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NATIONAL PEANUT BOARD/SOUTHEAST PEANUT RESEARCH INITIATIVE
QUARTERLY PROGRESS REPORT FOR WORK DONE UNDER RESEARCH AGREEMENT

Final Report
January 2019

INSTITUTION: University of Georgia

PROJECT TITLE: Confirming or Redefining the Water Use Curve for Peanuts

RES. AGR. NO.:
GACCP Budget No.: N/A

PROJECT LEADER: Dr. Doug Britton

EXPIRATION DATE: June 30, 2018 (extended to December 2018)

NPB CONTACT: Bob Parker/Maria Mehok
NPB Budget No.: PID 416

REPORT OF PROGRESS:

Introduction/History:
Research to look at the water use of peanut crops and the potential of reducing the amount of water needed to produce equal yields with less water was started in June 2017. The experiment was designed to conduct pot studies of the peanut water curve developed by Drs. J. Stancell and Pallas verses reduced water application rates. The hypothesis is that reduced water will be required for the 06G peanut verses that of the Florunner used by Drs. J. Stancell and Pallas. To conduct the research, the PI Dr. Gary Hawkins used grow lights inside enclosed building where irrigation could be applied at rates equal to and various rates below that of the current water use curve. Additionally, peanuts were grown under a hoophouse where the peanuts received natural light and irrigation equal to those of the water use curve and mimicking the application rates of those grown under LED lights.

As part of the project, Dr. Hawkins had both an undergraduate student in Biological and Agricultural Engineering (BAE) assist with the planting and irrigation of the peanut plants and a UGA CAES Young Scholar helping with the project. The BAE student helped with programming the irrigation system and monitoring the application rates. The UGA CAES Young Scholar assisted with the watering of plants, but had a few interesting ideas of how the project and data could be used. He was interested in space travel and growth of plants on the space station or other planets. So, we used the base project as a means for him to develop a poster on changes in growth rates of the peanuts under LED lights (those used in space) and natural light. In the previous report, a copy of the poster was included.

Since the last report, the peanuts from the 2018 harvest have been collected, blasted, and the results have been plotted.

Materials and Location:
Peanuts (06G) were grown in a Tifton soil in 16 inch pots [Note: soil was transported from Tifton to Watkinsville and used in pots]. The pots were filled with 65 pounds of Tifton Sandy Loam soil and placed either in a hoop house shelter or inside a building with LED lights (including far red spectrum) (Figures 1 and 2, respectively). The research was conducted as a Randomized Complete Black. There were three treatments being used for the experiment [both inside and outside (inside a hoop house)]. These treatments were as follows:

Treatment 1. Growing peanuts according to the current Peanut Water Use Curve developed by Drs. J. Stancell and J. Pallas in 1985.
Treatment 2. Growing peanuts with an applied 20% deficient irrigation
Treatment 3. Growing peanuts with and applied50% deficient irrigation.

Water was applied using drip irrigation tubing (1/4 inch diameter tubing with inline emitters placed every six (6) inches). Tubing was two (2) feet long and configured in a circle with a diameter of 10 inches. This diameter allowed water to be delivered to a location halfway between the planted peanut and the wall of the pot. Watermark sensors were placed below the peanuts to measure the soil water potential in each pot. The collected data was stored on a Campbell Scientific Datalogger with records of temperature of pots (at 4 inches), water potential (at 4 inches), and solar radiation.

To provide information for analysis of the data, there are four blocks established. Each Block had all three treatments with four samples per treatment. As can be seen in Figures 1 and 2, the different treatments are visible by different colored pots.

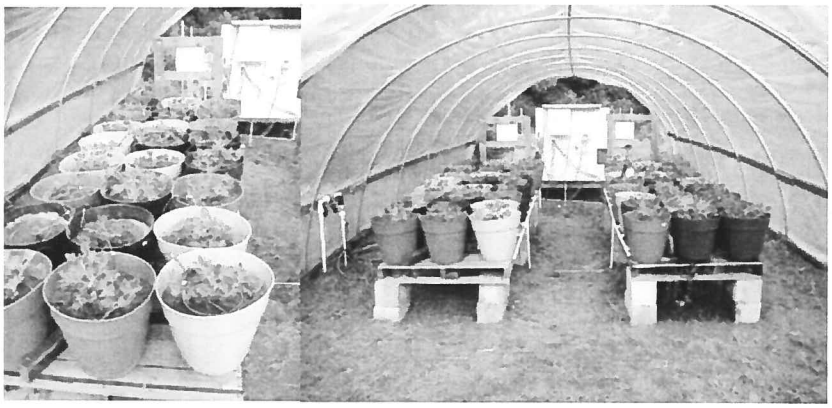
Figure 1. a) Close-up picture of pots and peanuts and b) pots in hoop house.

Figure 2. Pots and peanuts being grown indoors under LED lights.

Progress:

1. Since the last report, the peanuts for the 2018 growing season were harvested and analyzed.
2. It was noticed at the peak application rates and at some of the application rates on the higher end of the DAP application rates, water was draining from the Treatment 1 (curve application rates) pots with a little water draining from the Treatment 2 (80% application) and Treatment 3 (50% application rate) at the peak rates of application. This was observed on the inside plants only.

Issues:

During the 2018 growing season, no problems were noted outside the fact that the runners were growing outside the pots, so they were redirected into the pots to ensure the peanuts were growing in the same pot as the root of the plant. This also aided in the harvest at the end of the season.

Results:

Peanuts were harvested as close to the maturity date as possible. Each pot was dumped onto a screen and the soil was sieved and the peanuts collected and counted. Peanuts from each pot was then blasted to reveal the maturity color of each peanut using the standard blasting procedure (Figure 3).

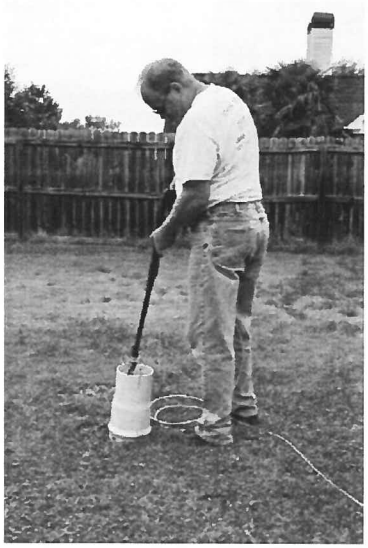

Figure 3. Gary blasting peanuts to determine maturity color of harvested peanuts.

The following are images (Figure 3 and 4) of some of the peanuts after blasting. The pictures are a few samples comparing the peanuts grown inside (LED light) as compared to outside (natural light) [NOTE: the number at the bottom is Block, Treatment, Plant number. So, 123 is Block 1, Treatment 2, Plant number 3]:

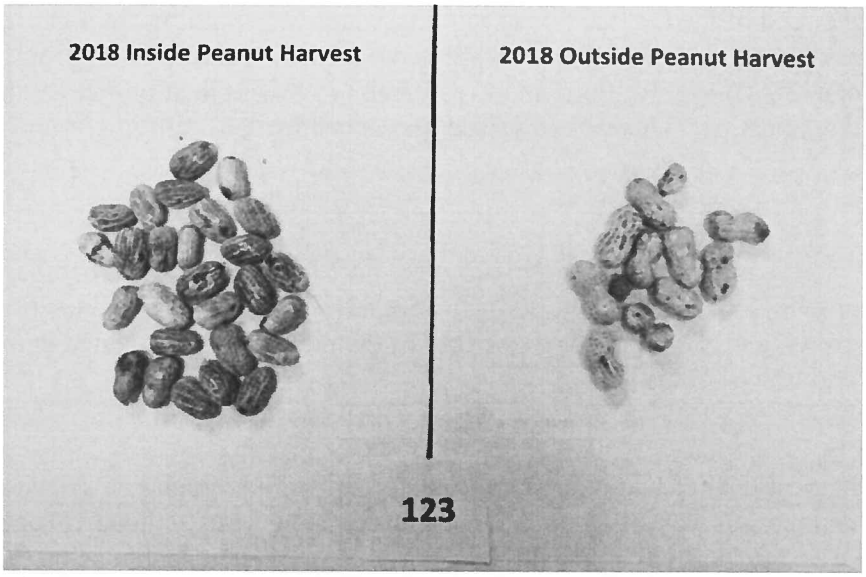

Figure 3. Peanuts after blasting from Block 1, Treatment 2. Plant number 3 for both inside (LED light) and outside (natural light).

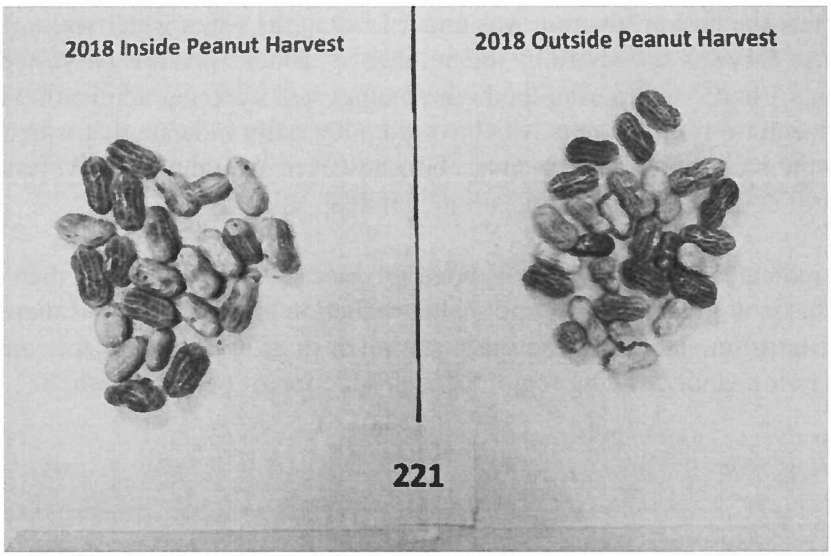

Figure 4. Peanuts after blasting from Block 2, Treatment 2. Plant number 1 for both inside (LED light) and outside (natural light).

The following is a graph comparing the results of counting the harvestable peanuts from the pots.

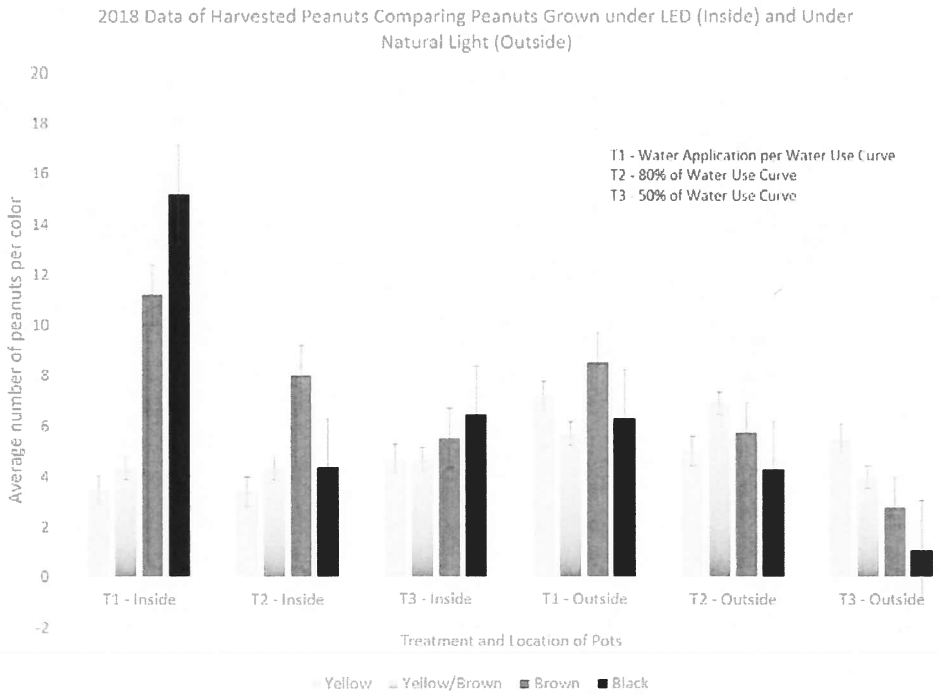

Figure 5. Graph of harvested peanuts indicating number of peanuts classified in different maturity colors.

Results indicate that the best production was under LED lights when water was applied using the water use curve as suggested by the number of "Black" peanuts harvested. One note on Treatments 1 and 2 was during the highest suggested watering application rates, there was water leaching from the pots which would potentially indicate that water was being lost below the root zone of the peanuts. This however, would need to be tested under conditions of controlled water application and deep soils.

The data further indicates that more peanuts were produced under LED lights than under natural lights. This is not feasible for large scale production of peanuts, but if there was a desire to grow peanuts on places like the space station or in grow chambers for small niche markets in non-peanut growing regions, the production of peanuts could be feasible.

Future Plans:

The data is expected to be used to draft a manuscript that could be submitted to Peanut Science Journal.