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Soil Science Society of America Journal Abstract - SOIL & WATER MANAGEMENT & CONSERVATION

In-Season Optical Sensing Improves Nitrogen-Use Efficiency for Winter Wheat

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Abstract

Optical sensor-based N management strategies are promising approaches to improve N-use efficiency (NUE) and reduce environmental pollution risk. The objective of this study was to evaluate an active optical sensor-based in-season N management strategy for winter wheat (*Triticum aestivum* L) in the North China Plain (NCP). Initially, 10 field experiments were conducted at four villages in NCP in the 2004/05, 2005/06, and 2006/07 growing seasons to evaluate the in-season N requirement prediction developed by Oklahoma State University. Then the N application rates, winter wheat grain yield, NUE, economic returns, residual N content after harvest and apparent N loss were compared among three different management systems on a total of 16 farmer fields in 2005/2006 and 14 farmer fields in 2006/2007. The systems included a sensor-based system, a soil test-based approach crediting soil residual mineral N (N_{min}) to different depth at different growth stages, and common farmer practices. Averaged across site-years, the sensor-based, soil N_{min} -based N management strategies, and farmer practices produced similar grain yields but used 67, 88, and 372 kg N ha⁻¹, respectively. Nitrogen-use efficiencies were 61.3, 51.0, and 13.1% for the three methods of N recommendations, correspondingly. Their residual N content in the soil and apparent N loss were 115, 122, and 208 kg N ha⁻¹, and 4, 15, and 205 kg N ha⁻¹, respectively. The optical sensor-based N management strategy is relatively easy to use, has better potential to improve NUE and economic returns, and reduces residual soil N content and apparent N loss than other methods currently used in the NCP.

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