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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. Grover Shannon |
| Other investigators: | Drs. M. Liakat Ali, Jeff Edwards, Tessie Wilkerson, and David Moseley |
| Report Period: | June 15, 2022 to September 15, 2022 |
| 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 36 breeding lines in two groups: MG-4 (18 lines) and MG-5 (18 lines) are being evaluated along with commercial checks for flooding tolerance and seed yield. The breeding lines included selections from 2021 flood advanced yield trials, 2021 preliminary yield trials and elite breeding lines that are included in the 2022 USDA soybean Uniform Test (UT). The lines were planted under both flood stress (flooded field) and non-stress (non-flooded field) conditions. In the flooded field, these lines were recently exposed to flooding stress during R2 (mid-season) for 8 days. Flood injury/tolerance ratings will be done soon. Non-flooded sets of lines were planted in two locations to determine performance under non-flood conditions. Flooding tolerance scores and seed yields will be provided in the next quarterly report in December 2022.**ii) Preliminary yield trial:** A total 28 MG-5 breeding lines selected from 2021 progeny rows (derived from 6 crosses) are being evaluated for flooding tolerance and seed yield. The test also included one tolerant check, one susceptible check and 3 commercial checks. The test entries were planted in flooded and non-flooded fields to compare yields under flood stress and non-flooded conditions. The test lines were recently exposed to flooding stress during R2 stage for 8 days. Flood injury/tolerance injury ratings will be recorded soon. The non-flooded trial planted in one location are growing well. Flooding tolerance and seed yield results will be provided in the next quarter report in December 2022.**2. Yield evaluation of selected tolerant and sensitive lines in flooded and non-flooded fields:** A set of 20 lines, one half of which are known to be tolerant and other half of lines are known to be sensitive, are being evaluated for flood tolerance and yield in flooded and non-flooded conditions. The objective of this test is to evaluate effects of flooding stress on seed yield, seed composition, and seed quality. The test lines were recently exposed to flooding stress during R2 (mid-season) for 8 days. Flood injury/tolerance ratings will be recorded soon. Seed yield results will be provided in the next quarterly report, December 2022. These 20 lines are also being grown in flood trials in AR, MS, and LA to determine if performance is consistent across locations.**3. Screening of recently developed elite lines for flood tolerance:** A set of96 breeding lines, recently developed at the University of Missouri-Fisher Delta Research Center and at the University of Arkansas and six checks (5 commercial cultivars and one sensitive line) are included in the screening test. These lines are planted in 7-feet single-row plots in 3 replications. The test lines were recently exposed to flooding stress during R2 (mid-season) for 8 days. Flood injury/tolerance rating will be recorded soon. Flooding tolerance results will be provided in the next quarterly report in December 2022.**4. Missouri commercial variety testing for flood tolerance.** During the 2022 season, 63 commercial varieties developed by 14 different seed companies are being evaluated for flooding tolerance to determine how popular varieties being grown by farmers respond to prolonged flooding. The test entries were planted in 7-ft single row plots in 3 replications. The test lines were recently exposed to flooding stress during R2 (mid-season) for 8 days. Flood injury/tolerance ratings will be recorded soon. Flooding tolerance comparisons among of popular soybean varieties will be provided in the next quarterly report in December 2022.**5. Testing of new breeding lines in progeny testing** **nursery:** About 100 F4:5 single plant progeny lines each from 7 populations (Table 1 below) are being grown in progeny rows at the Lee Farm, Portageville, MO. Lines with best appearance and potentially high yield potential will be selected at maturity. The selected lines will be evaluated for flood tolerance and seed yield during 2023 season.sTable 1. List of the populations are in progeny testing nursery.

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| **Cross** | **Pedigree** | **Generation** | **Year of evaluation** |
| S20-311 | S14-16267 (FT)x S12-1362 (FT) | F4:5 | 2022 |
| S20-312 | S12-1362 (FT) x R04-342 (FT) | F4:5 | 2022 |
| S20-313 | RIL 123 (FT) x R04-342 (FT) | F4:5 | 2022 |
| S20-314 | R11-6870 x S12-1362 (FT) | F4:5 | 2022 |
| S20-320 | S14-16267 (FT)x UA5814HP (Protein) | F4:5 | 2022 |
| S20-321 | S12-1362 (FT) x Osage (Protein) | F4:5 | 2022 |
| S20-322 | RIL 123 (FT) x R11-7999 (Protein) | F4:5 | 2022 |

**6. Breeding populations under generation advance:** Three crosses made in 2021 to develop new flood tolerant high yielding soybean varieties from tolerant PIs/lines and elite breeding lines are being advanced in winter nurseries in Costa Rica (CR) and Puerto Rica (PR). These lines are expected to be in the F4 generation by the end of 2022. Single plants containing F4:5 seeds from each cross listed below (Table 2) will be evaluated in plant rows and best lines will be selected during the 2023 season. Table 2. List of the crosses made in 2021 season aiming at developing new flood tolerant cultivars.

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| Cross | Pedigree | Generation | Year of evaluation |
| S21-806 | S12-1362 x S18-3460 | F2 | 2023 |
| S21-807 | S18-3555 x S12-1362 | F2 | 2023 |
| S21-808 | S16-3739RY x S12-1362 | F2 | 2023 |

**7. New crossing in 2022 season:** About 6-8 new crosses between flood tolerant PIs/lines and elite breeding lines have been made to develop new high-yielding flood tolerant varieties. The number of successful new crosses will be provided in the next quarter report in December 2022.**Arkansas:**Jeff Edwards,Chengjun Wu**Mississippi:**Tessie Wilkerson**Louisiana:****David Moseley** |
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