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NAPPN Annual Conference Abstract: Comparison of Methods for Detection and Quantification of Tar Spot Foliar Infection in Maize Using Dynamic Colorspace Thresholding, Object Detection, and Contour Analysis

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The expanding geographic range of *Phyllachora maydis*, the fungus that induces Tar Spot infection on corn foliage, is increasingly threatening a Michigan industry that contributes over $1 billion to the state's economy annually. Foliar infection of maize by *P. maydis* is often difficult to detect early. Visible lesions initially appear tiny, ambiguous, and sparse, making them difficult to identify with the naked eye. Both farmers and breeders of corn desperately need better tools that allow early, definitive detection of lesions and provide more time for management decisions. This tool must verify presence of *P. maydis* and quantify infection severity as quickly as possible to allow growers the most options for treatment. Advances in machine learning now enable quantification of crop infection presence and severity using powerful object detection packages. With the growing availability of open-source tools, such as the Mask Region-Based Convolutional Neural Network (Mask R-CNN) and PlantCV, the field of plant disease phenotyping has more options for methods than ever before. I propose comparing the accuracy of two potential pipelines to quantify tar spot infection severity: one based on heuristic methods, involving techniques such as dynamic image colorspace thresholding, and the other based on the use of annotations, such as object detection and contour analysis. Comparison of these two methods will provide insight into challenges involved with phenotyping in the field as well as phenotyping foliar diseases using automated methods.