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Southeastern Peanut Research Initiative 2015
FINAL REPORT

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Project Title: Modifying and developing peanut leaf spot decision support tools for the PeanutFARM website.

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1. **Abstract**

Decision support systems (DSS) for plant disease are continually being developed by researchers and industry personnel from around the world. Often the availability of these DSS are limited thus minimizing their impacts on stakeholders. PeanutFARM is a web-based resource that provides a set of electronic tools for growers to manage their everyday peanut farm operations. The addition of various peanut disease DSS to the PeanutFARM website can increase the utility of this resource while providing growers with access to multiple DSS. A schematic model was developed for leaf spot risk advisory on PeanutFARM website and sent to the websites programmer for development. While developing this tool, researchers continued field trials looking at the efficacy of various fungicides on peanut leaf spots. The information gained from this research will be used to incorporate fungicide application as a part of the leaf spot DSS on PeanutFARM

2. **Introduction**

We hypothesize that the addition of leaf spot DSS to the PeanutFARM website will assist growers with the spray management decisions, and lower disease impacts through optimum fungicide timing. The objectives of this study are to 1.) Identify and modify leaf spot DSS that can interface with the PeanutFARM website; and 2.) Assess the efficacy of various fungicide products on leaf spot control through solo-spray programs at the Plant Science Research and Education Unit in Citra, FL and North Florida Research and Education Unit in Marianna, FL. The long term goal of this research is to continually add more disease resources to the PeanutFARM website that will assist growers in making many of their peanut management decisions.

3. **Methods**

Model design and programing:

Using information from other modeling systems and research conducted at the University of Florida by Dr. Thomas Kucharek, and two simple models were developed for leaf spot (Figure 1). This model was discussed with Dr. Diane Rowland and her computer programmer on how to best adjust it for use on the PeanutFARM website. Currently, this model is being assessed for the cost to add it to the PeanutFARM websit.

Field trials:
Peanut experimental plots of Georgia-06G were planted at the University of Florida's Plant Science Research and Education Unit in Citra, FL on 4 June 2015, and at the North Florida Research and Education Center in Marianna, FL on 5 June, 2015. The plots were planted at a density of six seeds per foot of row on 36-in. row centers. Plots consisted of paired 25-ft long treatment rows with untreated buffer rows between each treatment arranged in randomized complete block design with 4 replications. Fungicide applications were made throughout the season as seen in table 1 below. Foliar treatments were applied with a CO_2 backpack sprayer calibrated to deliver 25 gal/A at 30 psi with TeeJetXR 8004VF nozzles at 36-in. spacing at the PSREU and using a tractor mounted spray at NFREC.

Percent disease severity was estimated from sampling 12 trifoliate leaves from each test plot, which were collected on a bi-weekly basis starting on 2 Jul and ending 25 Sep. Yields were obtained by weighing harvested peanuts from the two treatment rows on a scale. All data was analyzed with GLM using SAS version 9.2 and differences were determined using the multiple comparison test protected Fisher's least significant difference (LSD; $P < 0.05$).

Table 1. Spray schedule for fungicide treatments in field trials consisting of 7 sprays using the active ingredients listed in the treatments. Brand names are used only to indicate the amount of product in each spray and are not an endorsement or review of these products. Numbers in the top row indicate the day after planting (DAP) when the product below was applied.

Treatment (#)	30	45	60	75	90	105	120
Untreated (1)							
Chlorothalonil (2)	Echo 720 @ 1.5 pt/a	Echo 720 @ 1.5 pt/a	Echo 720 @ 1.5 pt/a	Echo 720 @ 1.5 pt/a	Echo 720 @ 1.5 pt/a	Echo 720 @ 1.5 pt/a	Echo 720 @ 1.5 pt/a
Tebuconazole (3)	TebuStar @ 7.2 fl oz/a	TebuStar @ 7.2 fl oz/a	TebuStar @ 7.2 fl oz/a	TebuStar @ 7.2 fl oz/a	TebuStar @ 7.2 fl oz/a	TebuStar @ 7.2 fl oz/a	TebuStar @ 7.2 fl oz/a
Azoxystrobin (4)	Abound 2.08SC @ 18 fl oz/a	Abound 2.08SC @ 18 fl oz/a	Abound 2.08SC @ 18 fl oz/a	Abound 2.08SC @ 18 fl oz/a	Abound 2.08SC @ 18 fl oz/a	Abound 2.08SC @ 18 fl oz/a	Abound 2.08SC @ 18 fl oz/a
Pyraclostrobin (5)	Headline SC @ 9 fl oz/a	Headline SC @ 9 fl oz/a	Headline SC @ 9 fl oz/a	Headline SC @ 9 fl oz/a	Headline SC @ 9 fl oz/a	Headline SC @ 9 fl oz/a	Headline SC @ 9 fl oz/a

4. Results

Model design and programing:
The flow charts were provide to the peanutFARM program using the AU-pnut model and the NC-State models. It is estimated that roughly $10,000 is need to program and implement these models on the PeanutFARM website and mobile webpage.

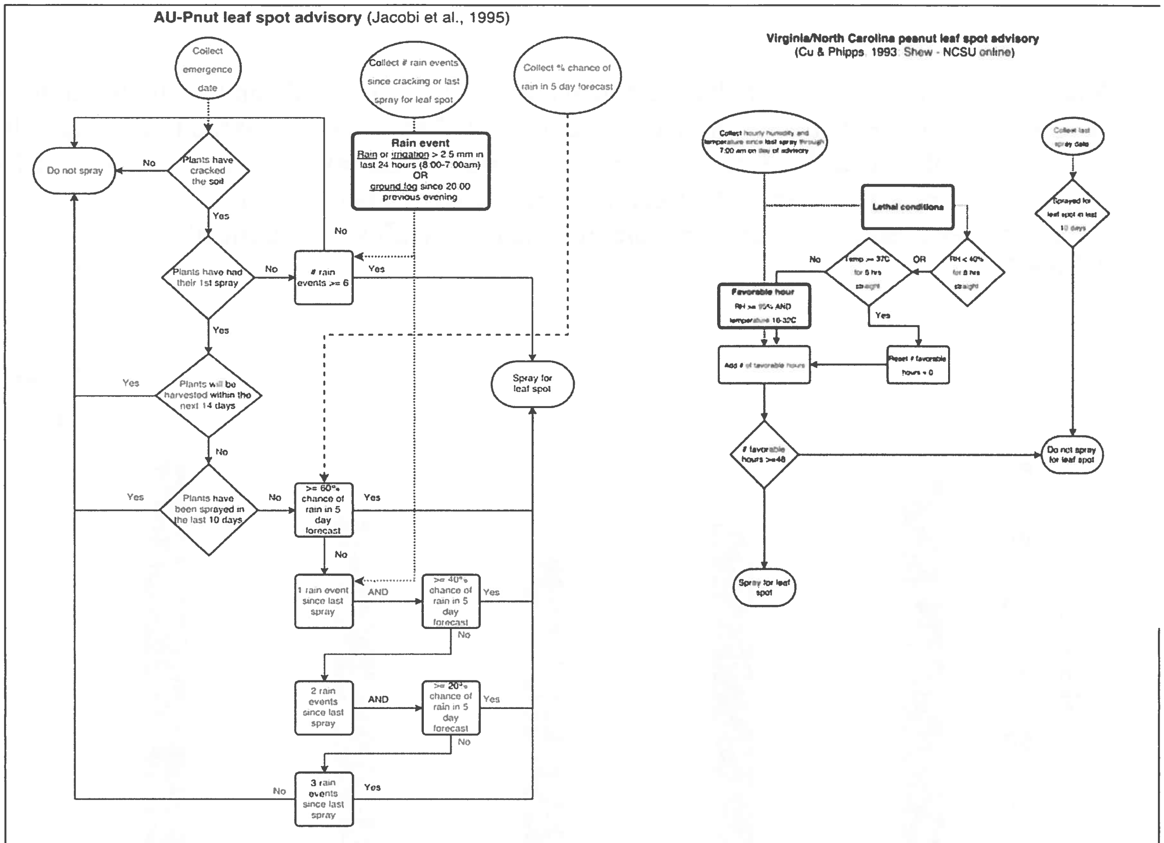

Figure 1. Flow charts for AU-pnut and NC Leaf Spot advisory models. These decision models are being programed for implementation on to the peanutFARM website.

Field Trial

Analysis of variance indicated that treatments did not have a significant ($p > 0.10$) on disease incidence of early leaf spot (ELS) and late leaf spot (LLS) (Figure 2) at the PSREU site. It was observed that tebuconazole numerically reduced disease severity and incidence of ELS compared all other treatments. All treatments produced yields that were similar to the untreated check, except for tebuconazole treatments which were numerically higher (Figure 3).

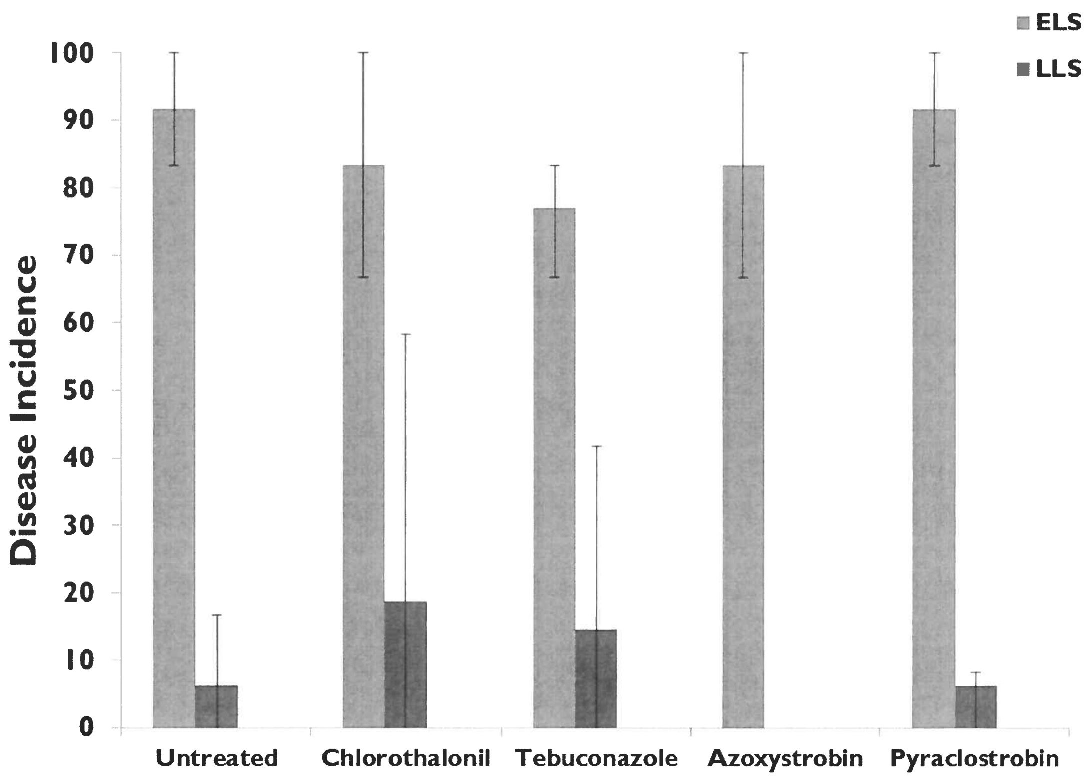

Figure 2: Percent disease incidence for the 5 fungicide treatments (table 1) examined in this study from sampling date September 22, 2015. Values are based on number of 12 randomly sampled leaflets in the 4 replications that had the presence of the disease indicated on the graph. Different bar colors represent the different diseases as designated by the legend.

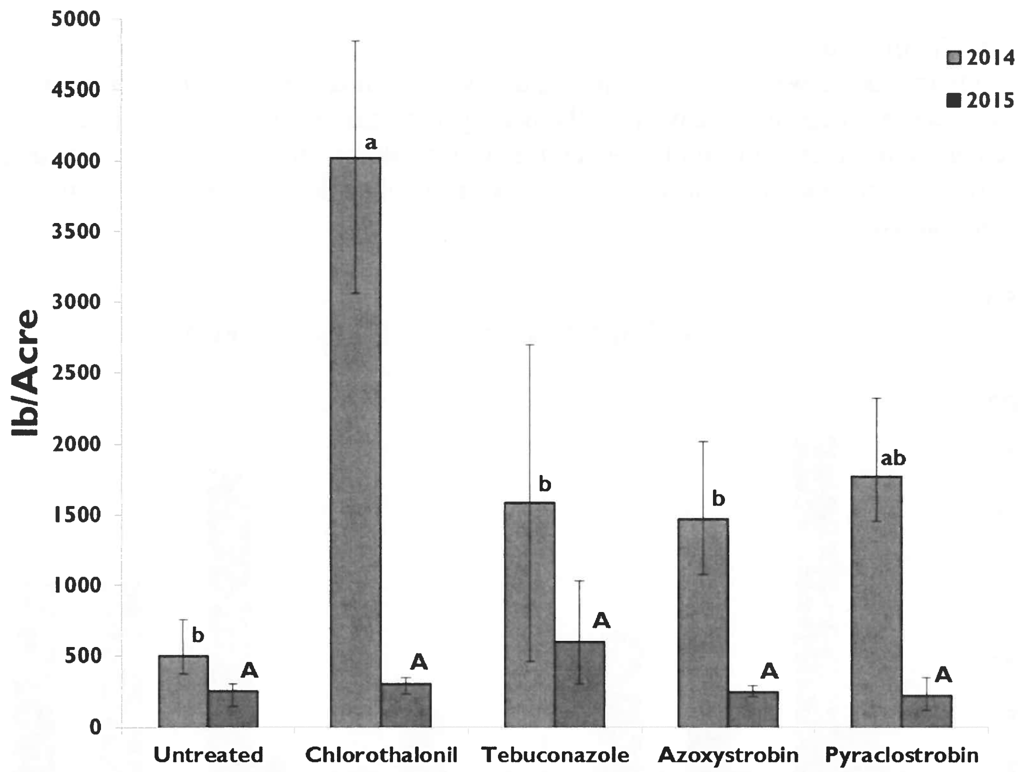

Figure 3: Yield data (pounds per acre) from plots harvested on 10/30/14 and 10/28/15. Data was based on 4 replications of 2 row plots that were 25 feet long. The bars represent the different years with fungicide treatments listed on the bottom. The protected Fisher's least significant difference (LSD) was conducted for each year, and treatments with a different letter a significantly different based on this test.

Field Site Comparison

Yield comparisons between 3 peanut sites (Quincy, Marianna and Citra, FL) showed the fungicide response depended heavily on the pathogen present (Figure 4). All products provided an increase over the control when rust was predominant (Figure 4, purple bar), but at Citra where early leaf spot was dominant only propiconazole and tebuconazole provide significant increases.

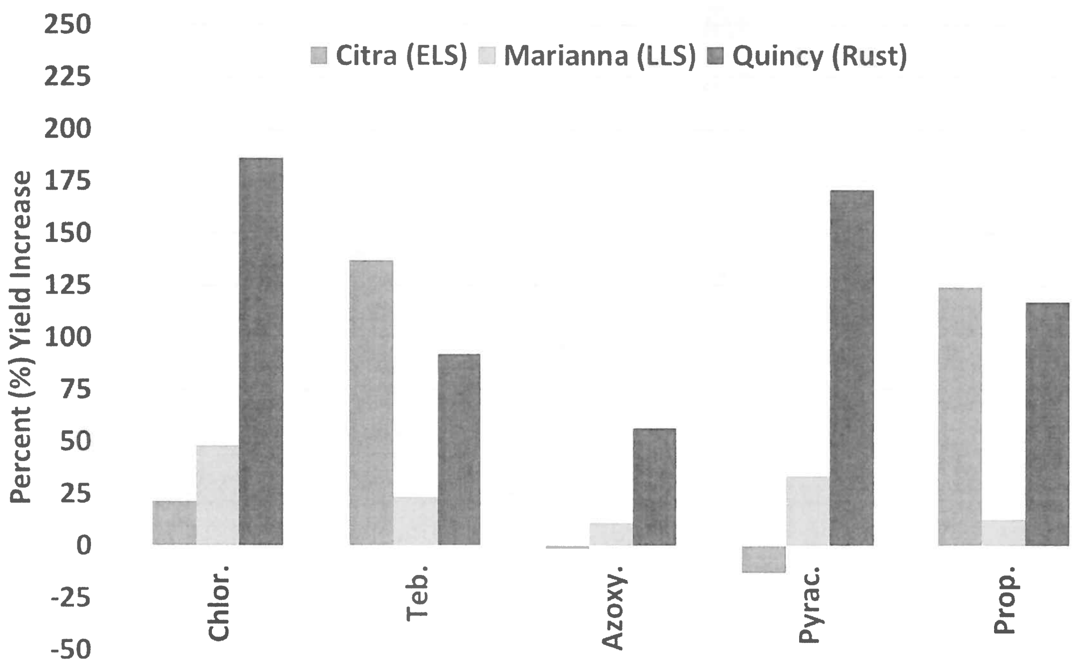

Figure 4: Yield comparison between sites using the different fungicide programs (table 1), a propiconazole (Prop.) treatment (4 fl oz/A for 7 sprays) was also added. Yields were standardized to the untreated check at each site. A positive value is the % increase over the untreated check. The acronym next the cite location at the top of the graph indicates the predominate foliar pathogen at each site for early leaf spot (ELS), late leaf spot (LLS) and rust.

5. Summary:

In general, the efficacy of the different fungicide products tested in this study was dependent on the type of disease present. For example, both azoxystrobin and pyraclostrobin did not reduce the incidence of early leaf spot compared to the untreated check (Figure 2) which lead to yield low yields in both plots (Figure 4). This variability of fungicidal products in relation to their foliar disease control means that accurate identification of the leaf spot pathogens will be critical to determining the proper management, especially with fungicides (Figure 4). It also indicates that the efficacy of these to strobilurin fungicides could be at risk in the future. The addition and rotation of fungicide chemistries for various peanut sprays is a critical step to limiting these management reductions.

These results support the need for a decision support system related to leaf spot fungicide sprays. Chlorothalonil (a.k.a. generic Bravo) is a good product for leaf spot control when applied in a timely manner. However, it appears that delayed applications of this product in 2016 lead to high pressure from early leaf spot and minimal control (Figure 2 and Figure 4). Better timing of this fungicide with other fungicide products (e.g. tebuconazole) could provide improved control for these pathogens. Also, limiting the use of tebuconazole, azoxystrobin and pyraclostrobin will be useful for the durability of these fungicides. Currently, the calendar based program provides average control over these pathogens, and a DSS could provide the information needed to make more accurate disease management decisions and fungicide efficacy. The cost to add leaf spot models to PeanutFARM will be $10,000, but these tools would be useful for in season management decisions.