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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. |
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| Project Title:  | Development of functional ultra-high stearic acid soybean germplasm |
| Organization:  | University of Missouri |
| Principal Investigator Name: | Feng Lin, PhD |
| Report Period: | September 16, 2024 |
| Project Status - 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. Limit 5,000 characters. |
| Our team is actively engaged in the development of high-yielding lines, with elevated levels of high stearic acid content. Table 1 provides an overview the 2024 breeding pipeline for high stearic (HS) at MU-FDREEC. Table 1. 2024 Breeding Pipeline for HS.

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| --- | --- | --- |
| **Test/Line/Population** | **Description** | **# of Entries** |
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| AYT | Advanced Yield Trial  | 1 |
| PYT | Preliminary Yield Trial | 3 |
| Progeny Rows | Stearic acid content and visual selection  | 107 |
| Population Development | F1 to F4 generation | 4 |
| New Crosses | Population Development | 3 |

**2024 AYT.** One advanced breeding line, S22-23421HS (derived from a cross between S19-19712 and S16-7922), was planted at the Lee Farm and six off site locations. In lee farm, S22-23421HS was tested in two environments (loam and clay), using 12-foot-long plots with two replications. The six off-site locations were distributed across different states (AR, IL, TN, MO) with two replications at each location. This line has white flower, with the stearic acid content of 7.11%. S22-23421HS could potentially be advanced to the Regional Trial in 2025, subject to the condition of satisfactory yield performances.**2024 PYT.** Three preliminary breeding lines including two commercial checks (AG 48XF0 and P45A81E) and one conventional check (S16-7922), were tested at Fisk, MO (one local environment) for yield trials. The plots were laid out in 7-foot-long plot with three replications. These lines were selected from the progeny row nursery based on their phenotypic appearance and stearic acid content, which ranged from 11.8 – 13.8% (Table 2). The lines identified for the stearic acid content and yield performance will be advanced to AYT in 2025.Table 2. List of three preliminary breeding lines in the 2024 PYT and their stearic acid content based on data from 2023.

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| **Line** | **Pedigree** | **Stearic Acid (%)** | **Flower Color** |
| S22-23407HS | S19-19712/S16-7922 | 12.5 | White |
| S22-23360HS | S19-19710/S16-11644 | 11.8 | White |
| S22-23363HS | S19-19710/S16-11644 | 13.8 | White |

**2024 Progeny Rows.** In total, 107 new breeding lines obtained from HS crosses were planted in single progeny rows (Table 3) at Lee Farm, Portageville, MO. The stearic acid content of these lines ranged from 8.2 – 21.9%. Selection will rely on the assessment of maturity alongside the phenotypic appearance which will be advanced to the PYT in 2025.Table 3. Summary of 107 breeding lines in the 2024 Progeny Rows.

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| **Population** | **Pedigree** | **No. of Lines** | **Stearic Acid (%)** |
| CR22-092 | S19-19705/S16-13165 | 44 | 8.2 – 21.9 |
| CR22-094 | S19-19731/S18-6328 | 26 | 8.4 – 17.5 |
| CR22-095 | S19-19731/S19-14797 | 37 | 8.2 – 16.5 |

**2024 Population Development**. Four bi-parental populations for increasing stearic acid content were sent to the Costa Rica winter nursery for generation advancement from the F1 to the F4 generation and will be planted in our progeny rows in 2025 in Portageville, MO (Table 4).Table 4. List of four bi-parental populations in 2023.

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| **Cross** | **Pedigree** |
| S23-502 | S22-23407/S19-10701 |
| S23-503 | S22-23407/S19-14797 |
| S23-506 | S22-23373/S16-7922 |
| S23-507 | S22-23373/S16-11644 |

**2024 New Crosses.** We attempted to develop three new bi-parental populations by crossing elite breeding lines with HS parents.  |