|  |
| --- |
| 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: | June 16, 2020 to September 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), have been included in 2020 field trials with 3 reps, for flooding tolerance (flooded) and yield (flooded and non-flooded). In MG-4 set, breeding lines S17-1146, S18-3463 and S16-7922 showed good flooding tolerance response with injury scores of 1.0, 2.3 and 2.7 (where 1 = no injury and 5 = all plants dead), respectively. In MG-5 set, breeding lines S12-1362, S16-3747R, S16-3739RY, S18-9258 and S16-15896C exhibited flooding tolerance response with injury score of 2.0 while S18-3555 had injury score of 2.3. All the commercial checks (AG43X7, AG46X6, AG4835, AG5335, AG55X7, P55A49X) and susceptible check (S99-2281) had flooding injury scores from 4.0 to 5.0. Because of lower field level with zero grade and 3-4 days of continuous rain before completely draining the water out after stress treatment, plants in replications 2 and 3 areas were very severely stressed. **ii) Preliminary yield trial:** 44 breeding lines are being evaluated for flooding tolerance (flooded) and yield (flooded and non-flooded conditions) in 2 replications. Breeding lines, S19-17313, S19-17667, S19-17693, S19-17382, S18-3555, S18-3616, S19-17864 and S18-3469 revealed good flooding tolerance with injury scores from 1.0 to 2.0. Commercial check varieties (AG46X6, AG4835, AG43X7 and sensitive check line (S99-2281) had flooding injury scores from 4.5 to 5.0.**2. Flood yield trial for selected tolerant and sensitive lines:** 20 lines (about one half was previously known to be tolerant and the other half was known to be sensitive) are being evaluated for flood tolerance (flooded) and yield (under flooded and non-flooded condition) in 3 replications. Breeding lines, such as S16-7922C, S17-1146, S12-1362, S16-3739RY, UA5615C, R04-342 and R11-6870 previously known to have flood tolerance, exhibited flooding tolerance response with injury scores from 1.7 to 2.7 under severe flooding stress conditions this year. Three commercial checks AG 49X6, AG52X9 and AG55X7 had flooding injury scores from 4.7 to 5.0. These lines are also being evaluated in other locations in AR, MS, NC and LA. **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, have been evaluated for flood tolerance in 2020 season in single-row plots with 3 replications. The experimental field was flooded during R1-R2 stage for 10 days. Flooding injury rating scores were recorded 5 days after draining the flood water (although the field still had slim layer of water). Ten Missouri lines (S16-15896C, S16-14730C, S16-14801C, S11-20124, S16-8852C, S17-1980C, S18-3463, S16-7922, S16-14869C and S17-1494C) and 4 Arkansas lines (R17-3393, R13-11034, R17-4177 and R17-3488) exhibited flood tolerance response with flooding injury scores from 1.0 to 2.0. As opposed to the test lines, the commercial checks (AG 4835, AG 43X7, AG 46X7, AG 5335 and AG 52X9) had injury scores from 3.3 to 4.7). However, a second round of flooding injury ratings aiming at recovery from injury will be made soon. Final screening results will be provided in the next report. This screening test is also being conducted in Arkansas, Mississippi, and Louisiana. The main objective is to identify most stable flood tolerant lines across different environments.**4. Missouri commercial variety testing for flood tolerance:** A set of 70 commercial varieties developed by 17 different seed companies have been evaluated for flooding tolerance in 7-ft single row plots with 3 replications. Several test varieties, such as 46-E50 (Armor), 49CK6 (Blue River Organic Seed), DG45E28 (Delta Grow), DG51E60 (Delta Grow), 39E00 (FS HiSOY) and ZS5098E3 (Local Seed) exhibited flooding stress tolerance with injury scores from 1.3 to 2.0. **5. Evaluation of new breeding lines in progeny row testing**: About 240 single plant progenies (F4:5) from 3 populations derived from flood tolerant and high-yielding parents have been evaluated for flooding stress tolerance. Only 36 progeny lines showed flooding tolerance response with injury scores from 1.0 to 2.0. **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 breeding populations from these crosses are being advanced from F1 to F4 in winter nurseries in Costa Rica (CR) and Puerto Rica (PR), and currently in F3 generation. The list of the crosses is given in Table 1.  Table 1. List of the crosses made in 2019 and are under generation advance.

|  |  |  |  |
| --- | --- | --- | --- |
| Cross # | Parentage | Generation | Year of evaluation |
| S19-822 | S11-16653 x R04-342 (FT) | F3 | 2021 |
| S19-823 | S15-10879 x PI 597459 C (FT) | F3 | 2021 |
| S19-829 | S14-16331 (FT\_) x S15-10434C | F3 | 2021 |
| S19-832 | R07-6669 (FT) x S15-3772RY | F3 | 2021 |
| S19-833 | S14-16235 (FT) x S16-8898C | F3 | 2021 |
| S19-836 | R10-4892 (FT) x S13-3851C | F3 | 2021 |
| S19-837 | RIL 48 (FT) x S11-20356GT | F3 | 2021 |
| S19-838 | S13-15999 (FT) = x S11-20337GT | F3 | 2021 |
| S19-839 | R11-6870 (FT) x S11-20195GT | F3 | 2021 |
| S19-851 | S13-3851C x PI 597459 (FT, *G. soja*) | F3 | 2021 |
| S19-853 | S15-5904RY x PI 597459 ((FT, *G. soja*) | F3 | 2021 |
| S19-854 | S15-5904RY x PI 407229 (FT, *G. soja*) | F3 | 2021 |
| S19-855 | S13-2743LL x PI 424102A (FT, *G. soja*) | F3 | 2021 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

**7. New crosses made in 2020 season:** A total of 9 new crosses have been made between flood tolerant lines and elite high-yielding breeding lines during the 2020 season. Three crosses involved flood tolerant and high protein parents. The list of the successful crosses will be provided in the next report |
| **Arkansas:** **Mississippi:****Louisiana:** |