**MSMC Flood Program Report: Project -319**

**April 10, 2018**

University of Missouri-Delta Research Center

P.O. Box 160, Portageville, MO 63873

**Title: Evaluation of Germplasm and Genetic Mapping for Flooding Tolerance in Soybean**

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**This project ended with MSMC, but will continue with funding from MSSB and USB.**

**1. Evaluation of breeding lines for flooding tolerance and yield**

**i) Preliminary yield trial:** A set of 11 breeding lines along with 5 commercial & susceptible checks will be evaluated for yield and flooding tolerance in clay soil during 2018 season. These 11 lines were selected from 2017 progeny rows from one flood tolerance population (S13-15826 x S13-15826). S13-15826 has flooding tolerance from R91-210-350 in its pedigree. The selection of these lines was done based on the flooding score of 1 to 2.5. The trial will be conducted in flooded field only.

ii**) Advanced yield trial**: Two advanced yield trails – MG-4 and MG-5 will be conducted in flooded field with clay soil and in two non-flooded fields having loam and clay soils. In MG-4 trial, 11 advanced breeding lines, and 3 commercial and one susceptible checks are included. Out of 11 lines, one line was derived from BC2 of S99-2281 × PI408105A, and the 10 high yielding lines that are included in 2018 Uniform Tests. In trial MG-5, 9 advanced breeding lines, and 2 commercial and one susceptible checks are included. Out of 9 advanced breeding lines, 4 lines were selected from 2017 AYT and the rest 5 are high-yielding lines that are included 2018 Uniform Tests. Both the advanced yield trials will be planted in 12’ 4-row plots with 3 replications. Data will be recorded on yield, maturity, plant height and lodging.

**2. Flood yield evaluation trial for selected lines:** This study includes18 breeding lines and 2 commercial checks. One half of the breeding lines is known to be flood tolerant while the other half is known to be flood susceptible. The test entries will be grown in three replications in flooded and non-flooded conditions in clay soil. The trial will be exposed to flooding stress in flooded field and flooding tolerance score will be recorded. The yield will be recorded from both flooded and non-flooded field. This is a multi-locations trial, and the Delta Research Center is one of the 4 locations.

**3. Commercial variety evaluation for flooding tolerance**: About 100-120 varieties (actual number is yet be known) developed by the different seed companies will be grown in 7-ft single row plots in three replications in clay soil. The field will be subjected to flooding stress at around R2 stage. The flooding tolerance score will be recorded about 10 days after draining flood water.

**4. Genotype** × **Environment study**: A set of about 120 accessions (PIs, RILs, and advanced breeding lines) will be planted in 7-ft single row plots and be subjected to flooding stress around R2 stage this season. The flood tolerance score will be recorded about 10 days after draining flood water. This is a multi-locations trial and the Delta Research Center is one of the 4 locations. The objective of the study is to identify most stable flood tolerant germplasm across the environments.

**5. Field phenotyping of mapping populations**: Two mapping populations – S99-2281 × PI567651 ((191 RILs), and V71-370 × PI407162 (292 RILs) will be planted in single row plots and be subjected to flooding stress around R2 stage for a period of 6-9 days this season. Flooding tolerance scores will be recorded on a scale of 1 to 5 where 1=tolerant to flooding while 5=very susceptible to flooding stress. The main objective of these studies is to map new flooding tolerance genes.

**6. Evaluation of exotic lines for flooding tolerance:** A set of 382 diverse plant introductions (PIs) used for genome sequencing (MG 4-6) will be grown in single row plots and be evaluated for flooding tolerance. The objective is to identify new sources for flooding tolerance with a view to use as parents in future crosses. The flooding tolerance score will also be used in genome wide association analysis.

Another set of 81 PIs of *Glycine soja* will be planted in hill plots and be exposed to flooding stress this season for flooding tolerance evaluation. The most tolerant *soja* soybeans could be used as parents to transfer flood tolerance to the elite breeding lines or could be used to develop mapping populations.

**7**. **Crosses under generation advance:** Currently there are four crosses are under generation advance. The crosses were made with a view to develop new flooding tolerant high yielding varieties and to develop mapping populations in order to map new genes from tolerant PIs. The generations of the crosses are being advanced in Costa Rica (CR) and Puerto Rico (PR), and the list of which is given in Table 1.

Table 1. List of the crosses for flooding tolerance with generation, current status and objectives.

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| --- | --- | --- | --- | --- |
| Cross # | Parents | CR# | Generation | Current status & objectives |
| S16-335 | S99-2281 x PI 603910B | CR16-150 | F4 | Advance in CR- gene mapping |
| S17-652 | S14-16235 × S13-3851 | CR17-123 | F1 | Advance in CR- variety dev |
| S17-653 | S14-16267 × S15-12003 | CR14-124 | F1 | Advance in CR- variety dev |
| S17-669 | S14-16267 x V12-0045 R2 | PR17-064 | F1 | Advance in PR- variety dev |

**8. New crossing plan in 2018:** About 10-15 new crosses will be made between new high yielding elite breeding lines and flood tolerant PIs and breeding lines.

**Percent of project complete:** 100% and the project ended.

**Project expenses to date:** All spent.

**Percent of budget remaining:** 0

**Names and positions/titles of those whose time is being charged to this research project:**

Dr. Liakat Ali, Research Associate.