NAPPN Annual Conference Abstract: Hyperspectral imaging for non-destructive determination of cannabinoids in floral and leaf materials of industrial hemp

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BodyText: There has been a surge in industrial hemp growth for producing cannabinoids, such as cannabidiol (CBD), because of their medical potential. Quantitative determination of cannabinoids in harvested materials is critical for cannabinoid production and compliance testing. Concentrations of cannabinoids in hemp are conventionally determined using wet-chemistry chromatographic methods, which are unsuitable for on-site rapid testing. This study presents a novel effort to utilize hyperspectral imaging technology for non-destructive quantification of major cannabinoids, including CBD, THC (tetrahydrocannabinol), CBG (cannabigerol) and their acid forms in fresh floral and leaf materials of industrial hemp on a dry weight basis. Hyperspectral images in the range of 400–1000 nm were acquired from floral and leaf tissues immediately after harvest from 100 industrial hemp plants of five cultivars at varying

growth stages. Linear discriminant analysis showed hyperspectral imaging could identify CBD-rich/poor and THC-legal/illegal flower samples with accuracies of 99% and 97%, respectively. Quantitative models based on full-spectrum PLS achieved prediction accuracies of RPD = 2.5 (corresponding R^2 = 0.84) for CBD and THC in floral tissues. Similar accuracies were obtained for their acid forms in flower samples. Consistently improved accuracies were obtained by PLS models based on a wavelength selection procedure for minimized variable collinearity. The best RPD values of approximately 2.6 (corresponding R2 = 0.85) were obtained for CBD and THC in floral materials. This study demonstrates the utility of hyperspectral imaging as a potentially valuable tool for rapid quantification of cannabinoids in industrial hemp. (This study was previously published: https://doi.org/10.1016/j.compag.2022.107387)