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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: |  |
| Project Title:  | Screening soybean germplasm and breeding soybeans for flood tolerance |
| Organization:  | University of Missouri-Fisher Delta Research Center |
| Principal Investigator Name: | Dr. Pengyin Chen |
| Other investigator | Drs. M. Liakat Ali, Leandro Mozzoni, Daryl Chastain, Tessie Wilkerson, Blair Buckley, and Mo Way |
| Report Period: | June 16, 2019 to September 15, 2019 |
| Project Status: On-going(What key activities were undertaken and what were the key accomplishments during this quarter? Please use this field to clearly and concisely report on project progress. Limit 5,000 characters).  |
| **1. Evaluation of breeding lines for flooding tolerance and yield to develop commercial varieties**i**) Advanced yield trial**: A total of 34 high-yielding breeding lines in two groups: MG-4 (17 lines) and MG-5 (17 lines), developed by the University of Missouri, were subjected to flooding stress for about 2 weeks during R1-R2 stages. The flooding injury rating of these lines has been recorded. The same sets of lines are also being grown in non-flooded field for evaluation of yield and phenotypic acceptability. The results of the flooding injury data along with yield performance will be presented in the next quarterly report. **ii) Preliminary yield trial:** A total of64 breeding lines selected from 2018 progeny rows, in two maturity groups (MG 4 and 5) each comprising of 32 breeding lines, were subjected to flooding stress. The flooding injury rating of these lines and 4 commercial varieties has been recorded. The same sets of lines are also being grown in non-flooded field for evaluation of yield and phenotypic acceptability. The results of the flooding injury data along with yield evaluation will be presented in the next quarterly report.**2. Flood yield trial for selected tolerant and sensitive lines:** This study includes 20 breeding lines and 4 commercial checks. The test entries were subjected to flooding stress and the flooding injury rating has been recorded. Seven lines, namely S13-15999, S15-3772RY, S14-16331, S11-20124C, R04-342, R06-4433 and R11-6870 exhibited flooding tolerance score from 1.3 to 2.0 (on rating scale of 1-5) with average score of 1.6 while commercial checks showed average score of 2.5. The sensitive line S99-2281 had a score of 4.3. The same set is grown under normal irrigation condition for yield evaluation. The yield performance along with yield index to be calculated based the head-to-head comparison between flooded test and non-flooded test, will be presented in next quarterly report. These lines are also being grown in other locations in AR, MS, LA and TX. The objectives of the trial are to evaluate the flooding tolerance stability across environments and effects of flooding stress on yield, seed quality and seed composition. Overall data will be analyzed and results presented in next report.**3. Screening recently developed elite lines for flood tolerance:** A set of100 breeding lines recently developed at the University of Missouri-Delta Research Center and at the University of Arkansas and five commercial cultivars as checks, are grown for flood tolerance evaluation. These lines were subjected to flooding stress, and flooding injury rating was recorded. Nine breeding lines, namely S16-14379C, S16-7922, S16-15170C, S17-19874R, S16-15896C, S16-11222, R15-7016, R15-7025 and UA 5814HP exhibited flooding tolerance score from 1.0 to 1.7 with average score of 1.3 while the commercial checks showed average tolerance score of 2.6. These lines are also being grown in Arkansas, Mississippi, Louisiana and Texas. Overall data will be analyzed and results will be included in next report.**4. Commercial variety testing for flooding tolerance:** A set of 180 commercial varieties developed by different seed companies were subjected to flooding stress to evaluate their flooding tolerance. The flood injury rating data analysis results will be presented in the next quarterly report. **5. Evaluation of new breeding lines in progeny rows:** A total of 648 progeny lines (F4:5) from 6 breeding populations, S14-16235 (FT) × S13-3851, S14-16267 (FT) × S15-12003, S14-16267 (FT) × V12-0045 R2, S14-36391 × S11-25615 (FT0, S14-9017RR × S11-25615 (FT), and S13-1955 × S16-16842 (FT) grown in 7’ single row plots were subjected to flooding stress. Flood injury rating of all the lines have been recorded. A total of 74 lines exhibited flooding tolerance with an injury score of ‘1’ on a rating scale of 1 to 5 (1 = No visible sign of flood injury while 5 = All leaves are yellow and plants are about to die). **6. Breeding population under generation advance:** Twelve crosses were made in 2018 to develop new flooding tolerant high yielding soybean varieties from tolerant PIs and elite breeding lines in MO. These populations are being advanced from F1 to F4 in Costa Rica (CR) and Puerto Rica (PR), and expected to return homo station as F4:5 lines in April/May 2020 for evaluation and selection. The list of the crosses is given in Table 1. Table 1. List of the crosses under fast-track generation advance for developing flooding tolerant varieties  in MO

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| Cross # | CR/PR# | Parentage | Generation | Year of evaluation |
| S18-298 | CR18-035 | S11-20124 × R04-342 (FT) | F2 | 2020-21 |
| S18-304 | PR18-019 | S14-16331 (FT) × S11-9618RR2 | F2 | 2020-21 |
| S18-305 | CR18-036 | S14-16306 (FT) × S13-3851C | F2 | 2020-21 |
| S18-306 | CR18-003 | RIL 123 (FT) × S11-20337GT | F2 | 2020-21 |
| S18-307 | CR18-004 | R07-6669 (FT) × S11-20195GT | F2 | 2020-21 |
| S18-308 | PR18-020 | UA 5615C (FT) × S15-3772RY  | F2 | 2020-21 |
| S18-310 | CR18-037 | S14-16267 (FT) × S16-14558 | F2 | 2020-21 |
| S18-311 | CR18-038 | S12-1362 (FT) × S16-14687 | F2 | 2020-21 |
| S18-312 | CR18-039 | R10-4892 (FT) × S16-14379 | F2 | 2020-21 |
| S18-313 | CR18-040 | RIL 48 (FT) × S16-14730 | F2 | 2020-21 |
| S18-486 | cR18-005 | S12-1362 (FT) × S14-9017 | F2 | 2020-21 |
| S18-487 | CR18-041 | S12-1362 (FT) × S13-3851C | F2 | 2020-21 |

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**7. New crosses made in 2019 season:** A total of 10 new crosses have been made between flood tolerant breeding lines and elite high-yielding breeding lines. In addition, 4 crosses involving 3 *G. soja* (wild) PIs have been made. F1 seed will be harvested in October and then sent to winter nursery for generation advance. |
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