2020 Research Progress Report for GACC for Soybeans

Project Title: Development of High Yielding Soybean Cultivars with Advanced Herbicide-tolerance Technology, and Pest and Pathogen Resistance for Georgia Growers

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1. Objectives

Develop high-yielding soybean cultivars adapted to Georgia with advanced herbicide-tolerance technologies, enhanced seed composition, and pest and pathogen resistance.

2. Deliverables

1) Soybean cultivar releases

In 2020 we had six soybean cultivars approved for release by the CAES Plant Cultivar and Germplasm Release Committee.

G14-6063 is a conventional maturity group VI cultivar with 25% of exotic germplasm in the pedigree. It was tested over 41 environments across southeastern USA, demonstrating high yield performance and adaptation compared to the elite commercial varieties available. It yielded 98.4 to 109.9% of current RR2 and LibertyLink commercial check varieties across multiple environments. The cultivar possesses good resistance to frogeye leaf spot and stem canker.

Two LibertyLink lines G15PRLL-989 (MG VII) and G15PRLL-953 (MG VIII) yielded commercial checks for 100-116%. These lines also possess resistance to soybean cyst nematode, root-knot nematode and frogeye leaf spot. Both lines were also approved by the committee for release

Three high oleic and low linolenic soybean lines G15PR-340, G17PR-1053HOLLR1, and G17PR-1207HOLL in MG VI and VII, respectively were approved for release. These high oleic cultivars yielded equivalently to or better than commercial check varieties and also possess good decisive traits

Three Roundup Ready 2 yield lines: G13-2842R2 (MGVI), G12-2062R2 (MGVII), and G13-2114R2 (MGVIII) exceeded the yield of commercial checks for 5-17%, respectively. These lines also possess resistance to soybean cyst nematode, root-knot nematode and frogeye leaf spot. We plan to submit applications for release as parental stocks and backcross both dicamba and LibertyLink (pending approval) into these lines with 3 generations per year using genomic technology.

2) New RR2Y, LibertyLink, and Conventional High Yielding Soybean Lines

A total of 43 high-yielding RR2Y, conventional and LibertyLink soybean lines were advanced to USDA Southern Uniform Tests/Prelim Uniform Tests in maturity groups 6, 7, and 8. All these lines have resistance to southern root-knot nematode and race 3 of SCN. Based on the performance of these lines in 2020 tests, top performing lines will be submitted for approval of release or advanced to a subsequent year of testing.

3) New herbicide tolerance technologies, RR2 Xtend and Enlist E3

With assistance from Innovation Gateway, we accessed to RR2 Xtend (Bayer) and Enlist E3 technologies (Corteva) in spring 2019. We have made 15 crosses with our best elite lines in the summer of 2019 and are in the process to perform backcrossing these new traits into our top 7 best elite lines with 3 generations per year using the DNA marker technology.

4) Soybean pipeline materials

Based on 2019 yield data, 68 conventional lines, 68 RR2Y lines, and 34 LibertyLink Lines, have been advanced to the second year of yield tests at three locations in GA and LA in 2020. We also advanced 648 conventional lines, 584 high-yield RR2Y, 432 LibertyLink, and 68 high oleic lines into our first year yield trials at two locations, Athens and Plains in 2019. These lines are resistant to Southern root-knot nematode and race 3 of soybean cyst nematode. Over 10,000 rows of lines at different generations were planted for evaluation and selection in 2020.

3. Impact of GACC Funding Support

Funding from GACC has resulted in the commercialization of conventional, Roundup and LibertyLink soybean cultivars with improved quality and pathogen resistance. We have developed strong pipeline materials using RR2Y and LibertyLink technologies. The funding has allowed us to utilize the Puerto Rican nursery for two generation advancement, molecular tools for early generation selection, and introgression of new traits into our varieties. The funding also allowed expansion of our capacity of yield trials by reducing one year of yield testing prior to cultivar release. The funds from GACC have been spent or encumbered for salary, winter nursery and lab and field supplies.