

A REVIEW OF FERTILIZATION STRATEGIES FOR WINTER WHEAT

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Introduction

With winter wheat acreage in Wisconsin expected to rise, now is a good time to review what nutrient management considerations should be made. Winter wheat is a crop managed during two growing seasons, so careful attention to soil testing and fertilizer inputs should be made.

Nitrogen Rate and Timing

Our current UW recommendations for nitrogen (N) fertilization for winter wheat are 90 lb ac⁻¹ for soils with < 2% OM, 70 lb ac⁻¹ for soils with 2 to 9.9% organic matter, 40 lb ac⁻¹ for soils with 10 to 20% organic matter and 0 lb ac⁻¹ for soils with organic matter greater than 20%. These recommendations are across a yield range of 20 to 100 bu ac⁻¹. A nitrogen credit of 40 lb ac⁻¹ should be taken if wheat follows soybean. Over-application of N fertilizer is not recommended for insurance, as yield declines in wheat have been reported with over-applications of N and increased potential for lodging.

Based on recent data (Conley and Gaska, unpublished) for four site years, there was no benefit from applying 20 lb ac⁻¹ of N in the fall (with the remainder of the N applied in the early spring). Thus, applying N in the early spring will provide the most benefit. Further split applications of N during the spring do not appear to provide any yield benefit and have often shown yield decreases.

Soil and Tissue Tests

The pre-plant soil nitrate test (PPNT) is recommended for winter wheat (along with corn and sweet corn). Soil tests should be taken in the late summer and taken in two depth increments: 0 to 1 ft and 1 to 2 ft. A minimum of 15 soil cores should be taken from random locations over a 20 acre area. The depth increments should be submitted separately and labeled accordingly. It is important to label the samples properly so the soil test laboratory knows which soil samples are related. One soil test recommendation will be made for each set of depth increments. When the PPNT result is less than 50 lb ac⁻¹, then no N credit should be taken. When the PPNT is greater than 50 lb ac⁻¹, then the N credit is equal to the difference between the PPNT and 50 (e.g., if the PPNT is 70, then the N credit is 20 lb N ac⁻¹).

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Plant tissue tests can be used at tillering or prior to heading to evaluate the nutrient status of the plant. In both cases, collect the newest fully developed leaf and collect at least 50 plants to ensure enough plant material for analysis. However, tissue samples have not been shown to be an effective method to manage nitrogen (Bundy and Andraski, 2001)

Phosphorus and Potassium

Wheat grain removal is 0.5 lb P_2O_5 per bushel and 0.35 lb K_2O per bushel. Wheat straw removes 6 lb P_2O_5 per ton of dry matter and 28 lb K_2O per ton of DM. If wheat is grown for grain or grain and straw, it is in demand level 3, which is also used for alfalfa, corn silage, irrigated field crops and low-demand vegetable crops. Thus, the optimum soil test level for P will be greater compared to that of soybean but only slightly greater than corn. Thus, from a P and K management standpoint, it is very simple to incorporate winter wheat into an alfalfa, corn or corn silage rotation while being able to manage wheat in the optimum range.

Sulfur and Micronutrients

Wheat grain is a low demand crop for sulfur (S), boron (B), molybdenum (Mo) and zinc (Zn). Wheat grain is a medium demand crop for copper (Cu) and a high demand crop for manganese (Mn). If wheat is grown for grain and straw, the demand categories are the same for wheat grain, except that it is a medium demand crop for sulfur. Sulfur application should be applied following the Sulfur Availability Index (SAI). There is no soil test for copper that will predict copper need, copper should be evaluated using plant tissue tests and copper should only be applied if verified by plant analysis. If copper is to be applied on loams, silts and clays, UW guidelines suggest 8 lb of Cu per ac if broadcast and 2 lb ac^{-1} if band applied. Lower rates (4 lb ac^{-1} broadcast, 1 lb ac^{-1} band applied) are recommended on sandy soils and higher rates (12 lb ac^{-1} broadcast, 3 lb ac^{-1} band applied) are recommended on organic soils. If using copper chelates, reduce the application rates by one-sixth.