

## Winter Wheat Fertility

Nitrogen fertility is a crucial piece of winter wheat production, as it is the key driver of winter wheat yield. One of the most daunting challenges for a winter wheat grower is making nitrogen fertilization decisions. What product to use, when and how to apply are all considerations. These choices may seem overwhelming but they also give growers great flexibility to fit the application to their specific operation, field conditions and risk tolerance. Growers must remember that more important than product, time or placement is matching nitrogen rate and yield goal.

### Products Placement and Timing

There are many fertilizer products that can be used to supply a winter wheat crop with nitrogen. Anhydrous ammonia (82-0-0), urea (46-0-0), ammonium sulfate fines (21-0-0-24), ammonium nitrate (34-0-0) as well as urea ammonium nitrate (28-0-0) are all options.

Products with nitrate are readily available to the plant and are not susceptible to gaseous loss. Nitrate is readily able to move with soil water and may be leached through the soil profile given light texture soil and significant moisture events. Urea products must be converted to ammonia or nitrate form to be taken up by the plant. Urea is the most susceptible to gaseous losses until taken into the soil or converted to ammonium or nitrate forms.

Nitrogen can be placed with the seed in fall (adhering to safe rates for cereal crops) side-banded at seeding, spread, coultered and dribble banded in fall or spring, or numerous combinations of the above.

Key concerns with fall application are too much nitrogen can cause excess lush growth, reducing winter hardiness as well as susceptibility to leaching loss of nitrate in early spring.

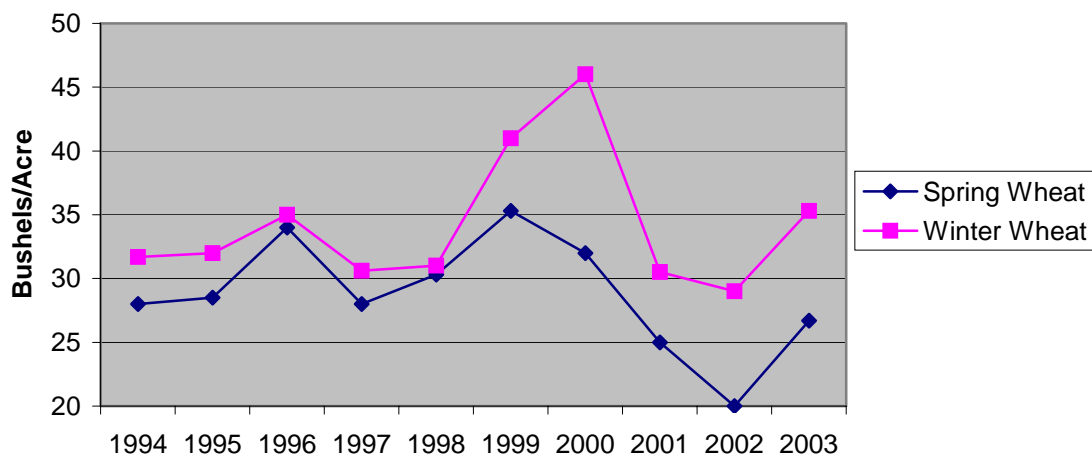
Spring application concerns generally focus on volatilization losses of surface applied product. Urea based products have highest loss potential and application on wet soil that is drying out produces the most volatilization. Urease inhibitors are available to reduce volatilization losses for 10-14 days until moisture moves the fertilizer into the soil. The other concern with spring application is application date. The fertilizer should be applied as early as possible to supply the plant with nitrogen needed for building yield. Successful growers who fertilize in spring apply nitrogen as soon as fields will support fertilizing equipment.

Growers have many options for timing and placement. This allows the choice of methods(s) that best fit fertilizer availability, equipment, labor as well as risk of environmental losses and matching application rates to yield potential.

### Rates

When considering nitrogen fertilization in your winter wheat crop, growers must remember that winter wheat has a very high yield potential. Thus, nitrogen rates applied should be higher than spring wheat crops. A general rule of thumb is that winter wheat will yield 25% more than spring wheat on average, so at least 25% more nitrogen should be applied. Chart 1 shows the average yield for winter vs. spring wheat for Saskatchewan in the last 10 years. The average yield increase has been 19.6% over the last 10 years and 31.4% over the last 5 years. Table 1 gives recommendations for total nitrogen requirements in different soil zones with different moisture levels.

**Chart 1. Winter vs. Spring Wheat Yields in Saskatchewan**



**Table 1. Nitrogen fertilizer recommendations in lb/ac for winter wheat in the Brown, Dark Brown and Thin Black soil areas at three soil moisture levels.**

Soil Nitrogen	Brown + Dark Brown Soil Zone			Thin Black Soil Zone		
	Soil Moisture Level			Soil Moisture Level		
	Low	Medium	High	Low	Medium	High
(0-24 inches)						
0-10	40	60	90	50	70	100
10-20	30	50	80	40	60	90
20-30	20	40	70	30	50	80
30-40	10	30	60	20	40	70
40-50	0	20	50	10	30	60
50-60	0	10	40	0	20	50
60-70	0	0	30	0	10	40
70-80	0	0	20	0	0	30
80-90	0	0	10	0	0	20
90-100	0	0	0	0	0	10
>100	0	0	0	0	0	0

Dr. Ross H McKenzie, Wendy Schatz and Allan Middleton, Aug 2002.

Winter wheat needs approximately 1.5 to 2 lbs of nitrogen to produce one bushel therefore the grower's yield goals have to be taken into consideration when planning rates (100lbs total N would mean 50-67bu per acre given appropriate weather conditions). Another way of checking if you were able to maximize yield with your nitrogen rate is looking at the grain protein. In general, if winter wheat has a protein level of less than 11.5%, the crop was not fertilized for maximum yield.

In order to make the right set of nitrogen fertilization choices for your farm, assess your farming practices, level of risk tolerance, product availability, and equipment availability. Also keep the following four tips in mind:

1. Do not compromise seeding practices such as seeding date and seed placement for fertilizing purposes.
2. When spring applying N, apply as early as possible to avoid temporary N deficiency and subsequent yield and quality reductions.
3. Winter wheat yield potential is significantly higher than spring wheat varieties. Fertilize accordingly.
4. When selecting a fertilizer product, being risk assessment by considering what form nitrogen is in ( $\text{NH}_3$ ,  $\text{NH}_4^+$  or  $\text{NO}_3^-$ ) and therefore what kind of losses to expect.

### Don't Forget the other Nutrients

**Phosphate** Plays a key role in fall establishment and winter hardiness and spring recovery, apply 20-40 lbs/ac in row at seeding as per soil test.

**Potassium** Most often deficient in sandy soils, place close to seed as per soil test (no more than 50 total lbs of  $\text{P}_2\text{O}_5$  and  $\text{K}_2\text{O}$ ) Potash fertilizer contains 50% Cl which may reduce the incidence of Physiological Leaf Spot in certain varieties.

**Sulfur** An important building block of protein, must be in balance with N rate to optimize yield and protein.

Nitrogen fertility is a crucial piece of winter wheat production. The first step in building a fertility plan is to understanding in initial nutrient levels. With soil test nutrient levels, moisture conditions, expected rainfall and yield goals, a plan for nitrogen fertility management in winter wheat can be built. These four factors influence final yield and when properly matched, will give a producer the proper nitrogen rate to maximize yield potential of winter wheat.



Applying fertilizer to winter wheat early in April. Midale, SK.