

2.0 Evaluating yield potential of new winter wheat varieties

Project duration: 2018-2019

Collaborators: Ducks Unlimited, WesternAg

Objectives

To establish a fertility program suitable for achieving high yield winter wheat on the Prairies.

Background

Following decades of extensive work in winter wheat production in North America, many researchers and producers have begun to implement best management practices to obtain higher grain yield. Management practices that can be utilized to improve winter wheat production are; increasing seeding rate and application of starter fertilizer by banding during seeding (Anderson, 2008). Fertility management, in particular nitrogen and phosphorus, remains the integral part of the overall management package aimed at achieving higher yields (Halvorson et al. 1987). The ideal fertility management package would help counteract escalating cost of production per unit area, which is the main goal that producers aim to achieve. There is still a knowledge gap on the rates as well as timing of application of nitrogen fertilizer, particularly in Western Canada, that would result in improved yield per given area without compromising the quality of grain. Morris et al. (2018) suggested the use of adaptive use of nitrogen to help augment and improve nitrogen application rate decision making by farmers. Therefore, there is a great need to continue with research on the best way that can be availed to producers so as to maximise production.

Materials and Methods

Field trials were established at four locations across Manitoba; Melita, Arborg, Carberry and Roblin in the 2018/2019 growing season. The Melita location was seeded at 0.5" on September 10, 2018 on Waskada loam soil under oat stubble. Preemergence weed control was necessary to ensure a clean seedbed and this was done using 0.75 L ac⁻¹ Glyphosate, 0.021 L ac⁻¹ Heat LQ tank mixed with 0.2 L ac⁻¹ Merge adjuvant. As a preventative measure for fungal diseases such as fusarium head blight (FHB), a spray application was done with Folicur at 0.12 L ac⁻¹ at 75% heading and when 50% of the head had flowers. Treatments were laid out as randomized complete block design in a 2 x 3 factorial (fertility practice x wheat varieties). Wheat varieties used were Gateway, Elevate and Wildfire and fertilizer treatments included;

- producer practice at 100 lbs of nitrogen (urea plus agrotain) per acre applied in spring and 30 lbs phosphorus banded at seeding in fall and,
- balanced fertility practice as per Western Ag recommendations split applied with 50% banded at seeding and the other 50% urea plus Agrotain broadcasted in spring.

A summary of fertility treatments is presented in Table 2a:

Table 2a: Fertility treatments for Balanced (high yield) and Producer practices

Practice	N	P	K	S
Balanced fertility with 50 % N applied in fall	44-0-0	11-52-0	0-0-60	20-0-0-24
Producer practice with N applied in spring	46-0-0	11-52-0		

Harvesting was done using a Wintersteiger small plot combine on the 19th of August 2019. An IM 9500 NIR grain analyzer was used to determine grain moisture and protein content on dry basis from a 500g subsample of each treatment.

Results

Variety appeared to have influenced wheat yield and protein at 3 of the 4 sites under study in 2019. Elevate and Wildfire varieties had significantly higher yields compared to Gateway at Melita ($P=0.001$) and Arborg ($P=0.036$) while there were no significant differences among varieties at Roblin and Carberry. Although Gateway had lower grain yield, it had significantly higher protein content of 15.8% at Melita, 13.8% at Roblin and 13.5% at Arborg compared to Wildfire and Elevate. Wildfire had significantly higher protein content (15.2%) compared to Elevate (14.4%) at Melita while there were no significant differences between the same varieties at Arborg. There were no significant differences in protein content at Carberry. Balanced application of fertilizer resulted in significantly higher grain yield at Roblin (5031 kg ha^{-1}) and Carberry (4864 kg ha^{-1}) compared to 100% spring applied. Balanced application of fertilizer resulted in significantly higher protein content compared to 100% spring applied fertilizer at Roblin and Arborg. On the other hand, 100% spring applied fertilizer resulted in significantly higher protein than balanced fertilizer application at Carberry. There was a significant interaction between variety and fertilizer on protein content and no influence on wheat yield. An interaction of Gateway variety and balanced fertilizer application resulted in significantly higher protein content (16%) compared to other interactions. Under both fertilizer systems, Elevate resulted in the lowest protein content of 14.4 and 14.5% at Melita (Table 2b). Based on the preliminary results from this study, balanced fertilizer application seemed to a better option to improve wheat yield and protein content at least at two sites but additional site years of study would confirm proper recommendations for use by winter wheat producers.