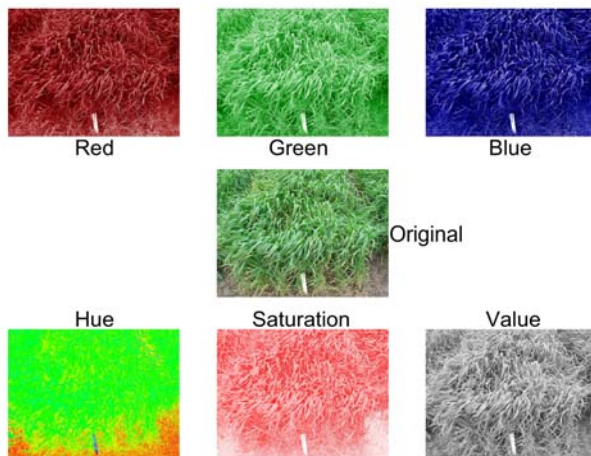


Digital Image Analysis for Assessment of Foliar Plant Diseases

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BACKGROUND

Plant pathologists rely on visual assessment of plant disease incidence and severity. However, in most cases, visual assessment is unreliable because of poor precision, accuracy and lack of repeatability. With the use of digital image analysis, plant pathologists have a more reliable method to determine how much disease is present in an entire field, or on a number of diseased leaves. While at one time digital image analysis required specialized hardware, currently, the only requirements are a scanner, digital camera, computer and image analysis software. In its simplest form, image analysis consists of selecting pixels that match a particular criteria. One particular method of this analysis type is called segmentation. Segmentation selects pixels based on color or saturation. Most images are stored in a format where they have a value for red, green and blue. In the image below, the original photo is in the middle, and each of the color segments is above. The hue, saturation and value photos, below the original, allow a plant pathologist to separate the leaf from the background (saturation) and the lesions from the leaves themselves (hue).



OBJECTIVES

- Determine the impact of image size, image format and compression settings on the results achieved with digital image analysis.
- Visual disease severity surveys versus digital image analysis.
- Use a readily available software analysis program (Assess, available from the American Phytopathological Society) to analyze digital images from leaves and canopy

RESULTS / BENEFITS

The analyses carried out in these experiments were conducted with leaves collected from diseased plots and images taken of field plots. In general, digital image analysis did a better job with both collected leaf tissue and images of field plots. Using digital images allows a plant pathologist to accurately quantify the percentage of leaf tissue that is covered by a lesion. We are currently conducting more research to improve the performance of this method with images of field plots. We believe the improved accuracy and precision of this method will be most effective in evaluating breeding material for the small scale differences needed in quantitative inheritance of disease resistance.