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In this article, I am going to provide a brief summary of some of the trials from 2019. The NCPGA and NPB provide funding to support this work and it is essential for this project to be successful. This project has many people involved in order to plan, implement and complete the research. We are still processing some of our samples and analyzing the data, but here are some of the findings. The title of the project is, *Optimizing Peanut Production and Pest Management through Applied Research and Extension Activities.* Seven objectives were included in the project. For a more detailed summary of the actual experiments, go to the Peanut Extension Portal (https://peanut.ces.ncsu.edu/). You will see an impact statement at the end of the summary.

Objective one*. To develop solutions to agronomic issues associated with peanut production in North Carolina.*

Nineteen trials were conducted during 2019. In one set of trials, peanut response to Apogee was similar regardless of nozzle selection (fine droplets produced by regular flat fan nozzles versus coarse nozzles delivered by TTI nozzles.) Row visibility was greater when Apogee was applied to the cultivars Bailey, Emery, Sullivan, and Wynne, although the first application needed to be delayed for Sullivan. Yield was not improved when peanut was treated with Peg Power or Radiate at two locations for each project.

Slower digging speeds resulted in less yield loss than driving greater than 4 mph. Runner and Virginia market types yielded substantially higher than Valencia or Spanish market types, although Spanish and Valencia market types could be dug earlier in the season. Experimental calcium sources did not increase peanut yield compared with the non-treated control or gypsum standard.

Objective two*. To cooperate with the plant pathologist, entomologist, and plant breeder at NCSU to refine IPM strategies for peanut in North Carolina.*

Twenty trials were conducted during 2019 to address this objective. Only minor differences in canopy defoliation caused by leaf spot disease were noted when fungicides were applied using regular flat fan (fine droplets) compared with TTI spray nozzles (coarse droplets). This experiment was designed to determine if the nozzle system growers are using to apply dicamba and 2,4-D in cotton and soybean are adequate for leaf spot control. The fungicides used in these experiments had systemic activity in most cases, and this may explain why control was often adequate with larger droplets compared with finer-droplets.

In other trials, defoliation caused by leaf spot disease did not differ when Miravis was applied in mid-July with follow up fungicide sprays 3, 4 or 5 weeks after Miravis was applied. When pooled over four trials, defoliation was 18% when fungicide was not applied after Miravis was applied in mid-July. When Miravis was followed by other fungicides, defoliation at harvest ranged from 2 to 6%, and there was no difference in yield between treatments receiving the follow up fungicide sprays and Miravis alone. In adjacent trials with non-treated controls, defoliation often exceeded 60% when peanut was dug. Leaf spot disease following Abound (azoxystrobin) was slightly lower when this

fungicide was applied with sulfur compared with Abound alone.

Samples comparing damage from southern corn rootworm when planted in native vegetation or cereal rye are still being processed. In other research conducted with Dr. Brandenburg, phorate (Thimet) and aldicarb (Ag-Logic) controlled thrips more effectively than Admire Pro or Velum Total.

The Peanut Risk Management Tool was revised during 2019 and is posted on the Peanut Extension Portal. We will discuss this at meetings in February.

Objective three. *To conduct appropriate research to develop weed management strategies for traditional and herbicide resistant weeds in peanut in North Carolina.*

Six trials were conducted during 2019 to address this objective. Palmer amaranth control with Zidua and Dual Magnum was similar when these herbicides were applied with paraquat and Basagran. Zidua provided greater residual control of morningglories and common ragweed than Dual Magnum, while Dual Magnum was more effective in controlling yellow nutsedge.

Screening of the 110 samples of Palmer amaranth seed collected in the coastal plain of North Carolina from peanut, cotton, soybean, and sweetpotato fields during fall 2016 has been completed. Increased tolerance to PPO-inhibiting herbicides was noted in some samples but resistance was not confirmed. Increased tolerance, however, is often the first step in selecting for evolved resistance. Almost all populations were resistant to glyphosate and ALS-inhibiting herbicides. There were also significant numbers of populations expressing greater tolerance to HPPD-inhibiting herbicides, and resistance to mesotrione was confirmed in one population. Populations were not resistant to glufosinate. Seed production was much greater in peanut and cotton than seed production in soybean, and especially corn. The same amount of Palmer amaranth seed was produced when this weed was grown with cotton and peanut. Preventing weed emergence during the first few weeks of the season often resulted in a 10-fold decrease for seed produced compared to emergence of Palmer amaranth when crops were emerging.

Objective four. *To continue rotation and tillage trials in order to develop more effective cropping systems.*

Nine trials were conducted during 2019 for this objective. Several of these experiments were initiated in 1997. Results from 2019 demonstrated the of long rotations in maintaining high yields and keeping nematode populations from increasing. Corn was a less effective rotation crop than cotton in suppressing nematodes. In one experiment, a 6% yield reduction in peanut yield was noted for each additional year soybeans were included in rotation prior to peanut. Velum Total did not minimize nematode populations or increase yield regardless of rotation sequence compared with Admire Pro. These results were surprising, although imidacloprid-containing insecticide products performed erratically in some areas of North Carolina. Additional research is planned for 20202 in these studies with cotton and then peanut in 2021 to compare these products to determine if results in 2019 were weather related. Peanut response to tillage systems in 2019 mirrored previous results. On typically sandy loam fields at Lewiston-Woodville, peanut yielded similarly in strip till and conventional till systems. At Rocky Mount on finer-textured

soil, peanut yield was lower in strip tillage compared with conventional tillage.

Objective five. *To determine yield and economics of seeding rates in twin and single rows with commercially available varieties.*

This experiment was initiated in 2017 and included three levels of variety (Bailey and Sullivan), two levels of plant population (4 and 6 plants per foot of row), and two levels of Apogee (with and without two Apogee). In most instances, few interactions were noted among treatment factors (variety, seeding rate, row pattern, Apogee.) When comparing results from all three years (2017, 2018, and 2019), peanut yield was 254 pounds per acre greater for Bailey than Sullivan when averaged over other treatment factors and years. Planting 6 seed per foot rather than 4 seed per foot resulted in an increase in yield of 116 pounds per acre. Applying Apogee increased yield by 184 pounds per acre while single and twin rows peanuts yielded 5342 and 5371 pounds per acre, respectively.

Objective six. *Assisting Cooperative Extension agents with pod maturity clinics.*

Instructional clinics for new agents were held in late August and early September. Digital images of crop maturation and heat unit accumulation from several trials and locations across North Carolina during August, September and October were provided to agents. Heat unit accumulation and images of pod-blasted samples were posted weekly on the Peanut Extension Portal.

Objective seven. *Enhancing Cooperative Extension Service agent expertise in managing peanut.*

Six agent training sessions occurred during 2019. One in-class session was conducted in January in combination with cotton. One in-field session was also conducted with cotton in June to compare weed and thrips control programs in peanut and discuss herbicide injury symptoms. Three additional training sessions were conducted in June, July, and August for new agents with a final in-field session held in late September with all agents

IMPACT STATEMENT: Approximately 50 trials were conducted during 2019 to continue developing a database in areas of agronomic production, growth regulation, fertility, digging and harvesting, integrated pest management, weed management, and cropping systems in order to refine recommendations to peanut growers in North Carolina and surrounding states.

Results from key trials are included in the annual Cooperative Extension Service *Peanut Information* series, formal classroom instruction on campus or at county production meetings, *Peanut Notes* loaded on the North Carolina Cooperative Extension Service portal (https://peanut.ces.ncsu.edu/) (214 to date in 2019), popular press articles (*V-C Peanut News*, *Peanut Grower* magazine), the peer-reviewed literature (*Peanut Science*, *Journal of Crop, Forage, and Turfgrass Management*), and field days (*67th Annual North Carolina Peanut Field Day* at Lewiston-Woodville and 8th *Southeastern North Carolina Peanut Field Day* at Whiteville).

Results from these projects support the historical mission of the land grant system through research, extension, and academic programs with emphasis on peanut. Virtually all of the trials are conducted in cooperation with other research and extension

faculty at NC State and with other partnering institutions including NCDA&CS, Virginia Tech, Clemson University, and the University of Georgia.