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WINTER AND SPRING CEREAL PRODUCTION IN THE MARITIMES

Final Research Report E2010-56

BACKGROUND

Organic producers have expressed an interest in diversifying their crop rotations through the inclusion of winter cereals. Winter cereals have many potential benefits, as they provide soil cover over the winter months, can often out-compete weeds in the spring and can be harvested earlier than other cereal crops.

This study aimed to evaluate the effect of management history on the performance of winter cereals versus spring cereals.

WHAT WAS DONE

The trials were established in the fall of 2008 at the OACC Brookside research fields (Truro, NS) and an organic farm in Freetown, PEI to examine the production of winter cereals: winter wheat (AC Sampson), fall rye (common), spelt (common) and triticale (Titan). The spring cereals: spring wheat (AC Barrie), oats (AC Baton), spring triticale (Bunker) and barley (AC Encore) were planted in early May 2009 for yield and performance comparison.

Small plot research trials were established at the Truro, NS site as strip plots, bisected by previous crop histories. The previous crops consisted of peas as a green manure, oats or buckwheat.

Winter and spring cereals plot trials at the NS site. From left to right: spelt with patchiness due to winterkill, triticale and fall rye (K. Nelson).

Spelt (left) and winter wheat (right) grown under three previous cropping histories at the Truro, NS site (K. Nelson).

The PEI site was established at farm scale also with peas, oats or buckwheat as the previous crops. However, the spring cereals were only planted into a previous crop of fall rye.

The grain was dried and weighed for yield (adjusted for moisture content to 13.5%), thousand kernel weight (TKW), test weight and protein content.

WHAT HAPPENED

Nova Scotia Trial

We found no interaction between cropping history (oats, peas or buckwheat,) and cereal crop. However, yield was significantly greater when cereals were grown on a previous crop of peas as opposed to buckwheat (Fig. 1).

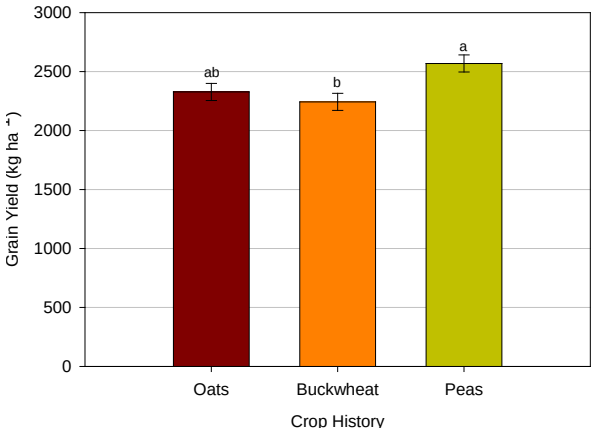

Figure 1. Grain yield of the winter and spring cereals for the three cropping histories at the Truro, NS site. Bars with the same letter are not significantly different ($p<0.05$).

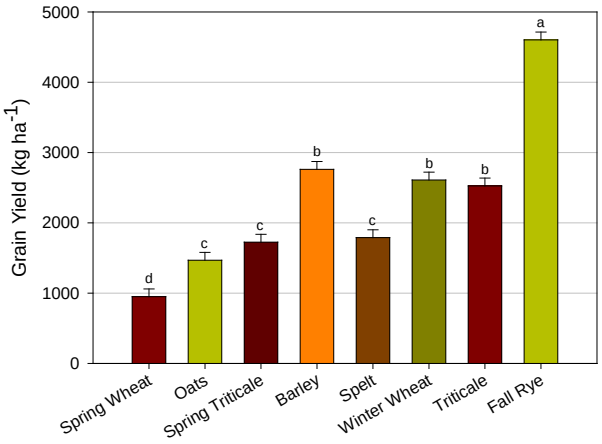

Figure 2. Grain yield of the winter and spring cereals for all three cropping histories at the Truro, NS site. Bars with the same letter are not significantly different ($p<0.05$).

Fall rye had significantly greater yield in comparison to the other winter and spring cereals grown (Fig. 2); and winter cereals yielded higher overall than spring cereals (with the exception of spelt). This is expected as the winter cereals had an earlier start in the field before the weeds began to emerge and compete. Interestingly, spring wheat demonstrated significantly lower yields than all the other cereals in this trial (Fig.1).

These low yields may have been a result of its reduced vigour, as seeding rate had been adjusted to compensate for a low germination rate (66%) (Fig.2).

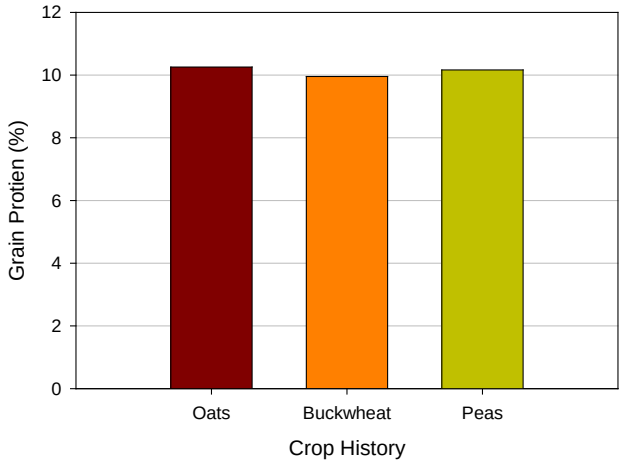

Figure 3. Average grain protein content of all winter and spring cereals for the three cropping at the Truro, NS site. Results are for one replicate only; statistical analysis was not performed.

For the grain protein content we are presenting only preliminary results, further analysis is required. Based on the preliminary data, grain protein did not appear to be affected by the cropping history (Fig. 3). However, the data suggest that there is a trade-off between grain yield and protein content. Typically cereals with greater yield had reduced protein content (Fig. 4). Cropping history did not have an effect on thousand kernel weight (TKW) or test weight of the winter and spring cereals (data not shown).

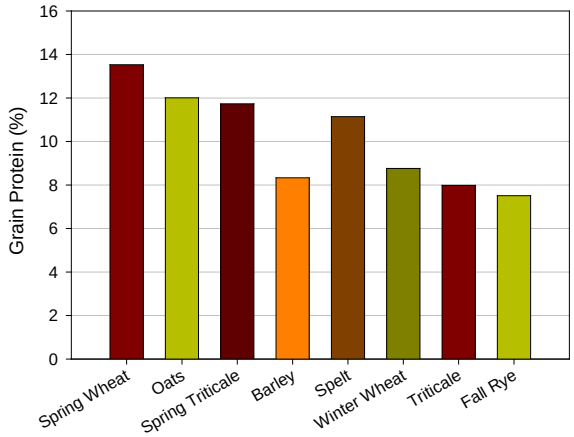

Figure 4. Grain protein content of the winter and spring cereals at the Truro, NS site. Results are for one replicate only; statistical analysis was not performed.

PEI Trial- Winter Cereals Only

In PEI, only the winter cereals were investigated on all three cropping histories. Interestingly, the winter cereals were found to have significantly increased growth on the previous crop of buckwheat, which was opposite to our findings at the NS site. Grain yield and protein content followed the same trends as found at the NS site, with fall rye having overall greatest yields again and spelt the lowest yields (Fig. 5).

The spring cereals oats (top) and spring wheat (bottom) growing at the Truro, NS site under three previous cropping histories (K. Nelson)

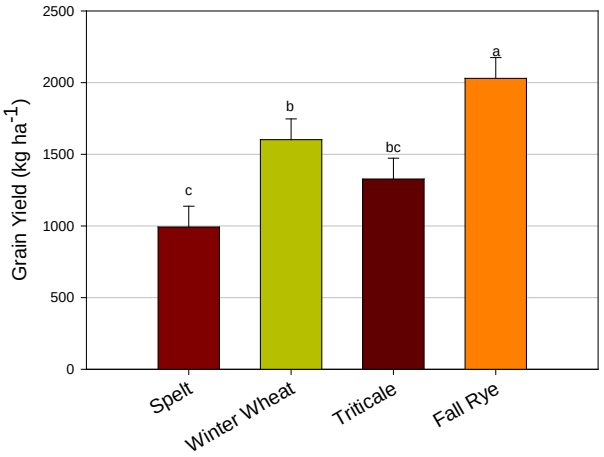

Figure 5. Grain yield of the individual winter cereals combined for the three previous cropping histories at the PEI site. Bars with the same letter are not significantly different (p<0.05).

Grain protein content was not affected by the previous cropping history (data not shown); however protein content followed the same trend as the NS site. Cereals with higher yields (Fig. 5) tended to have lower protein content (Fig. 6).

Test weight and thousand kernel weight (TKW) were not affected by cropping history, however individual winter cereals had an impact on test weight and TKW. Winter wheat and triticale had significantly greater TKW, followed by fall rye and lastly spelt. For test weight, spelt and winter wheat were significantly higher than other crops, followed by fall rye and lastly triticale (data not shown).

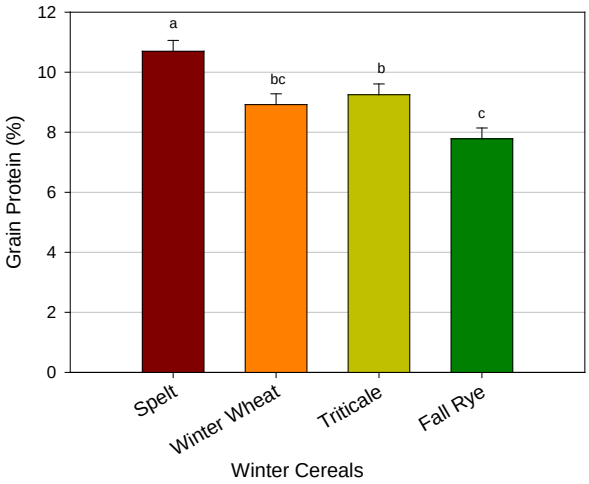

Figure 6. Grain protein content of the individual winter cereals combined for all three cropping histories at the PEI site. Bars with the same letter are not significantly different (p<0.05).

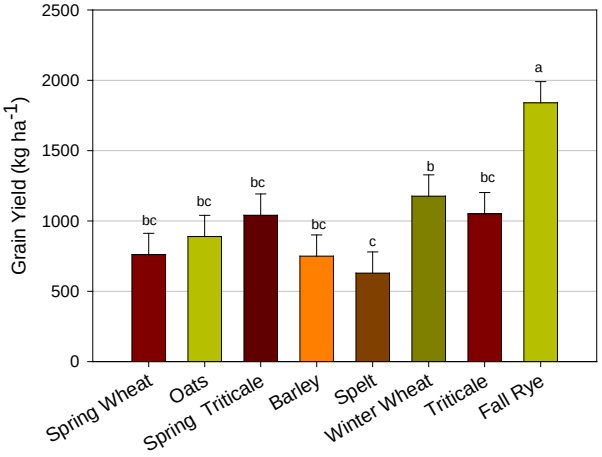

Figure 7. Grain yield for winter and spring cereals with a cropping history of <u>cereal only</u> at the PEI site. Bars with the same letter are not significantly different (p<0.05).

PEI Trial- Spring and Winter Cereals

We also investigated the performance of winter and spring cereals at the PEI site on a previous crop of cereal only. Fall rye once more had overall greater yields; however the other cereals tended to perform similarly with the exception of the spelt.

As was demonstrated in the above NS and PEI trials, protein content tended to be inversely related to grain yield (Fig. 8). This could be attributed to increased growth of fall rye at the early plant stages resulting in higher yield potential, however due to this earlier growth it resulted in protein dilution at seed filling.

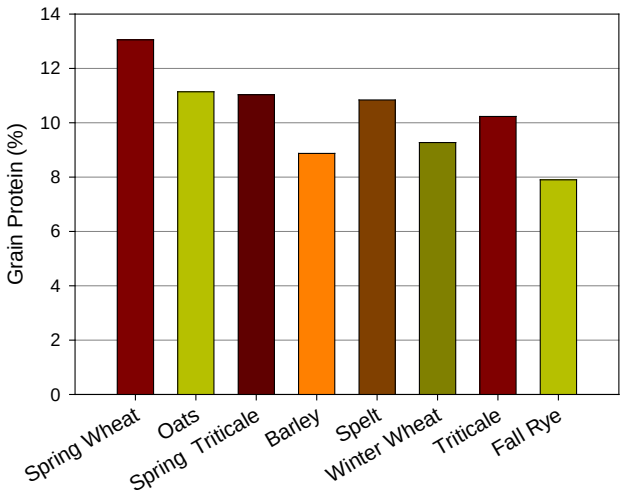

Figure 8. Grain protein for the winter and spring cereals with a cropping history of <u>cereal only,</u> at the PEI site.

Table 1. Grain TKW and test weight for winter and spring cereals with a cropping history of cereal only at the PEI site

Cereal Crop	TKW (g)	Test Weight (kg hL^{-1})
Spring Wheat	32.14a	70.14a
Oats	31.58a	54.62f
Spring Triticale	36.39a	59.07e
Barley	33.11a	54.04f
Spelt	17.83b	69.07a
Winter Wheat	39.00a	66.82b
Triticale	39.06a	62.05d
Fall Rye	26.61a	64.62c

**Note: Protein content is not included here as statistical analysis was not performed; protein analysis was made on a composite sample of three subsamples from each plot with a previous cropping history of oats.*

TKW was relatively unaffected by the winter and spring cereal crops, whereas test weight had a large range over the eight cereal crops investigated (Table 1).

All fall crops were exposed to winterkill conditions. Spelt by far was most susceptible, with significantly lower stand establishment especially in low areas where surface ice accumulated.

THE BOTTOM LINE...

In comparing winter and spring cereals, fall rye was highest yielding but of lowest quality. Winter wheat and triticale are at least as productive as spring barley and oats; winter wheat and triticale can be a valuable addition to the crop rotation for feed grains. Of the winter cereals tested, spelt proved most susceptible to winterkill.

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