



Early Season Phosphorus for End-of-Season Gains in Wheat Production

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PHOSPHORUS (P) is just as important as nitrogen (N) for wheat production. Early season P nutrition is especially critical. Without an adequate P supply early in its development, wheat experiences growth restrictions from which it may never recover, even if P supplies become adequate later.

Wheat produces two kinds of stems — the main stem and a variable number of tillers (**Figure 1**). Early in its life cycle, wheat “decides” which tillers to develop. Factors such as P or N deficiency, hard soil, or planting too deep can create stresses that reduce the initiation of tillers.

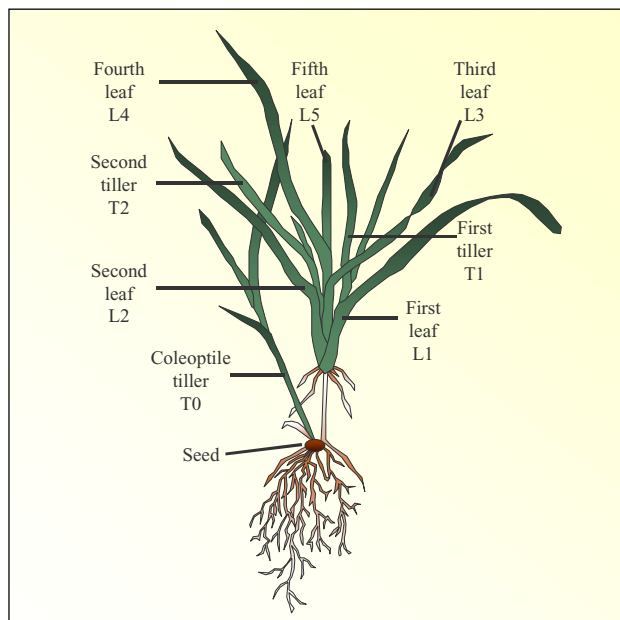


Figure 1. Diagram of a wheat plant at Haun growth stage 4.4. Possible tillers are labeled.

Of all the tillers formed, grain from the T1 and T2 tillers (originating from the bases of the first and second leaves, respectively) accounts for about half of the final yield. The other half comes from grain from the main stem (**Figure 2**).

On deficient soils, P fertilization increases P uptake. Early in the season, when wheat is “deciding” how many tillers to initiate, P from fertilizer may account for more than 50 percent of the total P in

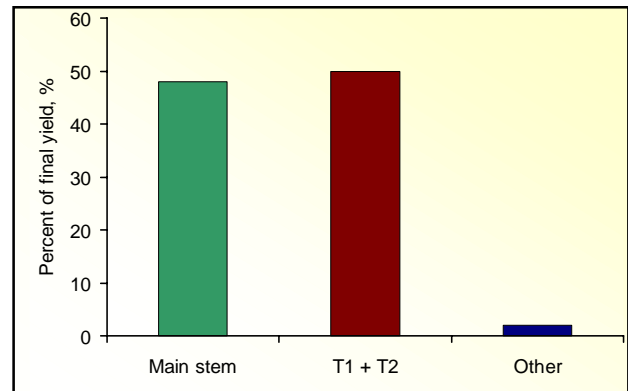


Figure 2. Contributions of the main stem (MS), T1, T2, and other tillers to a final 46 bu/A grain yield (North Dakota).

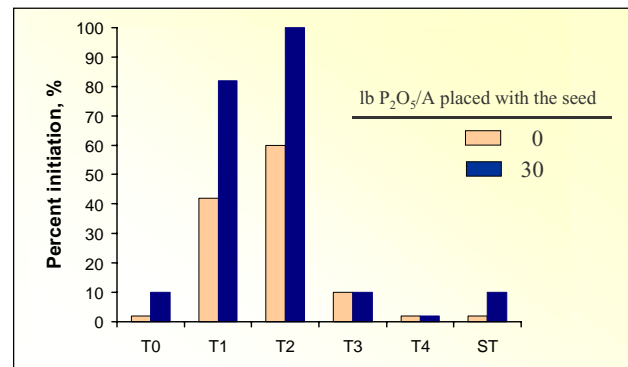


Figure 3. Improved initiation of tillers from 30 lb P₂O₅/A placed with the seed on a soil testing 10 parts per million (ppm) Olsen P (North Dakota). T= tillers; ST= sub-tillers.

the plant. If P supplies in the plant become deficient, the initiation of T1 and T2 tillers can be significantly inhibited, cutting into sources of approximately half of the final yield (**Figure 3**).

Wheat takes up P throughout the growing season (**Figure 4**). Total P uptake by wheat is about 0.68 lb P₂O₅/bu. Harvesting grain removes P from the field at a rate of about 0.50 lb P₂O₅/bu. Banding P near the seed provides ready access to P supplies

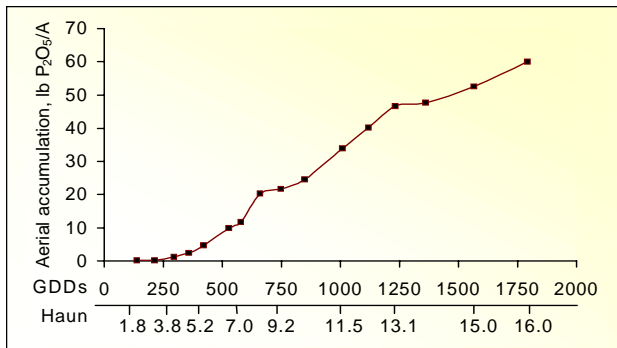


Figure 4. Uptake of P throughout the growing season by 80 bu/A spring wheat (Montana), Haun scale (GDDs=Growing Degree Days).

during early season growth. Maintaining adequate P supplies throughout the soil ensures P is adequate to meet plant needs during the remainder of the season. ■

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