Remote Sensing at Helms (Field 5)
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Methodology: Imagery was taken with an airborne hyperspectral sensor on July 1, July 8, July 22, Aug. 2, Aug. 17, and Sept. 9 (Fig. 1). The intensity of light reflecting off the field was extracted from each image at a series of points collected by Jim Bordovsky, where yield was taken. Light intensity was converted to % reflectance and compared against irrigation treatment (80, 100, and 120% evapotranspiration (ET)), and variety (FiberMax 989RR and Paymaster 2326RR). A vegetation index based on a wavelength in the near-infrared region (NIR) and red region (RED) (NIR-RED)/(NIR+RED) was obtained from each plot, based on light intensity at 858 nm and 668 nm. A second index was created from NIR and the green region (GREEN), where the green band was at 557 nm, (NIR-GREEN)/(NIR+GREEN). These indexes were correlated with yield and irrigation treatment.

Results: On July 22 and Aug. 2, irrigation treatment affected reflectance of light in the NIR, where higher reflectance was associated with higher irrigation rate. Higher reflectance in the NIR is often an indicator of more biomass. However, by August 17 and September 9, the relationship had changed. On Aug. 17, there was a higher peak of reflectance in the green spectrum for the higher irrigation treatments (Fig. 2). This means that there was probably greater nitrogen stress in the higher irrigation treatments. In the NIR, there was some inconsistency between higher reflectance and irrigation treatment, but by 839 nm, the higher reflectance was associated with the lower irrigation treatment (80%ET). The data on Sept. 9 was similar to Aug. 17, except the peak in the green spectrum was less distinctive. FM 989RR had a lower peak in the green spectrum than PM 2326RR during Aug. 2 and August 17 (Fig. 3), indicating more nitrogen stress associated with PM 2326RR during that time.

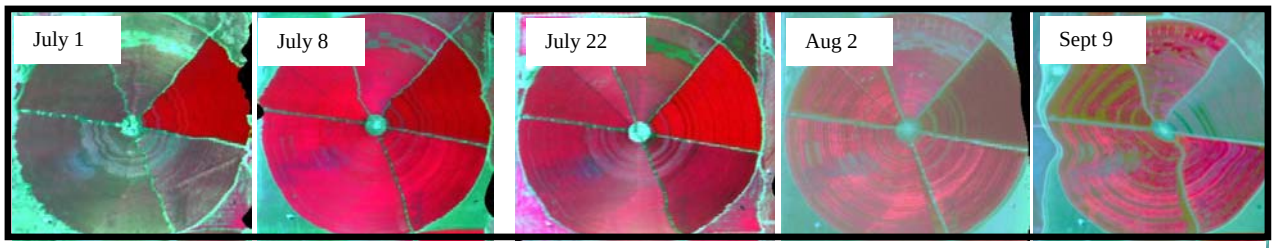

Fig. 1. Images taken at Helms by hyperspectral sensor. Full circle image from Aug. 17 was obscured by clouds.

The vegetation indexes correlated poorly with yield and irrigation treatment. The index based on NIR and GREEN bands was better ($R^2 < 0.20$) than the NIR and RED bands ($R^2 < 0.01$). In 2003, this same experiment resulted in R^2 values for yield around 0.60. The indices had a poorer fit in general for yield than for irrigation treatment, and fitting by variety only improved R^2 values marginally. Single band correlations were higher for yield than indices.

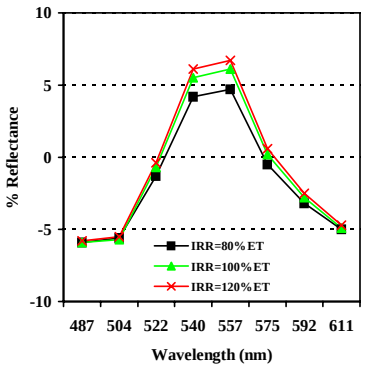

Fig. 2. Light reflectance on Aug 17 as related to irrigation treatment.

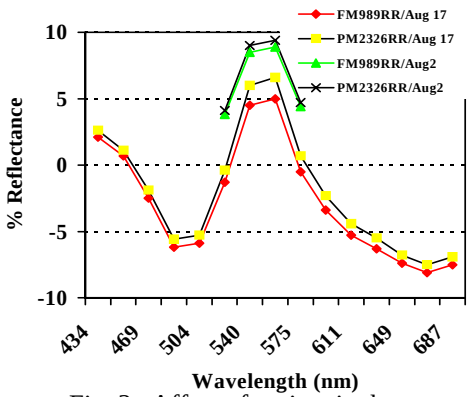

Fig. 3. Affect of variety in the green spectrum on light reflectance.