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| Please use this form to clearly and concisely report Ion project progress. The inficamba ormation 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:  | Identification and confirmation of natural tolerance to Dicamba damage in non-Xtend soybeans |
| Organization:  | University of Missouri and University of Arkansas |
| Project Lead Name: | Grover Shannon, MO, and Caio Viera, AR |
| Report Date: | Juene 16, 2023 to September 15, 2023 |
| **In the Progress Summary section below, please provide a brief summary of project progress in lay language that will be shared publicly in the** [**National Soybean Checkoff Research Database**](https://www.soybeanresearchdata.com/)**. Do not include any confidential or proprietary information. If no lay language is provided, the contents of this entire report will be published in the** [**National Soybean Checkoff Research Database**](https://www.soybeanresearchdata.com/)**.** |
| Progress Summary (in non-proprietary lay language suitable to be shared publicly): |
| **OBJECTIVE 1:** Identification and selection of high-yielding tolerant advanced lines**Promising lines in regional test:** Based on yield performance across different locations, 32 high yielding, MG IV to early group V breeding lines with potential dicamba tolerance were entered into the 2023 USDA Southern Uniform Trials. These lines were previously exposed to dicamba in previous tests across the US Delta States and were selected for high yield under both off-target Dicamba exposure and where Dicamba exposure was minimal to none. **2. Advanced yield trials**: A total of 72 early group IV to early group V advanced breeding lines were planted in Portageville, MO (4 local environments) and at 6-8 locations across different states (OH, IL, AR, LA, OH, TN, MO). The Portageville location had significant Dicamba injury, and all lines were phenotypically screened during reproductive stages for Dicamba injury. Lines with the least damage from Dicamba and highest yield across all testing sites versus commercially grown Xtend checks will be evaluated for future testing and possible release as cultivars.**3. Preliminary yield trials**: A total of 1,224 soybean late III to Late IV breeding lines were planted in Portageville, MO (3 local environments) and at two outside locations in AR and MO where Dicamba injury was minimal. Significant Dicamba injury was evident at Portageville and lines were phenotypically screened at during reproductive growth stages for dicamba injury after being exposed to off target dicamba volatility from surrounding farmer fields. **4. Progeny rows**: About 800 F4:5 single plant progenies from 8 crosses involving dicamba tolerant parents are in single 7 ft rows in the 2023 progeny row nursery. Rows with best agronomic traits will be visually selected, harvested fand entered in preliminary yield tests in 2024. **5. Breeding populations advancements:** A total of 7 breeding populations specifically to improve off target damage from dicamba are being advanced from F1-F4 in winter nurseries in Costa Rica, which are expected to produce 700 new breeding lines that will be grown in progeny rows for selection in 2024.**6. New crosses 2023:** At least 20 new crosses between dicamba tolerant and elite breeding lines were made the summer of 2023 to continue the development of new high-yielding and dicamba tolerant varieties. **OBJECTIVE 2**:Genomic studies to identify significant genetic marker-trait associations for dicamba tolerance.**Dicamba QTL mapping Population:** To map and identify genes for tolerance to dicamba, two mapping populations were planted earlier this season. In July of 2023, visual phenotyping was conducted at the R3-R5 growth stage at both Portageville, MO, and Marianna, ARs. Data from tolerance ratings be utilized for detailed mapping analysis, providing a deeper comprehension of the genetic factors contributing to non-GMO tolerance in these soybean mapping populations.   |
| Detailed Progress Status – Expand upon the above section. What key activities were undertaken and what were the key accomplishments during this reporting period? List each key deliverable from the proposal and describe progress made (or not made) toward achieving it, including metrics were appropriate. |
| There is a steady stream of non-GMO Dicamba tolerant lines being identified in the breeding programs in both Arkansas and Missouri. Yield losses from significant exposure of non-GMO breeding lines in regional, advanced, and preliminary yield tests have resulted in tolerant lines with excellent disease resistance and less yield loss after being exposed to off-target Dicamba.Genetic studies to determine non-GMO genes and their function in tolerance are being investigated. Genes specific for Dicamba tolerance have been identified. Further studies to discover additional genes and the impact new and known genes have on improved tolerance among non-Xtend soybeans is being studied.  |