



Selection of annual forage wheat lines for yield and quality

BREEDING FORAGE WHEAT

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Background: Wheat is grown on almost all soil types in Alberta and produces about 7.6 million tonnes annually, making Alberta Canada's second largest wheat producer behind Saskatchewan.

Until very recently, regulatory requirements did not allow for the registration and release of forage wheat varieties. Crops like barley, oats, and triticale were not subject to those same requirements, and have had some forage-specific varieties released over the years, but there are no forage-specific varieties of wheat in Canada. In Montana and other northern states, winter varieties of forage wheat such as Willow Creek are popular; partly due to the very high yield potential and feeding value.

Starting a breeding program from scratch is an expensive and time-consuming process, as it can take 8-10 years to get a new variety to the marketplace. However, the U of S Crop Development Centre began this process with forage wheat in 2006, despite the challenges of the time. Those efforts have resulted in advanced lines of forage wheat that, when scored visually, appeared to produce a high amount of biomass. These populations needed to be evaluated under field conditions for forage yield and quality before new varieties can be registered and released under the modernized regulations.

Objectives: The objectives of this study are to:

1. Evaluate advanced forage wheat lines for forage yield and quality at the early dough stage of maturity
2. Identify promising higher-yielding lines as potential forage wheat varieties

What they did: This study was conducted at two locations, the U of S Kernen Crop Research Farm, and the AAFC Saskatoon Research Farm over three years (2016-2018). At each site, 22 advanced lines of forage type wheat were grown along with AC Barrie (Canadian Western Red Spring) wheat, Pasteur (Special Purpose) wheat and Bunker forage triticale as checks. Seeding rate was 300 live seeds/m², and fertilizer was applied according to soil test results. At Kernen, additional plots of each line were planted for grain production evaluation. Plots (except those seeded to evaluate grain yield) were harvested at the early dough stage, with forage yield, flag leaf area, and quality measurements.

What they learned: When averaged across sites and years, there were five advanced lines with higher dry matter yield than AC Barrie at 8749 kg/ha, ranging from 9316 kg/ha to 9900 kg/ha. Crude protein ranged from 7 to 8.9%, similar to AC Barrie at 8.4%. ADF and NDF varied considerably among the lines at the Kernen site, but not at Saskatoon, with ADF averaging 31.5% and NDF averaging 52.5% over both sites and all years. Grain yield of the forage wheat lines ranged from 100-133% of AC Barrie, with an average of 4795 kg/ha,

4907 kg/ha and 4335 kg/ha in 2016, 2017, and 2018, respectively. Lodging scores ranged from 1.0 to 3.8, compared to 2.5 for AC Barrie. Days to heading for the breeding lines varied by site, with the breeding lines ranging from 51 to 60 days at Saskatoon, and 55 to 63 days at Kernen, compared to 50 and 52 days and 53 and 57 days for AC Barrie and Pasteur at Saskatoon and Kernen, respectively. Disease reaction of the breeding lines was similar to that of the check varieties. One line, in particular, had the highest forage yield, a grain yield 114% higher than AC Barrie, forage quality that would meet animal requirements in early- to mid-gestation, and very good lodging resistance.

What it means: Plant breeding is a long-term proposition, which requires many selection cycles. As these lines had already been identified as promising, these field trials helped grow the understanding of how well they might perform in the field. Further work in larger scale field trials needs to occur before a forage wheat variety is commercially released, but assuming these results hold true, the most promising line will be used to create breeder seed and will could be released commercially within the next five years. The other high performing lines will be used in subsequent crosses to further the enhancement of desirable forage wheat traits in this breeding program.

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