

Proline Fungicide on Corn Silage to Reduce Mycotoxins 2013, 2014 & 2015 Final Report

Purpose:

To assess use of a foliar fungicide such as Proline[®] on corn silage to reduce mycotoxins in the stored feed and impact on corn silage yield. This trial was completed in 2013, 2014 & 2015.

Methods:

Proline[®] fungicide was applied at the tasseling stage (VT) of corn on different farms in eastern Ontario in each of 2013, 2014 & 2015. At harvest, silage weights and moisture were measured. A fresh sample of silage was collected from which mycotoxin analysis was completed from each plot. All sites had a minimum of 2 replications of an untreated control and a Proline[®] fungicide treatment.



Image 1. Fungicide Application at VT Stage of Corn. (Photo courtesy of John Nanne, Pakenham)

All corn silage samples were analyzed for the following mycotoxins:

- Aflatoxin B1 (ppb)
- Aflatoxin B2 (ppb)
- Aflatoxin G1 (ppb)
- Aflatoxin G2 (ppb)
- Deoxynivalenol (DON) (ppm)
- 3-Acetyl-Deoxynivalenol (ppm)
- 15-Acetyl-Deoxynivalenol (ppm)
- Fumonisin B1 (ppm)
- Fumonisin B2 (ppm)
- Ochratoxin A (ppm)
- T-2 (ppm)
- HT-2 (ppm)
- Zearalenone (ppm)

Results:

Toxin Analysis

In each of the three years, the main mycotoxin present was Deoxynivalenol (DON). DON is produced by the fusarium mould fungus as in wheat and other cereals. Other mycotoxins found but at minimum levels were 3-Acetyl-Deoxynivalenol, 15-Acetyl-Deoxynivalenol, T-2, HT-2 and Zearalenone.

Table 1: 2013, 2014 & 2015 Summary of the Mycotoxin levels and Yield of Corn Silage Treated with Proline® Fungicide compared to Untreated.

Harvest Year	Average DON (ppm)		Reduction of DON	Average Yield (mt/ac)		Yield Increase of Fungicide
	Check	Proline		Check	Proline	
2013	0.5	0.1	-73%	16.6	17.0	2%
2014	0.5	0.2	-61%	20.5	20.8	1%
2015	1.4	0.5	-65%	18.9	19.8	5%
Average	0.7	0.3	-66%	18.0	18.7	4%

Silage yield is in metric tonnes per acre adjusted to 65% moisture.

Weather Conditions

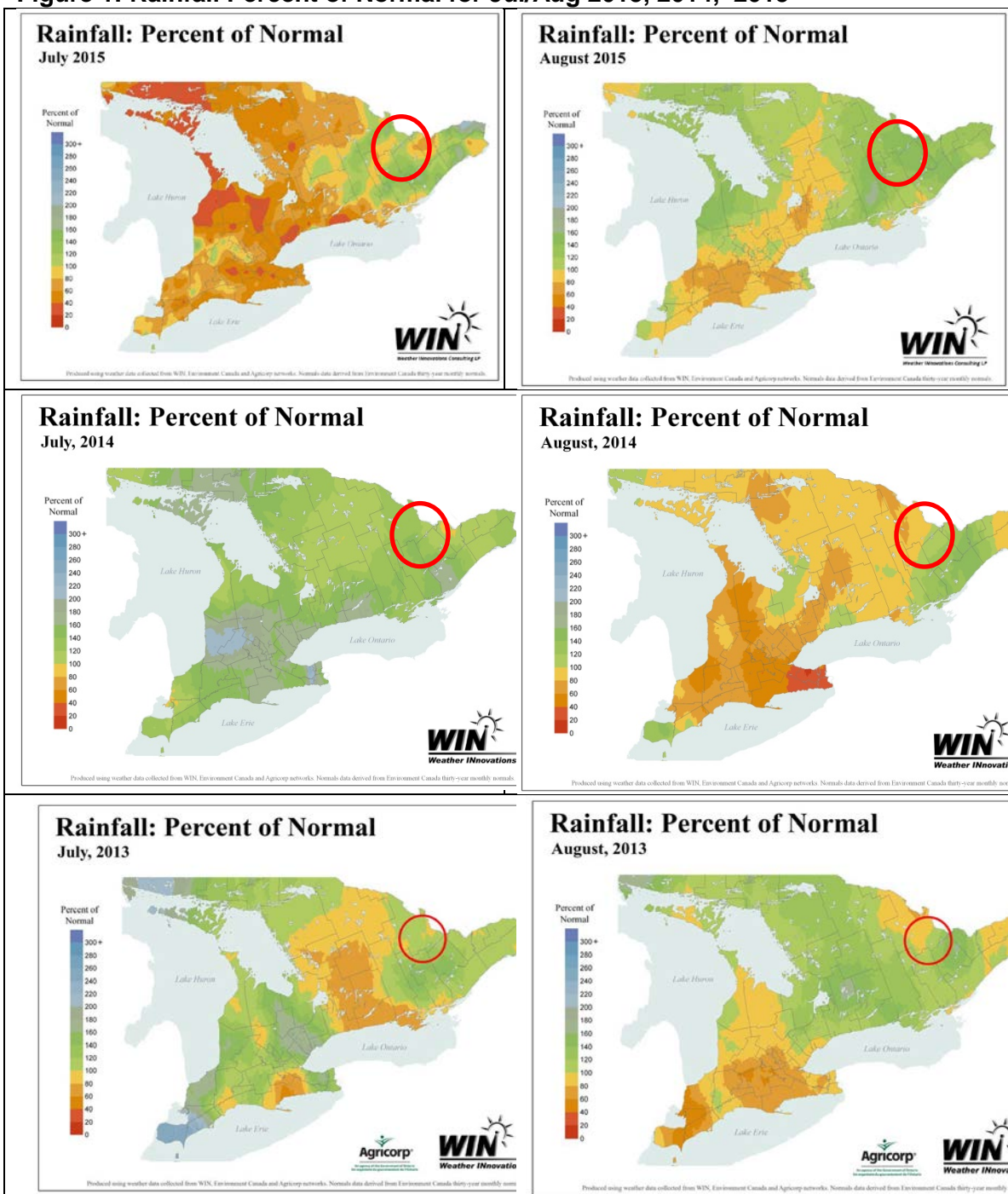
Weather conditions, primarily rainfall impact the growth of moulds and the resulting mycotoxins produced during pollination and grain fill. Figures 1 shows the Percent of Normal Rainfall for the months of July and August, of each year, respectively. The red circle indicates the area where the on-farm sites for this project were located. The above normal rainfall in August 2015 may be the reason for the highest DON levels in the check over the 3 years of this trial. In 2014, rainfall was above normal for July and although August 2014 shows below the normal rainfall, most of the rainfall came in the early part of August. In 2013, rainfall was normal to slightly below normal for July and about normal rainfall for August.

Summary:

Mycotoxin Reduction - Table 2 shows mycotoxin levels that livestock producers need to be concerned with in the total ration of which corn silage may make up a portion. Even at 'concern level' of 0.56 ppm, research has found that animal performance can be reduced (Mold and mycotoxin problems in livestock feeding, Department of Dairy and Animal Science, Pennsylvania State University).

In 2014, the untreated plots at the Pakenham and Renfrew sites had average DON levels above the 'concern level' of 0.56 ppm (data not included in final report, see previous interim reports). Both these sites received above normal rainfall in August as opposed to the Douglas sites. With the above normal rainfall it would be expected to have greater fusarium disease pressure, resulting in the higher levels of DON.

Figure 1: Rainfall Percent of Normal for Jul/Aug 2013, 2014, 2015



In contrast, in 2013 it should be noted that 3 of the 5 sites had DON levels in the untreated plots below the 'concern level' of 0.56 ppm (data not included in final report, see previous interim reports). These low levels may be due to the normal to below normal rainfall in July and August of 2013.

Table 2: Mycotoxin Level in Total Ration (Dry Matter)

Mycotoxin	Concern Level	Potentially Harmful Cattle	Potentially Harmful Swine
Deoxynivalenol (DON) (ppm)	0.56	2.5 - 6.0	0.6 - 1.0
T-2 (ppm)	0.56	0.7 - 1.5	0.7 - 1.5
HT-2 (ppm)	0.25	1.5 - 3.0	1.5 - 3.0
Zearalenone (ppm)	0.25	3.9 - 7.0	0.6 - 3.0

Source: Mold and mycotoxin problems in livestock feeding, Department of Dairy and Animal Science The Pennsylvania State University.

Overall the average reduction in DON between the untreated and Proline[®] fungicide treated corn silage plots in 2013, 2014 & 2015 was approximately 66%. In research trials conducted by Dr. Art Schaafma et al, Proline[®] fungicide resulted in up to a 50% reduction of DON in grain corn.

Silage Yields

From Table 1, a modest silage yield increase due to the Proline[®] fungicide of 2%, 1%, & 5% in 2013, 2014 & 2015, respectively, for an average yield increase of 4% was observed. Based on the value of corn silage of \$35 per tonne and the cost of Proline[®] fungicide of \$32/acre + \$10/ac application cost, a 1.2 tonnes per acre silage increase is required to breakeven. This does not include the value of improved animal performance from reducing the level of mycotoxins (DON).

Next Steps:

2015 was the last year of this project. The results of this trial have been presented at several local Soil & Crop Improvement Association’s – Annual Meetings in the fall of 2015. In addition to this report, articles with this information will be in the Ontario Soil & Crop Improvement Association CropTalk newsletter and the Field Crop News website.

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