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| Please use this form to clearly and concisely report on project progress. The information included should reflect quantifiable results that can be used to evaluate and measure project success. Comments should be limited to the designated boxes. Technical reports, no longer than 4 pages, may be attached to this summary report. | |
| Project Number: | 1920-172-0125-B |
| Project Title: | Biology and Management of Soybean Stem Diseases |
| Organization: | Iowa State University |
| Principal Investigator Name: | Leonor Leandro |
| Report Period: | Oct 1- Dec 15, 2018 |
| Project Status | |
| In the first quarter of this new project, our efforts focused on planning and coordinating research tasks. A conference call was held with all collaborators to discuss research protocols and assign responsibilities. The group decided to meet on March 6, 2019, in Pensacola, FL, between the SSDW and NCERA soybean disease meetings, to report on progress and finalize field protocols for the 2019 season. Below are details of the work conducted by the collaborators for each task during this quarter.  **Task 1: Increase availability of genetic resistance to stem diseases**  Iowa State University (Singh and Mueller)  A research associate position was advertised this fall to work on this project. Interviews have been completed and the new hire will start in January 2019 to work on this project. Breeding lines (~ 50) were grown in statewide trials. About 10 of these entries will be re-entered in year two (2019) of statewide trials, in addition to ~ 40 new entries. Disease and pest evaluations will be performed on these entries prior to commercialization. The Research Associate will be responsible for setting up early generation and parental strain disease selection (field and lab) pipeline for the 2019 crop season, to advance the breeding outcomes. This work is in collaboration with Singh-Mueller groups working together.  Michigan State University (Wang)  The MSU soybean breeding program harvested over 1,000 progeny lines derived from crosses between white mold or SDS resistant parents and high yielding parents. A subset of these lines will be selected for further evaluation for resistance to white mold or SDS and for other agronomic traits in 2019.  South Dakota State University (Mathew)  A preliminary study was undertaken to determine an isolate by genotype interaction for *Diaporthe caulivora*, the causal pathogen of northern stem canker, in soybean. For the study, three genotypes (Century, PI567473A and susceptible cv. Hawkeye) and four isolates from different U.S. States were used. For greenhouse inoculations, the toothpick method (Ghimire et al. 2018) was used. Briefly, autoclaved toothpicks were placed on PDA plates containing D. caulivora isolates and the plates were incubated at 22°C for 15 days under 12 h of alternating light and dark conditions. After 15 days, when the toothpicks were colonized by *D. caulivora*, they were inserted into the stems of the soybean plants at an angle below the first trifoliate node. The inoculation site was sealed with petroleum jelly. The plants were misted for 3 s every 5 min for 3 days after inoculation and then for 10 s every 3 h until 21 days after inoculation. At 21 days after inoculation, the disease severity was measured as 0 = if the plant showed no lesions; 0.5 = if the plant showed elongated lesions along the stem but no plant death; and 1= if the plant is dead. A significant isolate by genotype interaction was not observed (P = 0. 41) suggesting that a virulent isolate may be considered for screening soybean accessions for resistance to *D. caulivora*. Future plans include finishing isolate by genotype interaction study for *Diaporthe aspalathi*, the causal pathogen of southern stem canker by the next quarterly report. The two preliminary studies will provide information on if a single isolate or multiple isolates will be used for screening soybean accessions to resistance to *D. caulivora* and *D. aspalathi*.  Mississippi State University (Allen and Wilkerson)  Field Research experiments to evaluate in-furrow fungicide efficacy on *Macrophomina phaseolina*, the causal agent of charcoal rot in soybean, were planted June 1, 2018. Trials were set up with 30 treatments in a split plot design (inoculated/ non-inoculated) with 4 replications. Soybean varieties were selected based upon colonization data from an inoculated variety screen conducted during the previous season. In-season sampling of plant roots at an early and late reproductive growth stage was performed to assess the effect of fungicide in reducing colonization of the pathogen. Plots were harvested November 2018 and yield will be calculated. Data will be analyzed and assembled for presentation at the proposed review meeting.  Laboratory experiments to determine infection site of Macrophomina phaseolina on soybean root tissue have been initiated. Two soybean varieties with historical susceptibility to charcoal rot have been selected for the study and cultures for plug and spore suspension inoculation are actively growing.  **Task 2: Understand diversity of soybean pathogens causing stem disease based on fungicide resistance**  Michigan State University (Chilvers)  Genomic regions of putative fungicide insensitivity alleles in *Macrophomina phaseolina* have been identified and are being isolated from the genomes of the 96 sequenced strains, to compare genotype with phenotype (fungicide sensitivity).  **Task 3: Improve our ability to predict stem disease development**  Wisconsin State University (Smith)  Work focused on implementing and analyzing results from white mold disease forecasting models developed in the Smith Lab. Plans were initiated to expand the application of the models to collaborating states in 2019.  Michigan State University (Chilvers)  During winter meetings, the “Sporecaster” app has been promoted to producers and industry throughout Michigan. 2018 experiences and feedback on the app have also been sought and communicated with Dr. Smith.  Iowa State University (Leandro and Mueller)  We established a seedling assay to compare different inoculation techniques (infested sorghum grains and spore suspensions) and different plant health assessments (emergence, root rot, root length, shoot weight) for developing a fast and effective method to screening seed treatments against SDS.  **Task 4: Develop outreach materials to improve stakeholder awareness of stem disease pathogens and best management practices for diseases**  Iowa State University (Mueller) and University of Kentucky (Wise)  Work has focused in preparing an article on the impact of the 2018 stem and pod diseases in soybean. This article should be available through CPN in early 2019. | |