

Late Season Nitrogen Fertility Management in Wheat

Steve Wright, Alan Fulton, Doug Munier, Jerry Schmierer & Lee Jackson

The total nitrogen recovered by a wheat crop in season can range from 60 to 250 lbs N/A depending on the final grain yield. A high yielding and high protein wheat crop (3-3.5 tons/A above 13 % protein) will require about 150 to 225 lbs/A of applied nitrogen in a season. Residual nitrogen in the soil from previous crops will provide the difference between the nitrogen provided with fertilizers and the nitrogen which is recovered by the crop.

Nitrogen Management and Grain Protein

Wheat grown for bread-type end uses will likely require one more application of nitrogen fertilizer after heading to ensure high grain protein. Several years of trials throughout the Central Valley in the 1980's showed late applications of nitrogen after heading increased grain protein 1-2 percent and contributed to 150 to 300 lbs/A more yield due to higher kernel weight.

The N application should be applied after heading. A fairly wide window (about 3 weeks) of opportunity exists for the N application ranging from just after the grain heads have elongated from the flag leaf sheath to about 2 weeks after flowering. These stages normally occur in early to mid April for December plantings.

Appropriate late season N rates may range from 20 to 50 lbs N/A. Lower N rates are appropriate for lower yielding crops (2-3 tons/A) and higher N rates are best suited for yields above 3 tons/A. Sufficient grain protein may be attained without a late season N application if wheat yields are less than 2 tons/A, if preplant fertilizers and topdress applications were applied during the vegetative growth stages. Generally, cool and dry weather during grain filling will result in higher grain yields and nitrogen management for protein will be more critical.

Nitrogen fertilizer trials have shown application of N near the boot stage (before heading), which should occur between mid to late March for December plantings, will also elevate grain protein. Typically, the increase in grain protein is about 0.5-1.0 %. The grain protein increase with N applied at boot stage is not as large as the response when applied at flowering (1-2 % increase). The smaller effect on grain protein with an N application at boot stage is attributed to two factors: 1) the boot stage N application may also result in a yield response of 500 to 1000 lbs/A which means more grain is produced and requires more N in the grain to attain suitable protein levels; and 2) the wheat plant is more efficient at partitioning the nitrogen to the grain after heading than at boot stage (before heading).

Water run applications of ammonia or UAN-32, or urea or ammonium sulfate topdressed just before a rain/irrigation, are the preferred materials and methods for late season

fertilization. Topdressing ammonium nitrate just before an irrigation is another option, but it is less desirable since it is less effective in raising grain protein.

Determining Irrigation Cutoff

Studies conducted in 1985 and 1986 at the UC Westside Research and Extension Station near Five Points and related studies conducted in Kings County in 1987 through 1989 revealed primary dry matter and nitrogen accumulation in wheat was completed between 28-32 days after flowering for Yecora Rojo wheat. This corresponds to about the last 10 days of April and the first three weeks in May.

The amount of crop water consumption corresponding to this critical 30-36 day period of grain filling (depending on wheat variety) averages about 7 inches. It will range from 6-8 inches depending on weather conditions as well.

Timing the final irrigation is critical. Sufficient moisture must be available from the last irrigation to carry the crop through hard dough (the end of dry matter accumulation). However, too much irrigation or rain resulting in additional soil moisture beyond hard dough stage is wasted and may be detrimental to the crop. Lodging and black point are more likely to occur in wheat that is irrigated too late into the season. Late irrigations can also result in soil being too wet for effective deep ripping.

There is a wide range of appropriate irrigation cutoff dates, depending on the soil water holding capacity and crop rooting depth. Fine textured clay soils with high water holding capacities and deeper root systems may receive their final irrigation in late April to early May. In contrast, coarse sandy soils tend to have shallower root systems and have lower water holding capacities. As a result the final irrigation may occur as late as the second or third week in May.