PROJECT:UGA471920

Project Title: Evaluation of ALS resistant yellow nutsedge (*Cyperus esculentus*) in GA peanut Yr. 2 (July 2020- July 2021

Principal Investigators:
Nicholas T. Basinger, Assistant Professor of Weed Science, The University of Georgia, 3111 Miller Plant Sciences, Athens, GA 30602

Eric P. Prostko, Professor and Extension Weed Specialist, The University of Georgia, 2360 Rainwater Rd. Tifton, GA 31793

Report Summary:
A biotype of resistant yellow nutsedge was screened for resistance to Cadre. Tubers were harvested from the field site using peanut digger and brought back to UGA for screening. Tubers were planted in the greenhouse for screening, the majority of which failed to emerge. It was determined that these tubers needed additional stratification and were placed in the fridge. In the Fall of 2020 the greenhouse facility for Crop and Soil Science in Athens had it's greenhouse manager retire. This retirement put normal maintenance and watering schedules in flux. Furthermore, this last year we had several outbreaks of COVID-19 within our lab. This coupled with the greenhouse manager retirement we did not want to risk starting a trial of this size and risk it failing. Therefore, we aim to conduct the final run of this trial in the Spring of 2021 to confirm the previous resistance before the end of the grant in the Summer of 2021.

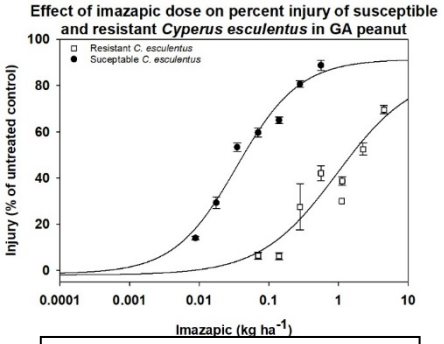

Figure 1: Injury of yellow nutsedge response to increasing dose of Cadre herbicide.

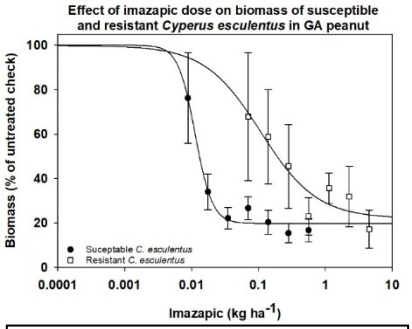

Figure 2: Biomass response of yellow nutsedge response to increasing dose of Cadre herbicide.

In absence of the greenhouse study in the fall of 2020 we were able to work with colleagues from Auburn to learn more about the genetic makeup of this resistant population and understand it's mechanism of resistance. RNA extraction was done using RNeasy Plant Mini kit (Qiagen) and following manufacturer instruction. DNA digestion was performed using turbo DNA-free kit (Applied Biosystems) to eliminate any genomic DNA content in the samples. RNA concentration and quality were checked on Nano drop 2000 (ThermoFisher Sci., Waltham, MA) and RNA integrity was determined using electrophoresis in 2% (w/v) agarose gel. RNA samples of both resistant and susceptible nutsedge biotype were shipped to Novogene for transcriptomic sequencing. At Novogene, the samples were tested for RNA quality using bioanalyzer instrument (Agilent 2100) and then proceed for library preparation.

Two mutations were found in the resistant biotype, not present in the susceptible population. One mutation was a non-synonymous SNP that cause a change in amino acids seen in other species such as Redroot pigweed conferring ALS resistance. This is suggesting a target site mutation of Alanine to Valine at the 205 position. However, there are some other indicators that there could be potential for some non-target site mutation as well. We are working with our collaborators at Auburn to confirm the second mutation site and if the plants within this population have resistance conferred by both target site and non-target site resistance mechanisms.

Once we complete the greenhouse and genetic work, we will be writing this work up for publication in *Weed Science* and will also submit this instance of resistance to the *International Herbicide-Resistant Weed Database* (www.weedscience.org).