Excerpt from the Triticale Manual
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Triticale Production and Utilization Manual 2005

Spring and Winter Triticale for Grain, Forage and Value-added

Alberta Agriculture, Food and Rural Development

SUMMARY

(Adapted from *Triticale*, AAFRD Agdex 118/20-1)

Spring Triticale

Drought tolerance is the primary advantage that spring triticales have over other spring cereal crops. Under dryland conditions, spring triticales are a valuable alternative to feed barley and oats. Spring triticale has a 5 to 19 percent yield advantage over CPS wheat and as much as 30% over CWRS wheat. This advantage is most apparent in areas with longer growing seasons. Spring triticale cultivars need a longer growing season because they mature more slowly than CPS wheat. Triticale is best adapted to the Brown soil zones of Alberta, Saskatchewan and southern Manitoba.

Spring triticale also provides an excellent high yielding alternative to barley and spring oat forage. In particular, a silage yield advantage of around 10 percent over barley and oats under dryland conditions makes triticale an excellent choice for livestock producers. Triticale generally ranks between barley and oats for silage quality.

The desired seeding rate plant population is 310 plants/m^2 (30 plants/ft^2). Triticale does not tiller as much as wheat. Maturity can be delayed and yields can be less when plant population is low. Triticale seeding rate should target higher plant density than CWRS wheat. Calculate your seeding rate using the seed's 1000 kernel weight, germination and seedling mortality for a target plant population. There is a calculator on the Alberta Agriculture website that can help.

Most cultural techniques for growing wheat can be transferred directly to triticale. Consequently, the fertilization, seedbed preparation, seeding depth and seeding methods used for wheat are acceptable for triticale. Spring triticale should be planted during the first two weeks of May. Although only a limited number of pesticides have been tested on spring triticale, pesticides that are suitable for use on both wheat and rye may be considered.

One of the most serious deficiencies of spring triticale is its susceptibility to sprouting in the swath. Spring triticale is more likely to sprout than red-seeded wheat but less likely than white-seeded wheat. Because triticale resists lodging and is hard threshing, it responds well to direct combining in areas where this practice is feasible (i.e. dryland).

Winter Triticale

Winter triticale differs from spring triticale because it requires a cold period (or vernalization) to initiate heading. If winter types are spring-seeded, there is no vernalization and plants will remain vegetative (no heading) and can be used for grazing.

Winter triticale provides a high-yielding early maturing alternative to spring triticale for short-season areas of the prairie provinces. Varieties such as Pika and Bobcat are similar in winter hardiness to the best winter wheats but are less hardy than fall rye. Pika and Bobcat are the only suitable varieties for use in Western Canada at present. Consequently, winter triticale is best adapted for seed production in the Brown soil zone of southern Alberta and in higher snowfall areas such as the Black soil zones of the prairies. In areas where winter triticale is well adapted, yields exceed those of winter wheat by as much as 10 to 20 percent.

Winter triticale can be two to three weeks earlier in maturity than spring triticale in the Black and Grey-wooded soil zones. Winter triticale matures approximately five days later than winter wheat and two weeks later than fall rye under similar growing conditions.

Fall-seeded winter cereals such as triticale and rye provide a valuable source of forage when spring grazed prior to harvest for silage or seed. Spring-seeded winter cereals alone or in mixtures with barley or oats provide an excellent source of pasture from mid-June until late in the fall (see *Winter Cereals for Pasture*, Agdex 133/20-1). Winter triticale and fall rye may also be planted in mixtures with barley or oats to produce a high quality silage crop with late-season grazing.

The test weight and 1000 kernel weight of winter triticale are rather variable compared to those of winter wheat. In general, a winter triticale will have a 1000 kernel weight 20 per cent greater than a CWRS wheat or a winter wheat. Consequently, seeding rates for triticale need to be adjusted to a higher rate.

There is no official test weight (pounds per bushel) for triticale, but it must be 52 lbs/bu (65 kg/hl) to make the grade of Canada No.1. However, the marketplace is demanding 55 lb/bu and higher.

Basic agronomic practices are similar for winter wheat, winter triticale and fall rye. Fertilizer applications should be based on soil tests. Ensure adequate levels of phosphate are applied in the fall and the nitrogen applications are split between fall and spring or if placed all in the fall, nitrogen should be placed outside the seed row.

Because few of the popular pesticides are registered for winter triticale, it may be necessary to use ones that are considered suitable for both wheat and rye.

The best time to seed winter triticale and winter wheat on black soils is between the last week of August and the end of the first week of September. Do not delay seeding winter triticale past mid-September because winter triticale hardens more slowly than winter wheat. Once developed, however, the hardiness of winter triticale equals or exceeds that of winter wheat.

The hardiest winter triticale cultivars are tall and may be subject to lodging if grown under high fertility and moisture conditions. Bobcat is an improvement on lodging susceptibility, but excessive nitrogen can still cause lodging.

Spring grazing for a short period before the end of the first week in June may reduce plant height without reducing seed yield. However, spring grazing may significantly reduce yield if it is poorly managed or timed too late.

Seeding at the earliest recommended date is another way that stand height may be reduced.

When combining triticale, a kernel moisture content of 14.0 percent or less is considered dry.

This manual presents in-depth information on the production and utilization of spring and winter triticale.

Part 1. INTRODUCTION

General information

- Triticale has become an accepted grain and forage crop worldwide, competitive with local grains and forages.
- Canada has leading technology for triticale production and use, but the industry has lagged in adopting this crop.
- New Canadian triticale varieties are equal to or higher yielding than other Canadian crops for grain, forage and biomass production, for feed, food and industrial applications.
- Canadian spring and winter varieties have superior adaptation to stress conditions such as drought, excess moisture, acidic soils, and high fertility situations where other crops are poorly adapted.
- Triticale grain is very suitable as feed for monogastrics and ruminants, especially for swine feed and for silage.
- Novel Canadian cropping systems using triticale provide new levels of sustainable crop planning flexibility, especially for enabling year-long forage supplies using grazing or conserved forage.
- Spring and winter types can be used in combination with other crops to spread the workload of seeding and harvesting more evenly throughout the year.
- Triticale has a special role in integrated cropping systems, providing crop diversity in the rotation, a break in pest, disease and weed cycles, and seasonal flexibility in its production and use pattern (i.e for grain, forage and for inter-cropping etc.).
- Triticale is very yield responsive and well-adapted to high fertility conditions. It is therefore a crop of choice to break a continuous barley rotation and can be used on highly manured lands with excessive nutrient loads. Used in this situation, triticale will remove nutrients from the field, thereby reducing the risk of nutrient leaching into groundwater. At the same time, high yields of triticale silage or grain will be returned to the livestock operation that generated the manure.

Background and history

Triticale is a hybrid between rye and wheat, made by using conventional plant breeding methods. No triticale varieties are genetically modified (GM).

The very first triticales were bred in 1876, and origins can be traced back to Scotland. Work on triticale was initiated in Canada in the 1950's but it was not until 1972 that the first commercial spring variety was released by the University of Manitoba. In the original triticales released in Canada and elsewhere the hope was to combine the hardiness and adaptability of rye to stress conditions with the high food and processing value of wheat. The breeding program in Winnipeg released a number of varieties in the early years (Rosner, Welsh and Carman) selected for grain yield and suitable agronomy. But as elsewhere in the world, these varieties were generally late maturing, very tall and weak-strawed, suffered from shriveled grain characteristics with low test weight, and also had a high frequency of sterile florets, limiting their yield potential in comparison to other cereals.

During this period a winter triticale breeding program was started at OAC Guelph resulting in the development of the early winter varieties OAC Wintri, OAC Trillium and OAC Decade.

High levels of ergot were associated with the high frequency of floret infertility in the early varieties. Also, suitable processing quality for bread was not generally achieved in the early varieties, and still remains a challenge for high value flour markets. Because of these limitations, breeding work was generally diminished at the University of Manitoba, later replaced by breeding and agronomic development programs of Alberta Agriculture, Food and Rural Development (Field Crop Development Centre, Lacombe) and Agriculture and Agri-Food Canada (Swift Current).

By the mid 1980's and into the 1990's genetic solutions to the limiting agronomic and grain features of the early varieties were found internationally, and these have been incorporated into new Canadian varieties now available for production. Current grain yields are competitive with the highest yielding wheat varieties, and may exceed that of barley, and the high quality of the protein has been maintained (expressed as a high percentage of lysine in the protein). New varieties have also been bred with superior forage yield potential that are especially suitable for silage, for early and late spring grazing, for swath grazing, for mixed cropping with other forage species, or for green-feed or haylage. Triticale can be called **'The Crop For All Seasons'.**

There has been a steady increase in triticale acreage on the Prairies from zero hectares grown in the early 1970's, to 17,000 hectares in 1996, 34,000 hectares in 1998 and 110,000 to 120,000 hectares in 2003 (270,000 to 300,000 acres). Production in Alberta accounts for 80 % of the Prairie production as feed, forage and grazing.

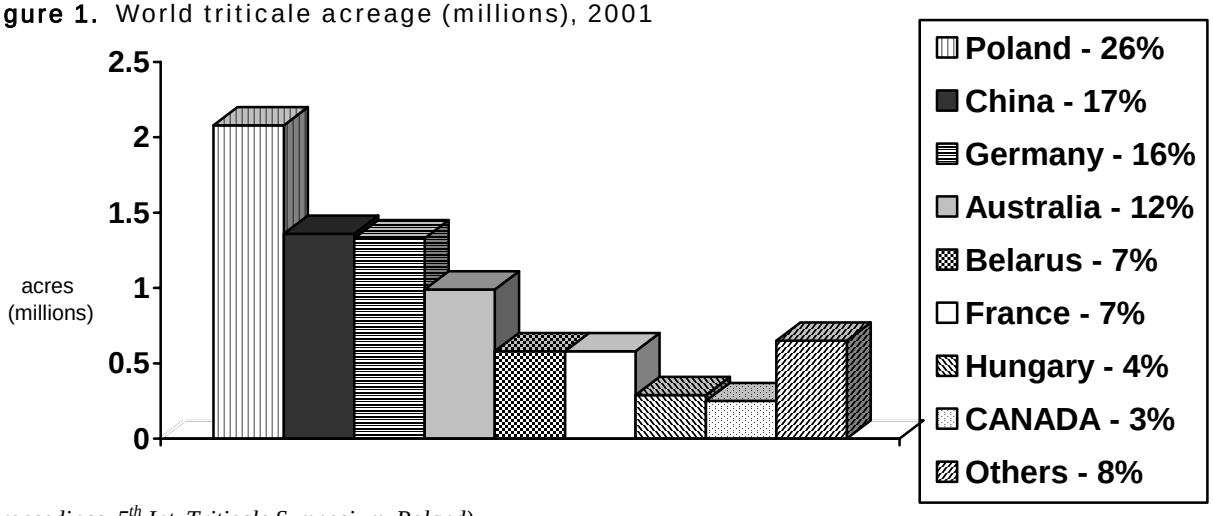
Both spring and winter triticale types are available (including semi-awnless winter varieties) which have provided a new crop option for breaking pest and disease cycles in cereal cropping systems.

Triticale has also demonstrated tolerance to drought and acidic soils, and are grown commercially worldwide (Figure 1).

Continuous breeding improvements in future varieties are expected for grain and forage yield, as well as for those traits which have remained more difficult to improve (earlier maturity, improved test weight, and shorter straw without loss of biomass). The floret sterility problem of the pioneer varieties does not exist in the new varieties, and incidence of ergot is now rare, although this question still remains as a feed marketing issue.

Because triticale has developed faster as a significant commercial crop in countries other than Canada (Figure 1), much of the research and literature about its suitability for feed and for forage is non-Canadian, including most of the feeding trials with animals. As of 2004, the greatest adoption in western Canada appears to be for use as forage, primarily for silage and grazing, with use as a feed grain for swine gaining some recent acceptance. Suitability for poultry and for dairy has been demonstrated in Canada.

Figure 1. World triticale acreage (millions), 2001



(Proceedings, 5th Int. Triticale Symposium, Poland)

Superior agronomics and yield potential in Western Canada

Data from variety registration trials, regional variety tests, and special purpose trials throughout the Prairie Provinces substantiate that triticale varieties have grain yields from 10% to 25% higher than the highest yielding spring wheats (the semi-dwarf Canadian Prairie Spring class).

Triticale is later maturing than wheat by 10 days. The test weight of triticale is still some 6 kg hl^{-1} less than that of wheat, though competitive with other feed grains.

Winter triticale grain yields are equal to or exceed those of winter wheat, although this crop is up to three weeks later maturing than winter wheat.

Silage yields from triticale usually exceed or are at least equal to any other of the cereal crops grown, especially barley. Triticale has stronger straw than barley under highly fertile and moist conditions.

Spring and winter triticale have good disease resistance profiles, and are not susceptible to many of the diseases that attack barley. Therefore, triticale is useful for breaking disease cycles in cereal crop rotations, which results in improved yield. In a crop rotation study, the yield of barley grown on triticale stubble was 14.9 % higher than barley yields from continuous barley on barley (same variety). The yield of barley grown on triticale stubble was 11.7 % higher than yield from continuous barley using rotated barley varieties (Turkington et al., 2005).

Although experimental data is limited, production experience confirms that triticale maintains its yield under conditions of stress, including drought and acid soils, when compared to other cereals. It has also proven highly adaptable to heavily manured soils, as a rotational option in intensive livestock operations. Lateness of maturity for grain is the greatest deficiency of current spring type varieties in short-season areas. Because triticale crop use for different grain and forage uses involves a wide range of planting and harvesting dates, winter triticale is an extra option that can help to stagger seasonal workloads and harvesting operations.

Triticale is now a well established crop internationally, with well over 8 million acres of spring and winter types used for food, feed (monogastrics and ruminants), grazed or stored forage and fodder, silage, green-feed and hay, or as biomass source for ethanol production and other uses.

Novel nutraceutical and other processed grain uses are also being explored. This crop is also adapted to stress conditions that may cause other crops to fail, such as drought, and acid soils, and it has a good disease resistance profile.