

Proline Fungicide on Corn Silage to Reduce Mycotoxins

Purpose:

To assess use of a fungicide such as Proline® on corn silage to reduce mycotoxins in the stored feed and to assess impact on corn silage yield.

Methods:

Proline® fungicide was applied at the tasseling stage of the corn on 5 different farms in eastern Ontario in 2013. At harvest, silage weights and moisture were measured. In addition a fresh sample of silage was collected for mycotoxin analysis from each plot. All sites had a minimum of 2 untreated replications and 2 treated with replications Proline® fungicide. Site (E) also had 2 replications treatment with Headline® fungicide.

Picture 1. Tassel stage of corn when the fungicide (s) were applied:



Photo courtesy of John Nanne, Pakenham

All corn silage samples were analyzed for the following mycotoxins:

Aflatoxin B1 (ppb)

Fumonisin B1 (ppm)

Aflatoxin B2 (ppb)

Fumonisin B2 (ppm)

Aflatoxin G1 (ppb)

Ochratoxin A (ppm)

Aflatoxin G2 (ppb)

T-2 (ppm)

Deoxynivalenol (DON) (ppm)

HT-2 (ppm)

3-Acetyl-Deoxynivalenol (ppm)

Zearalenone (ppm)

15-Acetyl-Deoxynivalenol (ppm)

Results:

Table 1 show the yield response to the Proline® and Headline® fungicides.

Table 1: Yield Of The Fungicide Treated And Untreated At Each Farm Site.

Site	Yield		% Difference in Yield	# of Reps.	Yield Headline	# of Reps.
	Check	Proline				
A	19.8	20.3	2.5%	2		
B	14.1	13.2	-6.2%	3		
C	16.7	18.3	9.3%	2		
D	17.7	16.6	-6.2%	4		
E	17.5	18.2	4.1%	3	16.1	2
		Average	0.7%			

Silage yield are in metric tonne per acre adjusted to 65% moisture.

Table 2 summarizes the mycotoxin results from the analysis of corn silage samples. Deoxynivalenol (DON) was the most prevalent mycotoxin found. DON is produced by the fusarium mould as in wheat and other cereals. Other mycotoxins found were 3-Acetyl-Deoxynivalenol, 15-Acetyl-Deoxynivalenol, T-2, HT-2 and Zearalenone. The mycotoxins Aflatoxin B1, Aflatoxin B2, Aflatoxin G1, Aflatoxin G2, Fumonisin B1, Fumonisin B2 and Ochratoxin A were all below detectable levels.

Table 2: Analysis Of Corn Silage Samples For Mycotoxins.

Site	Treatment	DON ^a (ppm)	% Change in DON	T-2 (ppm)	HT-2 (ppm)	Zearalenone (ppm)
A	Check	0.32		0.00	0.32	0.00
A	Proline	0.28	-12.5%	0.00	0.19	0.00
B	Check	0.50		0.03	0.07	0.05
B	Proline	0.17	-65.2%	0.00	0.02	0.00
C	Check	0.145 ^b		0.00	0.17	0.00
C	Proline	0.28	89.7%	0.00	0.07	0.00
D	Check	0.85		0.02	0.10	0.02
D	Proline	0.03	-97.1%	0.00	0.14	0.00
E	Check	0.00		0.00	0.00	0.00
E	Proline	0.00		0.00	0.00	0.00
		Average	-21.3%			
E	Headline	0.17 ^c		0.00	0.00	0.00

^aDeoxynivalenol (DON) (ppm)
^baverage of two checks; 1) 0.06 ppm & 2) 0.23 ppm
^c1 site, 1 year, 2 reps. (DON 0.12 & 0.22 ppm)

Weather conditions, primarily rainfall impact on the growth of moulds and the resulting mycotoxins produced by these moulds during pollination and grain fill. Figures 1 & 2 show the Percent of Normal Rainfall for the months of July and August respectively and the red circle indicates the area where the 5 sites for this project are. Figures 1 & 2 show that rainfall was normal to slightly below normal for July and about normal rainfall for August.

Figure 1: Rainfall Percent of Normal for July 2013

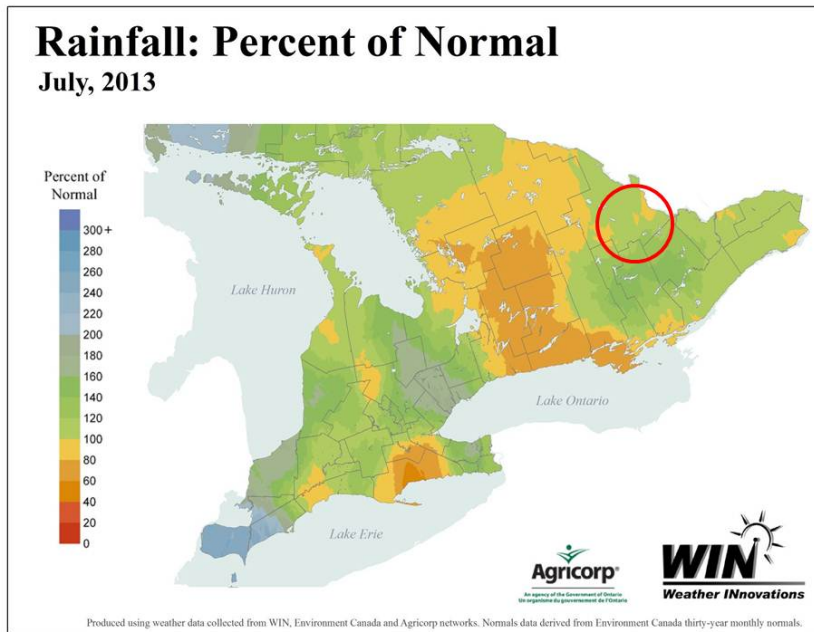
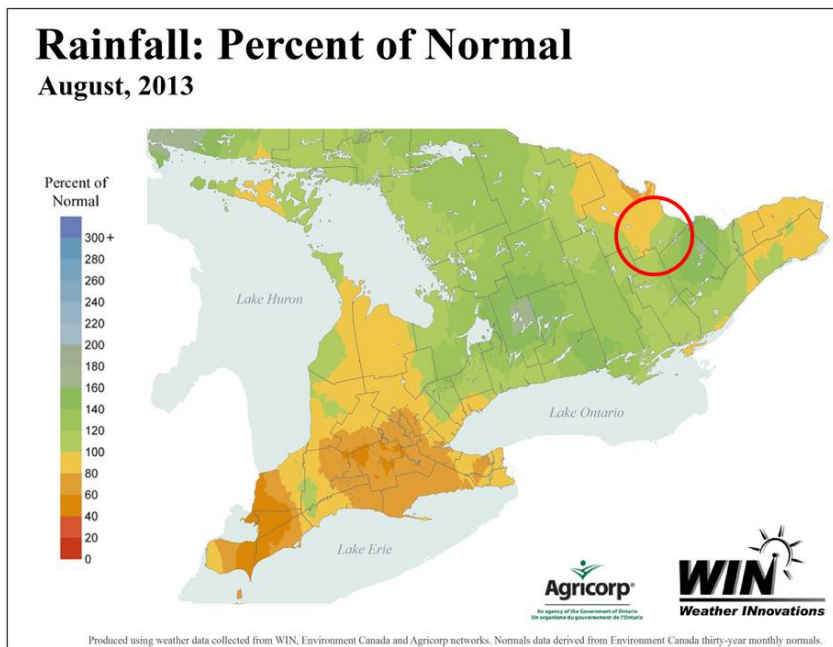


Figure 2: Rainfall Percent of Normal for August 2013



Summary:

Mycotoxin Reduction - Table 3 gives mycotoxin levels that livestock producers need to be concerned in the total ration of which corn silage may make up a portion of the total ration. It should be noted that at all 5 sites, the DON level was quite below the potentially harmful level for cattle of 2.5 ppm. These low levels may be due to the normal to below normal rainfall in July and August of 2013.

Table 3: 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

Overall the average reduction in DON between the untreated and Proline[®] fungicide treated corn silage was -21.3%. It should be noted that at site C, showed a lower DON level of the untreated than the Proline[®] fungicide treated. The value of 0.145 is an average of the two checks; 1) 0.06 ppm & 2) 0.23 ppm. The first sample of 0.06 DON ppm may have been an abnormality in the sample. At the other sites where there was DON was present in the untreated samples, the Proline[®] fungicide was able to reduce the DON level. In research trials conducted by Dr. Art Schaafma et al, Proline[®] fungicide resulted up to a 50% reduction of DON in grain corn.

Site E also compared Headline[®] fungicide. Headline[®] fungicide is registered for leaf disease control, but not registered for fusarium head blight suppression. It is interesting that the silage samples taken from the strips where the Headline[®] fungicide was applied had higher levels of DON than either the untreated or Proline[®] fungicide treated plots. Note, this was only 1 site and 1 year with two replications (DON 0.12 & 0.22 ppm). However, similar increases in DON levels have been found where Headline[®] fungicide was applied in Winter and Spring Wheat if applied too close to heading and therefore pollination.

The other mycotoxins found were 3-Acetyl-Deoxynivalenol, 15-Acetyl-Deoxynivalenol, T-2, HT-2 and Zearalenone. These mycotoxins were all below the level of concern for livestock.

Silage Yields - Table 1 shows overall a slight increase in silage yield on average. Two sites however showed a decrease in yield and at Site E the Headline[®] fungicide treatment also showed a yield reduction. This may be due to some field variability or possibly the fungicide maybe induce a stress and resulting in a yield decrease.

Next Steps:

Further work needs to look at the use of fusarium suppression fungicides to determine the impact of reducing mycotoxins in corn silage. The plan is to repeat this trial in 2014.

Acknowledgements:

Renfrew, Lanark and Ontario Soil & Crop Improvement Association – Major Grant Project. Farm co-operators; Alex Briscoe, Bruce Hamilton, Des, Mike & Ed Enright. John Nanne - Nandale Farms and Mark Foster - JockBrae Farms. Simon Octeau with Bayer CropScience provide the fungicide and Sean Cochrane and Bob Bowles - DEKALB® Seeds for assistance weighing off plots.

Project Contacts:

Scott Banks, OMAF, Kemptville, Scott.Banks@ontario.ca

Location of Project Final Report:

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