# Sulphur on Winter & Spring Wheat in Ontario 2013

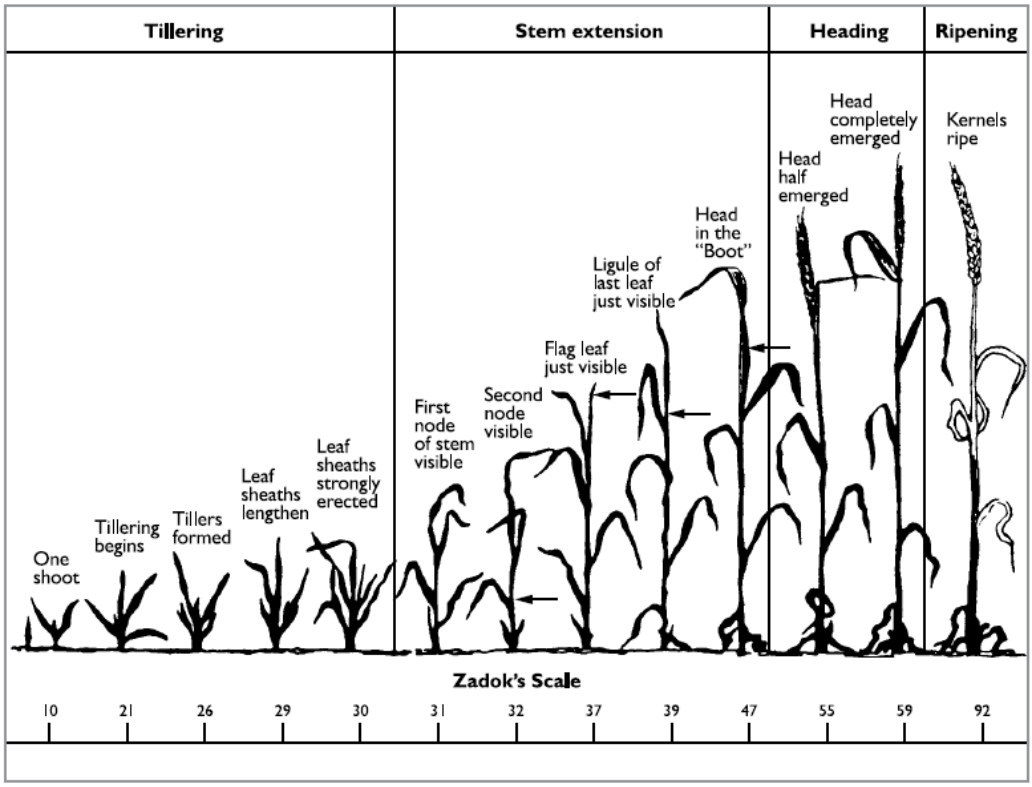
## Purpose:

To evaluate yield benefit and economics of applying sulphur fertilizer on Winter & Spring Wheat in Ontario.

## Methods:

At each field location, both treatments 1) without Sulphur and 2) with Sulphur added, had equal amounts of total nitrogen per acre as per the field recommendation. The treatments with sulphur (2) had 20 kg/ha of available sulphur. At harvest, adjacent strips of (1) straight urea or 28% and (2) urea or 28% plus the 20 lbs/ac sulphur were harvested. Plant tissue samples were collected from the Ameliasburg and Wellington sites at the last-two leaves emerged stage (Zadok's Stage 37 to 39) collected on 5 June 2013.

**Figure 1. Cereal Growth Stages**

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Weights were collected using a weigh-wagon and grain samples tested for harvest moisture and test weights.

## Results:

The yield and grain quality at harvest are shown in Table 1. At the Wellington site there was a 4.5 bushel per acre (bu/ac) increase on average in grain yield in the winter wheat, whereas the grain yield at the Ameliasburg site showed a lower yield of 2.3 bu/ac where the sulphur was applied. This lower yield is most likely due to field variability. The Pakenham site was hard red spring wheat and resulted in no yield difference. The addition of Sulphur did not result in any significant difference in either grain test weight or protein content.

**Table 1: Yield and Grain Quality at Harvest 2013.**

| Site | Crop | Treatment | Test Weight (lb/bu) | Protein % | Yield (bu/ac) | Difference Yield (bu/ac) | # of Reps |
|---|---|---|---|---|---|---|---|
| Wellington | Winter Wheat | No Sulphur | 62.5 | 10.2 | 77.9a[1] | | 3 |
| | | With Sulphur | 61.9 | 10.1 | 82.3b | 4.5 | 3 |
| Ameliasburg | Winter Wheat | No Sulphur | 56.0 | n/a | 78.4 | | 1 |
| | | With Sulphur | 56.0 | n/a | 76.1 | -2.3 | 1 |
| Pakenham | Spring Wheat | No Sulphur | 58.8 | 13.3 | 70.9c | | 3 |
| | | With Sulphur | 58.8 | 13.5 | 70.9c | 0 | 3 |

[1]Yields with the same letter beside them are not statistically different.

Soil samples were taken at the Ameliasburg site to compare the sulphur and organic matter levels at from 0 to 6 inch depth. The analysis of the soil samples at the Ameliasburg site are shown in Table 2. A plant tissue sample was taken on 5 June 2013 to measure the sulphur levels in the plants and are shown in Table 3.

**Table 2: Soil Sulphur And Organic Matter Levels – Sampled On 7 May 2013.**

| Site: Ameliasburg | No Sulphur | Sulphur |
|---|---|---|
| Sulfur from 0 to 6 inch soil sample<br>Sample Date: 7 May 2013 | 11 ppm | 9 ppm |
| Organic Matter | 4.1% | 4% |

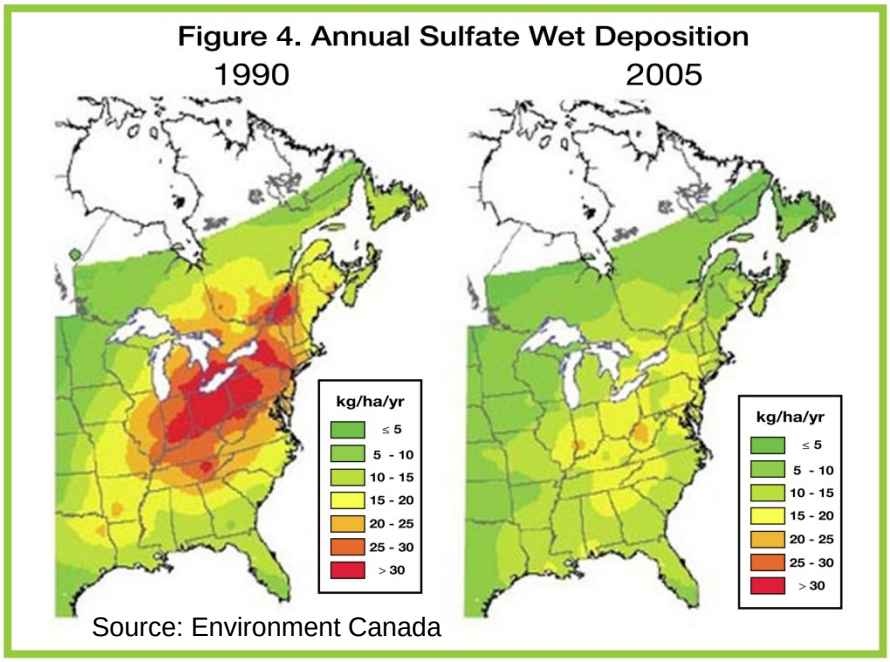
**Table 3: Plant Tissue Analysis Sampled 5 June 2013**

| Site | No Sulphur | Sulphur |
|---|---|---|
| Ameliasburg | 0.31% | 0.35% |
| Wellington | 0.26% | 0.27% |

## Summary:

Sulfate deposition from acid rain/precipitation has decreased significantly in the past 15 years as shown in Figure 2.

**Figure 2. Changes in Atmospheric Deposition of Sulphur in North America**




A few trials in winter wheat in southwestern Ontario have shown a yield gain to added sulphur fertilizer. Table 3 shows that only the Wellington site had a yield gain of 4.5 bu/ac. with the addition of 20 pounds per acre (lbs/ac) in 2013.

Table 2 shows the analysis of the plant tissue samples of the last-two leaves emerged stage (Zadok's Stage 37 to 39) collected on 5 June 2013 from the Ameliasburg and Wellington sites. Currently, in Ontario there is not an established Critical Value of sulphur in plant tissue. There is some research from Australia by Spencer and Freney that the sulphur critical value for wheat plant tissue collected at this stage is 0.3%. From the tissue analysis in Table 2, at the Ameliasburg site where No Sulphur of 0.31% and where Sulphur was applied it was 0.35%. As both treatments were above 0.3% and there was no yield advantage at this site to applied sulphur, the critical value of 0.3% may be a good indicator. However, at the the Wellington site, the no sulphur applied plots had a sulphur tissue level of 0.26%, and 0.27% where sulphur was applied. Both are below the 0.3%, level indicating insufficient sulphur levels even with the additional 20 lbs./ac of sulphur. More tissue sampling needs to be done to validate what the critical value is for sulphur.

The Wellington site is stony loam soil type whereas the Ameliasburg site is a stone-free, clay to clay-loam soil type and the Pakenham site is a clay soil type. Sulphur is known to be a soluble nutrient similar to nitrogen, so the courser texture soils, such as the Wellington site may be more prone to sulphur loss due to leaching. Both of the Ameliasburg and Pakenham sites have a history of manure and high soil organic matter levels of 4% or greater. This may explain why there was no response to added sulphur

at the Ameliasburg and Pakenham sites. The greatest response to sulphur seems to be at sites that have not had a history of manure and are low in organic matter.

## Next Steps:

The project is to be repeated again in 2014 to gain another year's data. In addition, the goal would be to have additional co-operators/sites and to increase the number of tissue samples to validate what the critical value is for sulphur.

## Acknowledgements:

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## Location of Project Final Report:

Crop Advances, Ontario Soil & Crop Improvement Association at:
http://www.ontariosoilcrop.org/en/resources/cropadvances.htm