



UNIVERSITY OF WISCONSIN AGRONOMY, SOYBEAN RESEARCH, UNIVERSITY OF WISCONSIN-EXTENSION

Validation of PPNT for Optimum Economic Nitrogen Rate for Winter Wheat in WI

Shawn Conley, State Soybean and Small Grains Specialist
John Gaska, Outreach Specialist

Near record wheat commodity prices coupled with increasing input costs for corn and soybean led many Wisconsin growers to increase their wheat acreage. A majority of wheat in WI follows soybean or alfalfa; therefore a significant nitrogen (N) credit can be contributed towards the crop. As nitrogen prices rose to near \$1.00 per pound of actual N, the need to refine and tailor N recommendations to specific fields and cropping systems became even more important to optimize profitability.

Current nitrogen fertilizer recommendations for Wisconsin can be found in Laboski et al. (2009). Generally, 70 lb/a of N is adequate for soils with 2.0 to 9.9% organic matter. Applying too much N fertilizer can have detrimental effects on yield. Excessive N fertilization encourages excess vegetative growth, which increases the possibility of lodging, making harvest more difficult and also increases disease potential due to a dense canopy. Nitrogen credit for any applied manure needs to be considered as well as an N credit of 40 lb/a for wheat following soybean.

To fine tune N recommendations, growers also have the opportunity to use pre-plant soil $\text{NO}_3\text{-N}$ (PPNT) content to assess N fertilization needs in specific fields. Recent studies by Bundy and Andraski showed a strong relationship between these tests and economic N recommendations (Bundy and Andraski, 2004). With the cooperation of Extension educators and growers and funding provided by the **Wisconsin Fertilizer Research Fund and Council (WFRFC)** we initiated six large-scale, on-farm, replicated trials (minimum of 1 acre plots) to validate the effectiveness of this N management tool.

Winter wheat plots were established by the cooperating growers in the fall of 2008. With the help of county based UWEX personnel, two N rate treatments were applied in the spring of 2009 to each field in 5 counties. Growers then harvested the plots and provided us with field information and yield data. Two trial locations intended to be included in this project were winterkilled and thus no data was collected. The two N rates tested at each farm consisted of an N rate based on the PPNT recommendation rate and the second was an additional grower selected N rate which was higher than the PPNT rate. No difference in grain yield or test weight (data not shown) between the two N rates were shown at any location (Table 1) in the 2008/2009 trials. This suggests that the PPNT accurately predicted the optimal economic nitrogen use rate across all sites. Validation trials will again be conducted in the 2009/10 winter wheat growing season. For information related to these validation studies please see our research protocol at www.coolbean.info.

www.coolbean.info

Table 1. Large scale nitrogen validation trials comparing PPNT nitrogen recommendations to a growers “normal” nitrogen application rate.

County	City	Ag Agent	Variety	Fall ¹	Applied ²		LSD ³ 10%
				2008 PPNT Rec. lb N/a	N rate lb N/a	Yield bu/a	
Brown	Luxemburg	Mark Hagedorn	VNS	21	50 150	118.3 113.9	NS
Calumet	Potter	Bryce Larson		WINTERKILLED			
Fond du Lac	Malone	Mike Rankin		WINTERKILLED			
Fond du Lac	Rosendale	Mike Rankin	Pioneer 25R35	30	30 60	77.0 81.3	NS
Jackson	Black River Falls	Trisha Wagner	Croplan 8302	50	50 80	41.8 43.2	NS
Shawano	Pulaski	Tom Anderson/ Mark Hagedorn	Hopewell	67	51 66 99	67.1 66.1 67.9	NS

¹Nitrogen rate recommended by PPNT test.

²Nitrogen rate treatments.

³NS: No significant differences: yield is the same between treatments.

Literature cited:

Bundy, L. G. and T. W. Andraski. 2004. Diagnostic tests for site-specific nitrogen recommendations for winter wheat. *Agron. J.* 96:608-614.

Laboski, C.A.M., J.B. Peters, and L.G. Bundy. 2009. Nutrient application guidelines for field, vegetable, and fruit crops in Wisconsin. A2809. University of Wisconsin-Extension, Madison, WI.