 614 hybrid parent lines, 696 germplasm accessions, and 43 varieties were evaluated to determine their resistance to major rice diseases and insect pests in PhilRice CES. Hybrid parent and CMS lines were further evaluated at PhilRice Isabela and Negros. The different reactions of these test entries to major rice insect pests and diseases were summarized. For a fast and efficient method of resistance screening to sheath blight, the foil method was conducted along with the optimization of previously validated mist chamber and micro-chamber methods. Among the treatments in the foil method, mycelial discs inoculated in trays mist chamber inside the screenhouse had the highest percent lesion.

The second project generally aimed to characterize the resistance of PhilRice breeding lines under development and other rice germplasm as potential sources of resistance genes against two distinct major rice diseases, the rice blast and the bacterial leaf blight. For 2020, eight breeding lines showed resistant reaction to all of the 20 differential blast isolates while six breeding lines exhibited high broad-spectrum resistance index value for bacterial blight disease. In addition, a Gal-ong–derived mutant line, GBX1, exhibited broad spectrum resistance to both rice blast and bacterial leaf blight diseases. These generated information will also help plant breeders in improving their breeding strategies for disease resistance.

The third project implemented eight interrelated studies to determine: (a) ecology of yellow stemborer, planthoppers, and other arthropods on select rice fields in the country; (b) determine the interfering ability of *Cyperus rotundus* against irrigated rice; (c) the efficacy of fungal endophytes, fungal epiphytes, and selected weed species against rice blast and sheath blight pathogens; (d) the efficacy of golden apple snail and *Lantana camara* as attractants to rice bug; and (e) the preservation methods that can maintain the viability and genetic integrities of beneficial microorganisms. Highlights of accomplishments included the developed alternative control techniques for major insect pests, diseases, weeds, and golden apple snail for better pest management options in rice production.

The fourth project aimed to continually improve the services of Entomology, Plant Pathology, and Weed Science Laboratories and to ensure accurate and good quality research outputs. Major activities under this project included regular calibration of laboratory equipment and periodic preventive maintenance procedures. Laboratory equipment was inventoried following the format of BAFS for online laboratory profiling for all DA laboratories. The generated data were uploaded in the BAFS Google data account and available online.

PROJECT 1

Evaluation of Rice Lines for Disease and Insect Pests Resistance

Juliet P. Rillon

Rice diseases and insect pests are considered major barriers in achieving the goal of increased rice production as these can cause significant seed yield and quality reduction resulting in reduced farmer's income. One way to increase yield is to reduce losses from insect pests and diseases. Screening is important in identifying rice lines that will show resistance to major rice insect pests and diseases that could be used for breeding. Thus, it is necessary to develop a protocol that can shorten the screening process.

In 2020, 1,816 entries composed of 463 inbreds, 614 hybrid parent lines, 696 germplasm accessions, and 43 varieties were evaluated to determine the resistance to major rice diseases and insect pests at PhilRice CES. In addition, the 614 hybrid parent lines were evaluated in PhilRice Isabela against major rice diseases and stemborer damage resistance, and in PhilRice Negros for tungro resistance. Evaluation for disease resistance was done by examining the dominant lesion type and leaf area infected (blast), length of lesion (bacterial leaf blight [BLB]), and relative lesion height (sheath blight [ShB]), and by assessing the percent infection for rice tungro disease. damage evaluation rating was determined for brown planthopper (BPH) and green leafhopper (GLH). Deadheart (DH) and whitehead (WH) were obtained for stem borer (SB) damage assessment. Results showed that 931 (54%) rice entries had resistant reactions to blast while 222 (13%) entries had intermediate reactions to the disease. For bacterial leaf blight, 104 (20%) entries were resistant and 250 (48%) entries had intermediate reactions to the disease. Sixteen (2%) entries showed resistant reactions against BPH while 185 (29%) had intermediate reactions. For GLH, 132 (21%) had intermediate reactions while the rest were susceptible. For stem borer damage (whitehead) assessment, majority of the entries had resistant reactions in the wet season with 10-30% SB damage (WH) in TN1 susceptible check variety.

In PhilRice Isabela, 96 (16%) parent lines showed resistant reactions to blast while 348 (51%) entries had intermediate reactions to the disease. For BLB evaluation, 192 (52%) hybrid parent lines showed resistant reactions and 108 (29%) were with intermediate reactions to the disease. In PhilRice Negros, 24 (6%) parent lines and three of five (60%) CMS lines showed intermediate reactions to tungro under modified field method of evaluation.

For fast and efficient method of resistance screening to sheath blight, foil method was conducted along with the optimization of previously validated mist chamber and micro-chamber methods in the screenhouse. Among the treatments in the foil method, mycelial discs inoculated in trays mist chamber inside the screenhouse had the highest percent lesion followed by mycelial discs inoculated in trays mist chamber inside the blast room in the entire test materials evaluated. In addition, substrate inoculated in trays mist chamber both in the screenhouse and blast room had the lowest percent lesion results. Actual percent lesions and visual rating scores obtained in the screening were nearly comparable with each other. In this study, improvement and modification on the disease reaction rating scale will further be explored to fit the screening on seedling stage.

Centralized Screening for Resistance to Rice Diseases

Keith Marielle B. Guarin, Juliet P. Rillon, Salvacion E. Santiago, and Ma. Salome V. Duca

Rice diseases are considered a major barrier in achieving the goal of increased rice production as these cause significant seed yield and quality reduction resulting in reduced farmer's income. Therefore, it is necessary to know the reaction of available rice lines to assist breeders in choosing resistant breeding materials. Following the protocol for disease resistance screening indicated in the National Cooperative Testing Manual for Rice, 565 promising rice lines were evaluated in 2020 to determine reactions to major rice diseases and to identify lines that could be used for breeding. Results showed that among the entries evaluated for blast resistance, 249 entries had resistant reactions while 79 entries had intermediate reactions to the disease. For bacterial leaf blight, PR42837-NSIC Rc222-188-B-RTD-1 were found resistant while 91 entries had intermediate reactions to the disease. All entries evaluated for sheath blight and tungro had susceptible reactions. Low disease pressure for tungro was observed during the dry and wet seasons.

Centralized Screening for Resistance to Major Insect Pests of Rice

Gilely dC. Santiago, Evelyn M. Valdez, and Ma. Salome V. Duca

Rice entries totalling 227 and 43 high-yielding varieties were evaluated against major insect pests under natural field and screenhouse conditions during 2020 dry season. The Institute issued force majeure during the reproductive stage of evaluation. Initial study showed low stem borer pressure to cause a required insect pressure on susceptible check, TN1. Screenhouse evaluation showed that majority of the entries had intermediate reactions to brown planthopper (BPH) and green leafhopper (GLH).

During 2020 wet season, 57 rice entries for rainfed saline (RF) were evaluated. PYT-R and PYT-SP were not screened due to lack of seeds. Twenty six high-yielding entries were re-evaluated for their resistance to major insects. Insect pressure was still low during the season; hence, data under the natural field condition was not valid. Under the screenhouse condition, majority of the entries were intermediate to BPH and all entries were susceptible to GLH.

Optimization of a Rapid Screening Method for Sheath Blight Resistance under Screenhouse Condition

Eleanor S. Avellanoza, Ronalyn T. Miranda, Juliet P. Rillon, and Catherine P. Duruin

There is a need for a fast and efficient resistance screening method for sheath blight to assess more breeding lines and hasten improvement of rice varieties in terms of resistance. In 2020 WS, the foil method, in which leaf sheaths of inoculated test plants were covered with foil to provide a favorable condition for the disease to progress, was validated. Treatments were: (a) mycelia discs in pots, (b) mycelia discs and substrate in trays mist chamber in the screenhouse, and (c) mycelia discs and substrate in trays mist chamber inside the blast room. Twenty-one-day-old seedlings of rice varieties with known disease reactions to sheath blight – Jasmine 85 and Tequing (MR), NSIC 2013 Rc330 and NSIC 2015 Rc430 (I), and TN1 (S) – were used as test materials. Mycelial discs and rice hull plus rice bran (3:1 ratio) served as inoculum carriers. At 10 days post inoculation (DPI) of the pathogen, the actual and visual rating scores for disease reactions were gathered based on the SES visual scoring for sheath blight.

Among the treatments, mycelial discs-inoculated plants in trays mist chamber inside the screenhouse had the highest percent lesions. It can discriminate the expected known disease reaction patterns. Results matched with the expected reaction, i.e., the susceptible check variety TN1 got the highest percent lesions of 66% while Jasmine 85 and Tequing had moderately resistant reactions to the disease with 40% and 49% lesions, respectively. NSIC Rc330 (58.92%) and NSIC Rc430 (52.39%) had slightly higher % lesions of 59% and 52%, respectively, corresponding to intermediate reactions. Furthermore, results of mycelial discs-inoculated plants in trays in mist chamber inside the blast room showed TN1, a susceptible variety check, having a comparable result with the two intermediate checks NSIC Rc330 (39%) and NSIC Rc430 (38%). Jasmine 85 with the expected moderately resistant reaction, on the other hand, had the highest percent lesion of 53% while Tequing (30%) had the expected moderately resistant reaction. All inoculated plants with mycelial discs in pots cannot differentiate the expected known disease reaction patterns of the five test materials evaluated. The lowest actual percent lesions were obtained in plants inoculated with substrate in all treatments. In this study, there is a need to further optimize the screening method and modify the disease rating scale to fit the disease reaction screening results of test materials in seedling stage.

Evaluation of CMS Parentals, Breeding lines and Promising Hybrids for Resistance to Major Insect Pests and Diseases

Salvacion E. Santiago, Genaro S. Rillon, Juliet P. Rillon, Frodie P. Waing, Gracia B. Amar, Cherryl U. Seville, Keith Marielle B. Guarin, Cesjoy Carl B. Encarnacion, Zarah Faith T. Lunag, and Ellie Zandrew S. Ganella

The superior yield advantage of hybrid over inbred could be affected by susceptibility to pests and diseases. To address one of the major concerns in the hybrid rice program, promising hybrid parent lines were evaluated for resistance to major rice diseases such as blast, bacterial leaf blight (BLB), sheath blight (ShB), and tungro, and to major rice insect pests like stem borer damage (SB) (deadheart and whitehead), green leafhopper (GLH), and brown planthopper (BPH) during the 2020 dry and wet seasons. All forwarded hybrid parent lines were evaluated in three experimental sites: PhilRice CES, Isabela, and Negros. Of the 227 lines evaluated during the dry season, 49 CMS parental lines (29 restorer and 20 maintainer) were found to have intermediate reactions to blast, BLB, and SB (whitehead) across sites. Among the 49 hybrid parent lines, 42 had 2-3 resistances to insect pests and diseases. Moreover, five restorer lines were also found to be intermediate to resistant to blast, BLB, sheath blight, and stem borer while another two restorer lines were found resistant. A total of 150 CMS parent lines were evaluated for pests and diseases during the wet season. There were 21 R-lines selected for their intermediate to resistant reactions to blast, BLB, and stem borer damage (whitehead) across sites. Of the 21 hybrid parent lines selected, 19 lines consistently had four intermediate to resistant reactions to blast, BLB, and stem borer damage (whitehead) while one restorer line was found to have the greatest number of resistances to pest and disease evaluations. Of the 21 R-lines selected, two restorer lines were found to have intermediate reactions to tungro disease under the modified field method of evaluation in PhilRice Negros during the wet season. One restorer line was also found to have resistance to the disease. Another R-line was observed to have resistance to tungro though not included in the 21 selected hybrid lines. Evaluation of resistance against stem borer damage (whitehead) was also conducted in PhilRice CES. In 2020, resistance to whitehead was noted in 286 hybrid parent lines, 59 hybrid lines had intermediate reactions, while 30 hybrid lines were susceptible.

Evaluation of Rice Germplasm for Biotic Stresses

Juliet P. Rillon, Gilely DC Santiago, Keith Marielle B. Guarin,
Salvacion E. Santiago, and Xavier I. Caguiat

Rice diseases can affect the quality and quantity of rice that cause profit loss to farmers. Rice germplasm possesses useful genes for key traits such as resistance to major rice diseases. Resistant accessions can be used as parent materials for new rice varieties. In 2020, 696 accessions from PhilRice Genebank were evaluated for resistance to blast and tungro. Blast resistance was evaluated 30 days after sowing by examining the dominant lesion type and leaf area infected. For tungro resistance, the percent disease infection was assessed 3-4 weeks after inoculation under induced method, and 45 and 60 days after transplanting under the modified method. Results showed that among the rice accessions evaluated for blast resistance, 496 (71%) were resistant while 131 accessions (19%) were found susceptible to the disease. Sixty-nine accessions (10%), on the other hand, had intermediate reactions. Under induced method, all accessions were susceptible to tungro. Low tungro disease pressure under modified field method, however, was observed during the 2020 dry season evaluation of 306 accessions. Evaluation of these accessions is necessary to identify donors of disease resistance that can be used in the development of new rice varieties.

Characterization of PhilRice Elite Germplasm for Functional Disease Resistance Genes

Jennifer T. Niones

Using the differential system for disease resistance, the resistance reactions of PhilRice elite lines developed through mutation breeding were evaluated against differential rice blast and bacterial blight isolates. The resistance genes harboring in these rice genotypes were likewise estimated. These breeding lines were also genotyped for the presence of resistance genes using R-gene specific DNA markers of known bacterial blight and rice blast major resistance genes.

Eight breeding lines had resistant reactions to all of the 20 differential blast isolates. These breeding lines showed a disease reaction pattern different from that of the major R genes included in the blast differential system. It is possible that R genes (not considered in the differential system) or novel R genes are controlling the resistance in these breeding lines. Meanwhile, six breeding lines exhibited high broad spectrum resistance index value for bacterial blight disease. However, the resistance patterns against *Xoo* isolates were different from that of the bacterial blight differential varieties, implicating unique or novel *Xa* genes possibly controlling the host resistance against the bacterial blight pathogen.

A Gal-ong–derived mutant line, GBX1, exhibited broad spectrum resistance to both rice blast and bacterial leaf blight diseases. Its spectrum of resistance is different from the disease reactions of known major blast and bacterial blight resistance genes against standard differential isolates. Thus, this mutant line possibly harbors novel disease resistance genes against blast and bacterial blight. These genes can be used for breeding rice varieties with pyramided genes for resistance against these two important rice diseases.

Identification of Major Blast Resistance Genes in PhilRice Elite Rice Germplasm and other Rice Materials as Potential Source of Blast Resistance Genes

Jennifer T. Niones and Jennifer Manangkil

Rice blast disease imposes a constant constraint to the stable rice production worldwide. In the Philippines, rice blast disease has been frequently reported in upland rice growing areas and rainfed lowland environments that are prone to drought, which causes yield losses ranging from 50 to 85% in some epidemic years. In this study, 53 elite lines developed through mutation breeding were evaluated for their rice blast resistance using the rice blast differential system. These mutant lines were derived from nine wildtype parents – variety Y Dam Do from Laos; Jepun from Indonesia; Philippine traditional varieties Gal-ong and Azucena; and Philippine released varieties PSB Rc10, PSB Rc72H, NSIC Rc222, Rc134, and Rc240. These elite mutant lines have improved traits from their wildtype parents that include higher yield, resistance to diseases, better grain quality, low phytic acid content, early maturity, and less chalkiness. Eight breeding lines, all derived from Gal-ong, had resistant reactions to all of the 20 differential blast isolates. These breeding lines showed disease reaction pattern different from that of the major R-genes included in the differential system. It is possible that R-genes not considered in the differential system or novel R-genes are controlling the resistance in these breeding lines. Moreover, most of the Gal-ong–derived mutant lines exhibited broad spectrum resistance against differential rice blast isolates. On the other hand, 16 breeding lines, 11 of which were mutant lines derived from Jepun and Y Dam Do varieties, exhibited narrow spectrum of blast resistance. Primary estimation of R genes present in these breeding lines using three distinct blast differential isolates showed 13 breeding lines estimated to harbor a combined *Pi20(t), Pita* and *Pik* genes. *Pita*(t) is the most frequently estimated gene among the breeding lines, either as single gene or in combination with *Pi20* and *Pik* genes. In addition to the aforementioned *Pi* genes used in the primary gene estimation, eight breeding lines were also estimated to harbor *Pita-2* gene.

Identification of Bacterial Blight Resistance Genes in PhilRice Germplasm and Potential Source of Bacterial Blight Resistance Genes

Eleanor S. Avellanoza, Cay Neth A. Callejo, and Jennifer T. Niones

In 2020 WS, 57 mutant elite lines derived from eight wild types of Azucena, Gal-ong, PSB Rc10, NSIC Rc134, Rc222, Rc240, Y Dam Do, and Jepun, which were selected for low phytic acid, good eating quality, improved yield and maturity, disease resistance, and tolerance for adverse environment (drought- and saline-prone) were subjected to phenotyping using the BB differential system and genotyping using five molecular markers (*Xa4, xa5, Xa7, xa13* and *Xa21*) for the detection of the presence *Xa*-genes. Thirty-two mutant elite lines were grouped into seven based on their reaction patterns to eight differential lines evaluated against the seven selected Xoo races, i.e., Variety Group 1 (VG1) – estimated xa5 gene; VG2 – Xa7 gene, VG3 – Xa10 gene, VG4 – Xa13 gene, VG5 – Xa21, VG6 – Xa57, and VG7 – with different reaction patterns from the known *Xa* genes. Moreover, the broad spectrum resistance index (BSRI) of 57 mutant elite lines evaluated were grouped into 10 based on computed BSRI values that ranged from 0.2 to 0.9. The Gal-ong-derived mutant elite line GXB-307-1, belonging to VG1, had a broad resistance spectrum of 12.0 and the highest computed BSRI of 0.9. Molecular analysis showed that 54 of the mutant elite lines evaluated mostly harbored the *Xa4* and *Xa7* genes in their genome, which were detected in 17 Gal-ong-derived mutant lines and from all (6) Azucena- and NSIC Rc222-derived lines. The xa5 gene was detected in 21 mutant elite lines while none of the mutant lines harbor the *xa13* gene. The *Xa21* gene present in 44 mutant elite lines were detected in 15 mutant lines of Gal-ong. However, 37 mutant lines segregated in terms of *Xa* genes detected in their genome; i.e., they had either 2 negatives or 1 positive results. These segregating populations of mutant lines can be purified and further plant selections can be done to ensure that the advanced mutant elite lines have the Xa resistance genes in their genome.

PROJECT 3

Ecology and Management of Key Pests of Rice and Conservation of Beneficial Organisms

Dindo King M. Donayre

Pests are one of the limiting biotic agents in rice production as they significantly reduce yield and quality of harvests, and income, if not properly managed. Management techniques are easily available to combat pests. However, the biology and ecology of target pests must be determined first to develop a successful, effective, and economical pest management. In the Philippines, the use of pesticides to combat rice pests remains the foremost option for many farmers. Alternative control techniques such as the use of biological control agents and other potential organisms have been suggested to minimize injudicious use of pesticides. Potential organisms were also previously identified to be effective against major pests of rice. Unfortunately, many of these did not reach the end-user because of limited scope of exploration and lack of evaluation. Thus, this project implemented eight interrelated studies to determine: (a) ecology of yellow stemborer, planthoppers, and other arthropods on selected ricefields in the country; (b) determine the interfering ability of *Cyperus rotundus* against irrigated rice; (c) the efficacy of fungal endophytes, fungal epiphytes, and selected weed species against rice blast and sheath blight pathogens; (d) the efficacy of golden apple snail and *Lantana camara* as attractants to rice bug; and (e) the preservation methods that can maintain the viability and genetic integrities of beneficial microorganisms. Monitoring insect pests through light traps showed that the population of yellow stem borer peaked in Mar-Apr and Sep-Oct this year but had less chance to cause damage to rice plants. Other insect pests like brown planthopper and green leafhopper peaked in the 2nd week of March and in the last week of July to 1st week of Oct. Increase in population was congruent to the increase in number of predators. The population of rice black bug, on the other hand, was highest from November 2019 to January 2020. Data from field monitoring by trapping through sticky traps showed that RPH population was also low in PhilRice CES and Mabini, Sto. Domingo, Nueva Ecija; although in wet season, there was a minor peak observed during the flowering stages in both sites and then later declined as the crop matured. On the other hand, allowing LE-CYPRO to grow within 30, 40, 50, 60 days and until harvest resulted in grain yield reductions by 10.7, 19.9, 14.8, 16.3, and 40%; minimal reductions when the weed was absent within 10 until 60 DAT. Grain yield of DSR was reduced by 15, 17.2, 16.3, 18.5, and 34.1% when the weed was present within 30, 40, 50, and 60 DAT and until harvest, respectively. No yield penalty was observed within 10 and 20 DAS. Grain yield of DSR was reduced by 16.9 and 4.1% when it was weed-free within 10 and 20 DAS. In an experiment to determine the effect of weed ethanolic extracts against

Magnaporthe grisea, results showed that extracts of extracts of *E. crassipes*, *I. aquatica*, and *P. angulata* inhibited the spore germination of *M. grisea*. In food poisoned technique, the 75% concentration of *E. crassipes* caused 3.6% mycelial growth reduction on the rice blast fungus while *P. angulata* by 9.5%. Meanwhile, crushed or uncrushed GAS attracted a greater number of rice bugs than *L. camara* particularly at Wenceslao, Aurora. Initial testing of different trap designs showed that putting GAS inside the net was the most effective in attracting rice bugs. In determining the best method of conserving organisms, it was found that filter paper had the higher rate of revival of organisms. It was also the cheapest, easiest to prepare, and required minimal space for conserving fungal isolates.

Seasonal Fluctuation of Stemborer and Other Arthropods at PhilRice CES

Gilely dC. Santiago and Evelyn M. Valdez

Light trap helps determine the seasonal patterns of insects' densities in the cropped areas. It provides information related to insects' distributions, abundances, and flight patterns. In addition, it helps in deciding when to initiate control thru application of bio- and synthetic pesticides as well as the release of biocontrol agents. Weekly light trapping was done to monitor the arthropods in PhilRice CES using a JICA light trap. Samples were brought into the laboratory for sorting, identification, and counting. The population of yellow stem borers peaked in March-April (dry season) and September-October (wet season) this year. Highest number of moths caught was 147 in the 2nd week of Oct. The population, however, was generally low to cause damage. The hoppers, specifically brown planthopper and green leafhopper, peaked in the 2nd week of March and in last week of July to 1st week of Oct. The increase in the population of predators coincided with the peak of the population of the hoppers. The population of rice black bug was highest from November 2019 to January 2020. Yellow stem borer egg masses in the dry season were likewise generally low.

Development of Management Options for Rice Planthoppers

Genaro S. Rillon, Cesjoy Carl B. Encarnacion, and Jayvee S. Bruno

Planthoppers (RPHs) are one of the recent serious constraints to rice production in the Philippines. Hence, information on their population and associated damage are very minimal. Light trap catches at PhilRice CES this year showed low population of RPH. Population of brown planthopper (BPH) was only 2,160 (September 2020) and there was almost nil number of white-backed planthopper during the monitoring period. Data from field monitoring by trapping through sticky traps showed that RPH population was also low in PhilRice CES and Mabini, Sto. Domingo, Nueva Ecija. However in the wet season, there was a minor peak observed during the flowering stages in both sites and then later declined as the crops matured. During field samplings, numerous spiders and other predators such as the coccinelids and mirids were observed. No incidence of injuries caused by RPH was recorded. To avoid BPH infestation in the future, we recommend planting of RPH-resistant rice varieties, practice synchronous planting but avoid rice ratooning, conserve beneficial organisms, and apply insecticides cautiously.

Interference of *Cyperus Rotundus* on Growth and Development of Rice under Irrigated-Lowland Condition

Dindo King M. Donayre, Jessica Joyce L. Jimenez, Edwin C. Martin, and Anna Ma. Lourdes S. Latonio

Lowland ecotype *Cyperus rotundus* L. (LE-CYPRO) has been reported infesting irrigated lowland ricefields. Its effects on the growth and yield of rice under flooded conditions are still unknown. Two trials were conducted to determine the vulnerable periods of irrigated-lowland transplanted (TPR) rice and direct-seeded rice (DSR) to competition by LE-CYPRO. Eight TPR and 36 DSR plants, grown with 10 tubers of LE-CYPRO, were subjected to duration of tolerable period of competition, where the weed was allowed to compete with rice from 0 DAT/DAS, then simultaneously uprooted at 10, 20, 30, 40, 50, and DAT/DAS; and duration of weed-free period of competition, where rice plants were free from the weed within periods of 10, 20, 30, 40, 50, and 60 DAT/DAS. All the experiments were arranged in RCBD with three replications. Allowing LE-CYPRO to grow with TPR and DSR from 0 DAT/DAS until harvest resulted in significant increase in its number and dry-weight of off-shoots. Its growth decreased when its presence was delayed from 0 to 60 DAT/DAS. Dry-weight of shoots and number of panicles of TPR significantly decreased as LE-CYPRO grew and competed. Grain yields were not reduced within 10 and 20 DAT but reduced by 10.7, 19.9, 14.8, 16.3, and 40% when the weed was within 30, 40, 50, 60 days and until harvest; minimal reductions when the weed was absent within 10 until 60 DAT. Dry-weight of shoots and number of panicles of DSR were also significantly reduced. Grain yield of DSR was reduced by 15, 17.2, 16.3, 18.5, and 34.1% when the weed was present within 30, 40, 50, and 60 DAT and until harvest, respectively. No yield penalty was observed within 10 and 20 DAS. Grain yield of DSR was reduced by 16.9 and 4.1% when it was weed-free within 10 and 20 DAS.

Antifungal Effects of Selected Weed Against the Philippine Isolate of *Magnaporthe grisea* Causing Rice Blast Disease

Fe A. Dela Peña and Henesie G. Pascua

An experiment was conducted to determine the effect of weed ethanolic extracts against *Magnaporthe grisea*. In phytotoxicity test, extracts of *Eichhornia crassipes* and *Ipomoea aquatica* at 100ul plus 5ml water showed slight injuries on rice plants; *Pistia stratiotes* caused yellowing; and *Physalis angulata*, a very light discoloration. Respective extracts of *E. crassipes, I. aquatica,* and *P. angulata* inhibited the spore germination of *M. grisea*. In food poisoned technique, the 75% concentration of *E. crassipes* caused 3.6% mycelial growth reduction on the rice blast fungus while *P. angulata* by 9.50%. *I. aquatica*, at all concentrations, had no effect on the fungus. The weed extracts can be recommended as biofungicide against *M. grisea*.

Evaluation of Golden Apple Snail and *Lantana camara* as Attractants for Rice Bug

Evelyn M. Valdez, Dindo King M. Donayre, Jessica Joyce L. Jimenez, and Anna Maria Lourdes S. Latonio

Golden apple snail (GAS) and *Lantana camara* have been reported as effective attractants to rice bugs. Despite the discoveries, evaluating the attractive effects of these organisms under field conditions are very limited. A field study was conducted in Maria Aurora and Baler, Aurora from January to March 2020 to determine the efficacies of GAS and *L. camara* as attractants to rice bug. Crushed or uncrushed GAS attracted a greater number of rice bugs than *L. camara,* particularly at Wenceslao, Aurora. Initial testing of different trap designs, conducted in Science City of Muñoz, Nueva Ecija from September to October showed that putting GAS inside the net was the most effective in attracting rice bugs.

Conservation of Organisms with Beneficial Uses to Pest Management

Ma. Salome V. Duca, Jessica Joyce L. Jimenez, Dindo King Donayre, and Jennifer T. Niones

A study was conducted at the Plant Pathology Laboratory of Crop Protection Division to determine the best method of conserving organisms with beneficial uses to pest management. Four preservation methods [filter paper, PDA, PDA with glycerol (PDAG), and microbank] were evaluated by storing each separately with 12 fungal endophytes, 12 fungal epiphytes, and 4 fungal pathogens of rice at two varying temperatures (5°C and -20°C) and two periods of revival (1 and 2 years). After two years of preservation, filter paper had the highest revival rates regardless of storage temperature (93% from 5°C and 86% from -20°C). This was followed by PDA (63% from 5°C and 32% from -20°C) and PDAG with 4% from 5°C and 29% from -20°C. In addition, 17 isolates (61%) from microbank were mainly revived from -20°C. The widest growths of fungi (67-100%) were obtained in filter paper method (5°C and -20°C), particularly for isolates' 1Clt2, 37 Bub, D7, DT7, DT4, DT5, and the sheath blight pathogen. Among the four preservation methods, the filter paper was the cheapest, easiest to prepare, and required minimal space for conserving fungal isolates.

PROJECT 4

Crop Protection Division Research and Analytical Laboratory System and Maintenance

Evelyn M. Valdez

This project aimed to (a) provide assistance in the improvement/upgrade/ maintenance of the existing laboratory facilities for better quality research output; (b) capacitate the laboratory workers on proper maintenance of laboratory equipment; and (c) build-up database and inventory of information on the chemical and other IMS-related laboratory management system and eventually migrate or integrate to the laboratory unified information system in collaboration with ISD and other PhilRice laboratories.

CPD has three laboratories: Plant Pathology, Entomology, and Weed Science. Each laboratory is manned by trained researchers based on their field of expertise and is managed by a laboratory manager.

Laboratory workers were mentored/coached by a trained internal calibrator from RCFSD on the calibration of NAWI. This is to increase their knowledge and skills on the care and maintenance and validation of the laboratory equipment, and for them to always uphold good laboratory practices.

The operation of these laboratories is being implemented in adherence to quality, environment, and health and safety standards and in compliance with all the applicable laboratory legal and other requirements. Laboratory equipment was inventoried following the format of BAFS for online laboratory profiling for all DA laboratories. The generated data were uploaded in the BAFS Google data account and available online.

Continual improvement in the operations is needed. Proper care and maintenance of laboratory facilities and equipment should always be guaranteed for accurate and good quality research outputs.