

## Winter Wheat Straw Nutrient Removal 2019

### Purpose

The purpose of this assessment was to answer in-season questions around the removal of N, P and K in winter wheat straw after wheat harvest and whether they are in line with current OMAFRA guidelines.

### Methods

Straw samples were collected from 8 winter wheat fields in Waterloo, Wellington and Huron counties. One spring wheat and two barley straw samples were also collected from Huron county. Samples were collected as soon as possible after harvest and before any rain event except for sample 3, to remove any potential leaching effect. All straw samples were analyzed at SGS Labs in Guelph.

### Results

Nitrogen values in winter wheat straw collected through this project ranged from 0.54-0.78% with an average of 0.64% (Table 1). This data is also consistent with the work conducted in Ontario by Kendall *et al* in 2012. They reported wheat straw N concentration from 15 sites in 2009 (pre-leaching) with a range of 0.49 to 0.70%, with a mean of 0.59%. In 2010, wheat straw N concentrations ranged from 0.53 to 0.97 percent, with a mean value of 0.66%.

Phosphorus values in the samples collected in 2019 varied quite a bit more compared to nitrogen at 0.02-0.12% with an average of 0.05%. This was slightly lower but still in line with the work done in 2009 and 2010. Wheat straw P concentrations from 15 sites in 2009 had a range of 0.04 to 0.12%, with a mean of 0.07%. In 2010, wheat straw P concentrations from the same 15 sites ranged from 0.05 to 0.15% with a mean value of 0.08%.

Potassium was also quite a bit more variable in 2019 compared to nitrogen with a range of 0.53-1.67% with an average of 1.18%. The range of results was in line with the work conducted in 2009 and 2010 as they reported wheat straw K concentration from 15 sites to be in the range of 0.51 to 1.56%; however, they had a lower mean of 0.87%. In 2010, wheat straw K concentrations from the 15 sites ranged from 0.33 to 1.49% with a mean value of 0.75%.

Sample ID	County	Wheat Yield (bu/ac)	Nitrogen (%)	Phosphorus (%)	Potassium (%)
1	Waterloo	73	0.58	0.03	0.93
2	Waterloo	73	0.57	0.02	1.11
3	Wellington	110	0.54	0.03	1.23
4	Wellington	108	0.78	0.09	1.67
5	Waterloo	110	0.7	0.05	0.84
6	Huron	99	0.61	0.05	1.42

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7	Huron	99	0.56	0.04	0.53
8	Huron	120	0.79	0.12	1.67

**Table 1:** N, P and K nutrient concentrations in straw collected from 8 Ontario winter wheat fields after harvest.

### Summary

While this was only done on a handful of locations and in one year, the N, P and K nutrient concentrations in wheat straw were similar with those found in the work done by Kendall *et al* in 2012 in the pre-leaching analysis and the current OMAFRA guidelines for average nutrient removal rates. In this set of samples, the average removal rate for N was 12.8 lb/ton, for P<sub>2</sub>O<sub>5</sub> was 2.29 lb/ton and K<sub>2</sub>O was 28.6 lb/ton. Current average removal rates for N are 14 lb/ton, P<sub>2</sub>O<sub>5</sub> removal rates are 3.4 lb/ton and 24 lb/ton for K<sub>2</sub>O (OMAFRA Publication 811: *Agronomy Guide for Field Crops*).

As was noted in the work done by Kendall *et al*, the P and K removal rates can vary greatly depending on how much the straw is rained on and how long the straw is left in the windrows. While there was no significant difference between N removal rates between a pre- and post-leaching scenario, the average P removal in 2009 decreased by 19.17% from the pre-leaching to post leaching conditions and in 2010 decreased by 35.55% showing a significant effect both years. The leaching effect had an even greater impact on K with the average removal rate for K removal in 2009 decreasing by 74.57% from the pre-leaching to post leaching treatments and in 2010 decreased by 39.37%. Therefore, you will note in OMAFRA Publication 811: *Agronomy Guide for Field Crops* that while there is an average removal rate for N, P and K in wheat straw there is also a range that is included in order to capture the fact that some straw may be rained on or harvested at a later date. The range in nutrient removal can also be impacted by soil fertility levels. Where soil K levels are high, there is higher uptake (luxury consumption) than when fertility levels are low.

At the end of the day, if you want the most accurate removal rates for your straw you should take a sample from the field when the straw is being harvested to get the most accurate assessment.

### References

Kendall, Katie. Characterizing Agricultural Residue Nutrient Properties and Removal Variation in Ontario. (M.Sc. Thesis). 2012, <http://hdl.handle.net/10214/3666>.

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### Project Contacts

For further information on this project please contact Joanna Follings, Cereals Specialist, OMAFRA, [joanna.follings@ontario.ca](mailto:joanna.follings@ontario.ca).