

Utilization of UAV-Based Hyperspectral Imaging Technique on Acquiring Phenotypic Characteristics of Prairie Field Crops

The department of **Plant Sciences and Mechanical Engineering** studied field crops including **canola, spring wheat, lentils, peas, and faba-beans**. As a part of preliminary study it was discovered that **various band ratios (vegetation indices)** derived from **UAV-based HSI approach** are strongly related to the seed vigor and crop varieties. Using a **Draganfly UAV system** along with a **gimbal mounted HSI camera** flying over canola field at **40m altitude**, alongside a ground-based **BLUE-Wave spectrometer**, hyperspectral data at key growth stages, including **booting, heading, flowering, and ripening stage** were obtained. The drone technology was able to capture a **rapid change in the red-edge and near-infrared (NIR) region**, spectral bands corresponding to **biophysical quantity/yield (680-750nm), chlorophyll (650-670nm) and carotenoid (450-470nm)** that differed considerably as the crops matured, including vegetation indices related to the photosynthetic capacity (chlorophyll content) of the plants during the growth stages of crops. The field data collected determined that the use of **UAV technology will transform crop breeding research** and provide innovative solutions to national and global food security. In addition, it was determined that combining **hyperspectral data with RGB and multispectral sensor data** would provide new insights to the field of high-throughput phenotypic research.

