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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 investigators: | Drs. M. Liakat Ali, Leandro Mozzoni, Daryl Chastain, Tessie Wilkerson and Blair Buckley |
| Report Period: | March 16, 2020 to June 15, 2020 |
| 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).  |
| **Missouri:**1. **Evaluation of breeding lines for flooding tolerance and yield to develop commercial varieties**

i**) Advanced yield trials**: A total of 32 breeding lines in two groups: MG-4 (16 lines) and MG-5 (16 lines) under advanced yield trials (AYT), will be evaluated for flooding tolerance and yield. The test lines include selections from 2019 flood advanced yield trials, 2019 preliminary yield trials and elite breeding lines included in the 2020 USDA Uniform Tests (UT). The test lines have been planted in 12’ 4-row plots with 3 replications in both flooding-stress field and non-flooding fields.**ii) Preliminary yield trial:** A total of 44 breeding lines selected from 2019 progeny rows will be evaluated for flooding tolerance and yield. The test entries are of MG-4 and have been planted in two sets on 12’ 4-row plots in 2 replications in flooding-stress and non-flooded field. The tests also included one flood sensitive, and one flood tolerant check and 2-3 commercial varieties. The plants will be subjected to flooding stress during R1 stage for 5-7 days. Flooding injury ratings will be done in 10 days after draining the flood water.**2. Flood yield trial for selected tolerant and sensitive lines:** 20 breeding lines (about one half was previously known to be tolerant and the other half was known to be sensitive), 3 commercial varieties and one sensitive check will be evaluated for flood tolerance and yield under flooding stress condition while under normal irrigation condition, only yield performance will be tested. The test entries have been planted in 12’ 4-row plots in 3 replications. These lines will also be evaluated in other three locations in AR, MS, and LA. 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.**3. Screening recently developed elite lines for flood tolerance:** A set of105 breeding lines recently developed at the University of Missouri-Delta Research Center and at the University of Arkansas and five commercial cultivars as checks will be evaluated for flood tolerance in 2020 season. These lines will be subjected to flooding stress during R1 stage for 5-7 days, and flooding injury rating will be done in 10 days after draining flood water from the field. The test lines have been planted in single-row plots in 3 replications. This screening test will also be conducted in Arkansas, Mississippi, and Louisiana. The main objective is to identify most stable flood tolerant lines across different environments.**4. Commercial variety testing for flood tolerance:** A set of 70 Missouri commercial varieties developed by different companies will be tested for flooding tolerance in 2020 season. The test entries have been planted in 7-ft single row plots in 3 replications and will be subjected to flooding stress during R1 stage. **5. Evaluation of new breeding lines in progeny row testing**: About 880 single plant progenies (F4:5) from 11 different flood crosses have been planted in progeny row testing nursery in flood screening field. The plants will be subjected to flooding stress for 5-7 days in R1 stage.**6. Creation of new breeding populations:** Thirteen crosses were made in 2019 to develop new flooding tolerant high yielding soybean varieties from tolerant PIs and elite breeding lines. The generation of the crosses (populations) are being advanced in Costa Rica (CR) and Puerto Rica (PR), and is expected to be in F3 generation by the end of 2020. The list of the crosses is given in Table 1.  Table 1. List of the crosses to develop flooding tolerant varieties under generation advance

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| Cross # | Parentage | Generation | Year of evaluation |
| S19-822 | S11-16653 x R04-342 (FT) | F2 | 2021-22 |
| S19-823 | S15-10879 x PI 597459 C (FT) | F2 | 2021-22 |
| S19-829 | S14-16331 (FT\_) x S15-10434C | F2 | 2021-22 |
| S19-832 | R07-6669 (FT) x S15-3772RY | F2 | 2021-22 |
| S19-833 | S14-16235 (FT) x S16-8898C | F2 | 2021-22 |
| S19-836 | R10-4892 (FT) x S13-3851C | F2 | 2021-22 |
| S19-837 | RIL 48 (FT) x S11-20356GT | F2 | 2021-22 |
| S19-838 | S13-15999 (FT) = x S11-20337GT | F2 | 2021-22 |
| S19-839 | R11-6870 (FT) x S11-20195GT | F2 | 2021-22 |
| S19-851 | S13-3851C x PI 597459 (FT, *G. soja*) | F2 | 2021-22 |
| S19-853 | S15-5904RY x PI 597459 ((FT, *G. soja*) | F2 | 2021-22 |
| S19-854 | S15-5904RY x PI 407229 (FT, *G. soja*) | F2 | 2021-22 |
| S19-855 | S13-2743LL x PI 424102A (FT, *G. soja*) | F2 | 2021-22 |

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**7. New crossing plan:** About 10-15 new crosses will be made between flood tolerant breeding lines/PIs and elite high-yielding breeding lines during 2020 season. Crosses will also be made between flood tolerant lines and elite breeding lines with high oil content. The parental lines have been planted in crossing blocks on three planting dates. |
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