

# Detangling Relationships Between Aflatoxin Formation and Plant Physiological Status in Peanut (*Arachis hypogaea*)

Justin Pitts<sup>1</sup>, Barry Tillman<sup>1</sup>, Zachary Brym<sup>1</sup>, Alina Zare<sup>2</sup>, William Hammond<sup>1</sup>

<sup>1</sup>Agronomy Department, University of Florida, <sup>2</sup>Department of Electrical and Computer Engineering, University of Florida

## Introduction

Aflatoxin is a common contaminant of staple crops globally. Both acute and chronic exposure can lead to serious human health impacts, including liver failure, cancer, and birth defects. Research on aflatoxin formation in peanut has been limited to impacts of soil environmental conditions, leaving the role of plant physiological status on aflatoxin formation unknown.

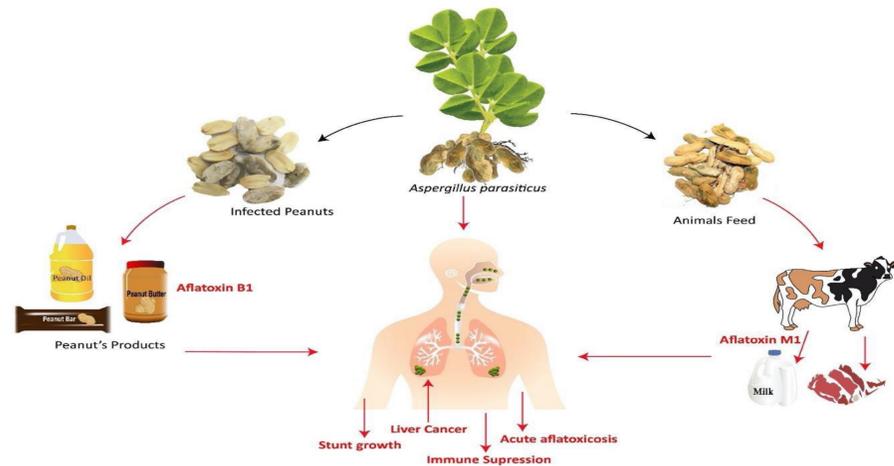
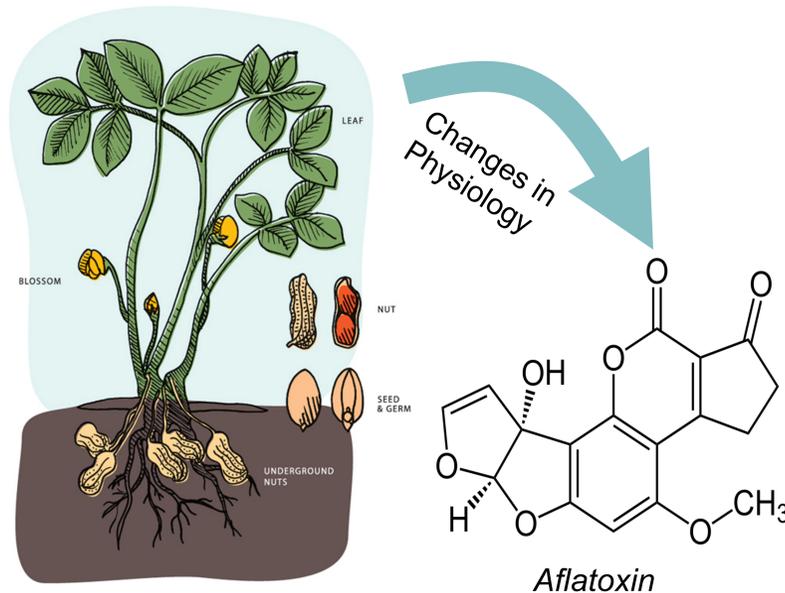


Figure 1. Routes of potential human exposure to aflatoxin.

## Objectives

- Improve understanding on impacts of soil environment and plant physiological status (water relations) on aflatoxin formation in peanut.
- Capture leaf-level hyperspectral reflectance throughout peanut's entire life cycle that may be indicative of aflatoxin infection.
- Isolate physiological characteristics associated with reduced aflatoxin formation to inform future breeding decisions.



## Research Approach

We are developing a novel split-pegging environment (Figure 2) which will allow for the manipulation of both soil conditions and plant water status on the **same** individual.

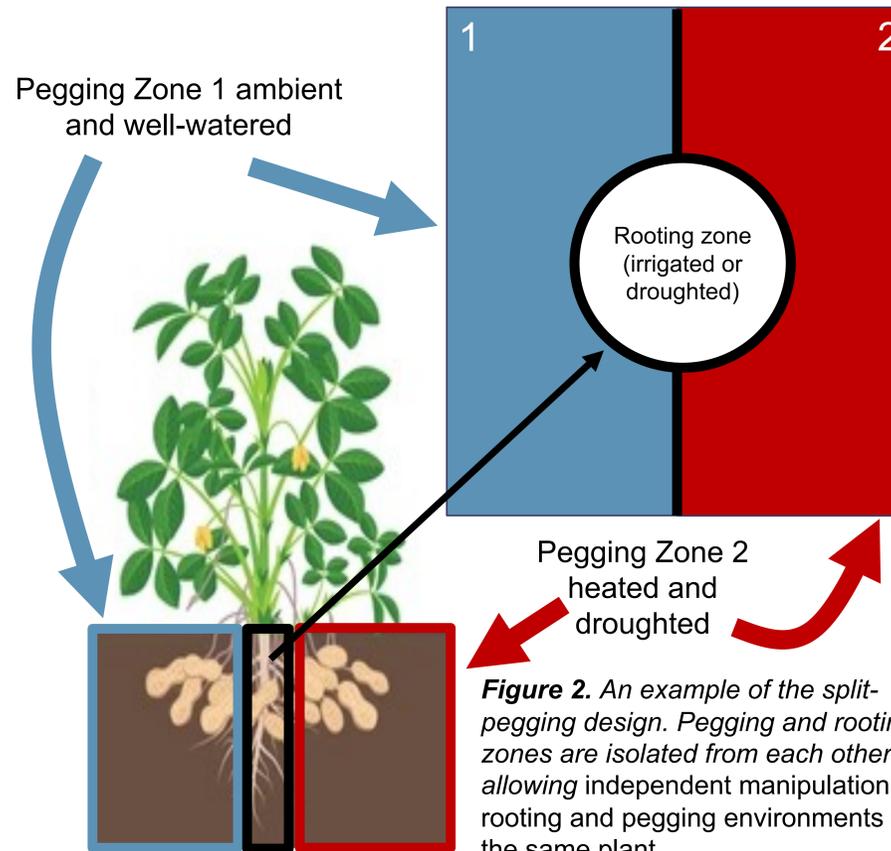


Figure 2. An example of the split-pegging design. Pegging and rooting zones are isolated from each other allowing independent manipulation of rooting and pegging environments on the same plant.



Figure 3. A suite of physiological measurements which will be taken throughout the course of the peanut's life cycle. These will include gas exchange (1), hyperspectral reflectance (2), relative water content, leaf water potentials and chlorophyll fluorescence (not shown)

## Data Analysis

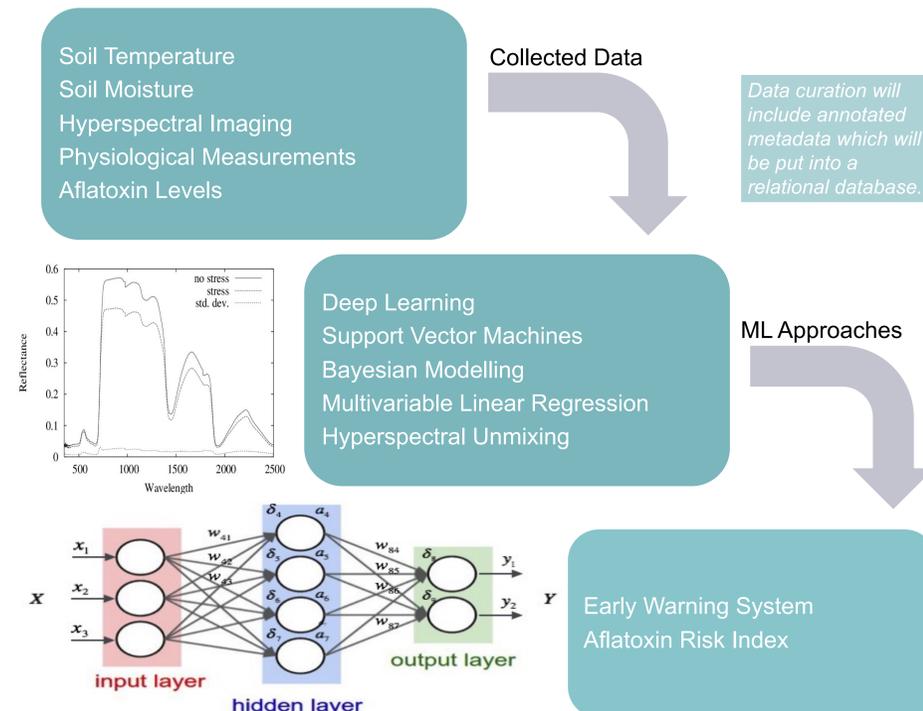


Figure 4. The flow of data from field to data analysis using machine learning algorithms and eventual development of aflatoxin risk index.

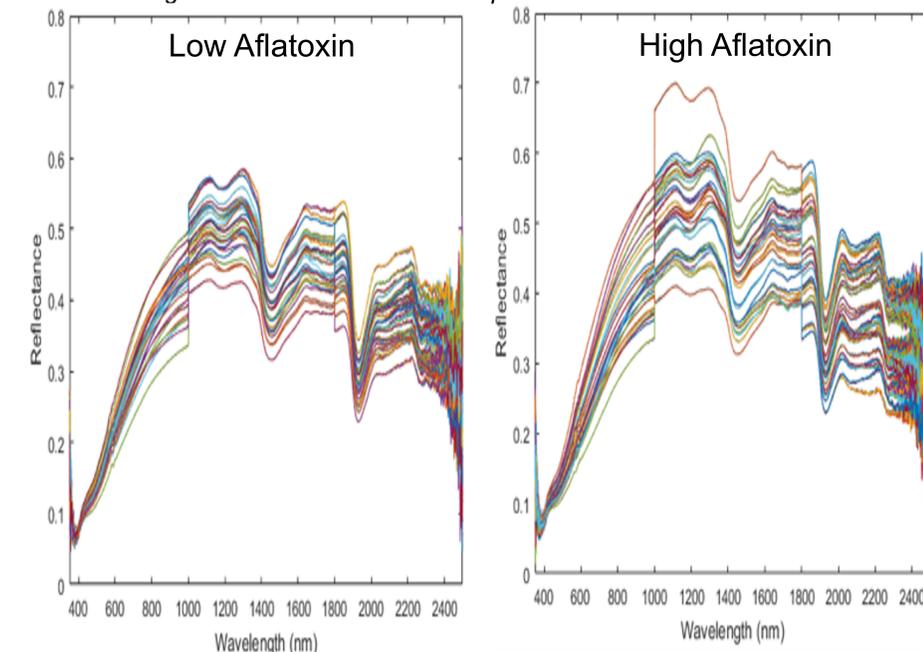


Figure 5. Spectral reflectance of a low aflatoxin (left) and high aflatoxin (right) peanut. Note peaks between 1000-1500 nm.

## Acknowledgements

I would like to thank my co-advisors William Hammond and Alina Zare. Barry Tillman, Zachary Brym, Yang Song, Gerard Sapes, Khaled Hammad, Xiaolei Guo and Eric Torres. The University of Florida's Food Systems Institute and Southeastern Peanut Research Initiative for providing funding to make this research possible.