MONITORING WINTER WHEAT MATURITY BY HYPERSPECTRAL VEGETATION INDICES

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ABSTRACT—It is very important to harvest wheat in optimum time which greatly affects grain quality, mainly referred to as protein content in the research. Because either too early harvest shortens grain-filling process or too late harvest leads to yield losses and poor quality caused by high grain respiration rate in dry and hot wind weather and sprouting in rainy weather. Research was conducted during 2007-2008 to determine if vegetation indices could be used as indicators of winter wheat maturation. The cultivar Jingdong 12 was planted under four nitrogen treatments, and reflectance and agronomy parameters were measured on five different harvest dates. In maturation process, increasing grain protein content ranged from 12.2% to 16.5%, declining ear water content ranged from 36% to 60%, chlorophyll, carotenoids content of both leaf and ear decreased, and ratio of carotenoids to chlorophyll increased on the whole. Seven maturation monitoring models were established by corresponding vegetation indices, which were chosen by comparing correlation coefficients between vegetation indices and agronomy parameters. Compared with the other models, the ear water content model was chosen as the best one due to the least average absolute relative error and high prediction accuracy in validation, with 0.03, 0.04 in cross test and 0.98, 0.98 in training samplings test. The results suggest that hyperspectral vegetation indices could potentially aid in predicting winter wheat maturation.

Key Words: winter wheat; maturation; protein content; agronomy parameter; vegetation indices