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Agronomic Management of Winter Wheat in Alberta

Winter cereal crops are excellent for inclusion in a crop rotation. Winter cereals include winter wheat, fall rye and winter triticale.

Winter wheat is an excellent crop for many southern and central Alberta farmers to consider growing. Winter wheat should be direct-seeded in early September and is usually harvested several weeks earlier than spring wheat the next year. Therefore, including winter wheat in the crop rotation spreads out the workload and results in good time management for farmers.

In most years, winter wheat can potentially be up to 20 per cent higher yielding than spring wheat, making it an economically attractive crop. In southern Alberta in 2007, yields of winter wheat are predicted to exceed spring wheat by 40 to 50 per cent in some areas, due to the hot, dry July conditions.

Growing winter wheat is fairly straightforward. However, management practices are quite different for winter wheat versus spring-seeded grain crops. Therefore, to successfully grow winter wheat, a number of specific management practices must be followed:

- selection of the best variety for your local area
- seeding date
- rate and depth
- proper fertilizer types
- amounts and time of application
- weed control

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Variety selection

In southern Alberta, AC Bellatrix and Radiant are the newest and best varieties for farmers to grow. Both varieties were developed at the Lethbridge Research Centre by Dr. Rob Graff. In central Alberta, farmers could also consider CDC Osprey, which is very good for both quality and winter hardiness.

Seeding

Ideally, winter wheat should be direct-seeded into standing stubble. Seeding into canola, mustard or pea stubble offers crop rotation advantages such as reduced weed problems, volunteers are easy to control and there is reduced potential for insect and disease problems. Standing stubble will help trap snow, which acts as an insulator. Four inches of snow will normally provide sufficient insulation to ensure over winter survival.

In southern Alberta, farmers should ideally seed winter wheat in the first two weeks of September. Farmers in central Alberta should consider seeding winter cereal crops in the last week of August or first week of September, provided soil moisture conditions are adequate.

Seeding at the ideal time allows winter wheat to germinate, develop at least three leaves and develop a crown, which is the base of the shoot where secondary roots develop. Plants must develop to this stage to ensure good over winter survival.

Later seeding may result in poorly established plants, which will result in lower winter survival. Late seeding may result in delayed heading, later maturity, increased weed problems and lower yield potential. Recent research in southern Alberta has shown up to a 30 per cent yield decrease with both winter wheat and winter triticale when seeding is delayed from the second week of September to the first week of October.

Alberta

In general, recent Alberta research has shown that spring plant population was 20 per cent lower for early October-seeded winter wheat compared to the plant population when seeded in early September. Late seeding reduced grain yields of winter wheat by an average of 18 per cent and at some sites, by up to 30 per cent. Increases in target seeding rates from 150 to 350 plants m^{-2} did not affect grain yield and quality of September-seeded winter wheat, but did increase grain yield of late seeded winter wheat although not enough to fully compensate for yield losses caused by late seeding.

The ideal seeding rate for winter wheat is higher than what most growers use for spring wheat. Generally, winter wheat should be seeded at a minimum rate of 120 lb/ac to achieve a plant stand of 250-plants/square meter (23 plants/square foot). Actual seeding rate should be based on the 1,000 kernel weight of the seed to be planted. Winter wheat has considerable ability to tiller; however, the best yields are obtained with higher seeding rates. Ideally, narrower row spacing of 7 to 9 inches is best.

Winter wheat has a very short coleoptile. The coleoptile is the extension of the seed embryo that pushes its way through the soil to the surface, from which the first leaf develops. It is very important to seed winter wheat 0.5 to 1 inch (1.5 to 2.5 cm) deep.

Winter wheat that is seeded deeper than 1 inch will result in reduced emergence. Deeper seeding will delay emergence and cause weaker, spindly plants that are more susceptible to winterkill. Seeding winter wheat too deep is a common mistake made by newer winter wheat growers, resulting in poor crop stand and lower than anticipated yield.

A research study of a direct seeding comparison between a disc versus a hoe opener showed increased spring plant density of 13 per cent with a disc compared to the hoe opener; however, opener type did not affect final grain yield.

Frequently, soil moisture is low in stubble fields in early September in southern Alberta. Farmers are faced with the decision whether to seed into dry soil or wait for rain. Saskatchewan research has shown that winter wheat will germinate at very low soil moisture levels. Ideally, it is best to seed winter wheat in the first two weeks of September rather than wait for rain, provided that the seeding operation leaves the seed firmly covered with no more the 1 inch of soil.

Soil temperature can dramatically affect the time it takes winter wheat to germinate. For example in a moist soil, winter wheat will take only 7 days to germinate and emerge at a soil temperature of 20 °C, while it takes 12 and 25 days to emerge at soil temperatures of 10 and 5 °C, respectively. Therefore, seeding into cooler soils in late September or early October will mean that the plants require a longer period to germinate, emerge and develop a crown before winter. Plants that do not develop to this stage are at an increased risk of poor winter survival.

Winter wheat should only be seeded into "clean fields," without any green volunteer cereal growth. Volunteer grain can harbour an insect called the leaf curl mite, which can transmit a virus called wheat streak mosaic. Any actively growing green vegetation such as volunteer grain or grasses can serve as a host for the mites.

If winter wheat is seeded into stubble with green volunteer or by adjacent green fields, the mites will move from the host plants into the winter wheat after emergence and spread the virus. The damage from this disease can range from severe to complete crop failure. Cultural controls are the only way to control this disease. If there is a concern with the wheat curl mite, AC Radiant is the only variety to grow. It is the only variety with wheat curl mite resistance.

Fertilization

Research has shown that phosphate placed with or near the seed at the time of seeding improves plant growth in the fall, resulting in better winter hardiness. Approximately 20 to 25 lb/ac of phosphate is usually adequate and is most effective when placed with the seed.

Stubble fields are often low in soil nitrogen, particularly if the previous crop was high yielding. It is wise to soil test to determine nitrogen (N) and phosphorus (P) soil levels, to accurately determine N and P fertilizer requirements. If time does not permit soil testing, or if fall soil moisture conditions are very dry, it is best to apply approximately 40 to 70 per cent of estimated nitrogen requirements at the time of seeding, soil test in late fall and then apply additional nitrogen in early spring based on soil moisture conditions.

Research in southern Alberta showed that nitrogen fertilizer banded before seeding dried out the seedbed at times and resulted in a rougher and lumpier seedbed, which had a negative effect on germination and emergence. Work has also shown that seed-placed nitrogen fertilizer applied at rates of 50 lb N/ac using urea with a seedbed utilization of 10 per cent (spreading the seed and fertilizer over 0.75 inches with a row spacing of 8 inches) with low soil moisture had a detrimental affect on winter wheat germination and emergence.

Therefore, the maximum recommended safe seed-placed rate of nitrogen is 30 lb N/ac using urea. Rates higher than this must be either banded before seeding, side or mid-row banded at the time of seeding or broadcast in late fall or early spring.

Recent work with ESN (Environmentally Smart Nitrogen) nitrogen fertilizer, a polymer-coated urea, shows it can be safely seed-placed with winter wheat up to a rate of 80 lb N/ac. This is an excellent option for producers who have single shoot openers, to allow them to place all their N and P fertilizer requirements with the seed in a one-pass seeding operation.

In dry fall conditions, another option is to use a split application of nitrogen fertilizer, applying a safe rate of N with the seed at the time of seeding and then applying additional N fertilizer in the spring based on soil moisture conditions. For spring broadcast N, producers can either broadcast urea very early in the spring or dribble band liquid N fertilizer.

For further information on fertilizing winter wheat refer to Agdex 112/542-1, *Fertilizing Winter Wheat in Southern Alberta*.

Weed control

Due to the competitive nature of vigorously growing winter wheat, weed pressure tends to be lower than with other crops. Winter annuals, such as stinkweed and flixweed, are the greatest problem. However, these weeds can often be controlled with inexpensive products such as 2,4-D or MCPA, preferably in late fall but early spring application is also quite effective.

Summary

Winter wheat can be an excellent crop to include in a crop rotation. By following simple, straightforward management practices, it can be an easy and very profitable crop to grow.

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More detailed research information:

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