

## Comparison of Technologies for Assessing Leaf Spot Severity

C.S. NEWMAN\*, A.T. OAKLEY, R. AUSTIN, R.J. ANDRES, J.C. DUNNE, Department of Crop and Soil Sciences, North Carolina State University, Raleigh, NC, 27695; A.M. HULSE-KEMP, USDA-ARS GBRU, Raleigh, NC, 27695.

The most economically threatening diseases to Virginia-type peanuts are Early Leaf Spot (ELS) and Late Leaf Spot (LLS) which are caused by *Cercospora arachidicola* (Hori) [syn. *Passalora arachidicola* (Hori) U. Braun] and *Cercosporidium personatum* (Berk. & M.A. Curtis) Deighton [syn. *Passalora personata* (Berk. & M.A. Curtis) S.A. Khan & M. Kamal] respectively. ELS and LLS manifest as tissue lesions that cause eventual plant defoliation. In mature Virginia-type peanuts, it has been shown that significant yield losses will result when plants reach 25% defoliation. The accurate quantification of disease symptoms is imperative to breeding peanuts with enhanced disease resistance. The established rating system for ELS and LLS is the Florida severity scale, which is a visual scale with possible values of 1-10. It is meant to capture both lesion and plant defoliation levels. Drawbacks of using the Florida severity scale include, subjectivity and rating two separate disease symptoms simultaneously. In this project, ELS and LLS were quantified by leaf scans, consumer-grade UAV RGB imaging, enterprise-grade UAV RGB and 10-band multispectral imaging, and visual rating with the Florida severity scale for the purposes of method comparisons. In 2020, 220 *A. hypogaea* genotypes were grown and evaluated at the Peanut Belt Research Station (Lewiston-Woodville, NC). In 2021, the same genotypes along with 45 additional genotypes were planted and evaluated at both the Peanut Belt Research Station and the Upper Coastal Plains Research Station (Rocky Mount, NC). From the data collected in 2020, results were compiled from comparing visual ratings to the objective evaluations of leaf spot percentage on the leaf surface (tissue), the defoliation percentage (consumer-grade UAV), and a combination of the two ratings using the first principal component (PC1). In each instance, the evaluation type was highly correlated with the visual rating (Tissue: 0.637,  $P < 0.001$ ; Drone: 0.713,  $P < 0.001$ ; PC1: 0.756,  $P < 0.001$ ). Additional pairwise comparisons using data from all years and technologies will be presented.

This project will provide information about what objective measure can be used as a proxy for the Florida scale. Correlations between lesion characteristics [count and area] detected by the leaf scans and plot-level defoliation detected by UAV imaging will be presented, which will provide information about how the two disease symptoms are related. The optimal ELS and LLS rating method, technology and time point at which to capture the data will be discussed. The findings of this study will allow for unbiased, efficient rating of ELS and LLS across locations and programs, which will ultimately facilitate high accuracy breeding activities.