REGITNIG, PETER J.* and BRYAN AVISON, Lantic Inc., 5405 – 64th Street, Taber, Alberta, Canada T1G 2C4. **Suppression of Aphanomyces root rot in Alberta.**

ABSTRACT

Root disease has been a very minor production issue in southern Alberta in the past; however, in recent years some fields have exhibited disease symptoms that are associated with *Aphanomyces cochlioides*. Symptoms generally appear later in the growing season as rot on sugar beet roots. Early season damping-off observed in other sugar beet growing areas is less common in Alberta. Soil samples taken from suspected problem areas produced Aphanomyces soil disease index (SDI) values as high as 99 (0-100 scale). The sugar beet production area of Alberta is primarily sprinkler irrigated and has relatively high pH calcareous soils.

The seed treatment fungicide Tachigaren that is used for Aphanomyces control in the United States does not have a registration on sugar beets in Canada. Aphanomyces resistant varieties used in the U.S. also lack testing or approval in the Alberta growing region. This deficiency in disease control options combined with the limited acres affected by the disease generated interest in evaluating alternative Aphanomyces control measures. Aphanomyces control studies in the Red River Valley suggested that the application of precipitated calcium carbonate (also referred to as PCC, factory lime or spent lime) generally produced healthier beets and higher yields than unlimed plots in fields where *Aphanomyces cochlioides* was present (Bresnahan et al. 2002).

Five field trials were conducted in Alberta between 2005 and 2007 in soil with SDI values between 86 and 97, to evaluate the effect of precipitated calcium carbonate (PCC) and resistant varieties on suppression of Aphanomyces root rot. PCC, a byproduct of the sugar beet purification process, was applied at rates of 0, 4 and 8 tonnes wet weight/acre. The PCC used for these studies had been stockpiled for at least 20 years at the sugar factory at Taber, Alberta. Moisture content of the PCC averaged 33%. The resistant varieties evaluated were commercially approved in various U.S. growing regions. The susceptible varieties were commercially approved Alberta varieties. In two of five trials, sugar beets were planted two years in succession in order to intensify the effect of the disease. In one of these trials, PCC applications two years prior to sugar beet production were evaluated.

The application of PCC significantly reduced late season visual root rot ratings and significantly increased sugar beet root yield in all five trials, including one trial where PCC was applied 2 years prior to planting sugar beets. In 4 trials where Aphanomyces susceptible and resistant varieties were compared, the root yield of a susceptible variety always showed a significant increase when PCC was applied. Root yield of resistant varieties only responded significantly to PCC application in the trial which exhibited the highest level of visual root disease symptoms. In 4 of 5 trials, PCC application did not have a significant effect on sugar beet quality. In one trial where extractable sugar per tonne was affected by PCC, the observed increase was likely due to a significant increase in sugar beet plant stand when PCC was applied. In 4 trials where soil pH was determined approximately one year after PCC application, values were 7.2, 7.6 and 7.7 for 0, 4 and 8 tonnes/acre PCC.

In a 2005 trial with an SDI of 90, sugar beet root yield was increased by 2.25 and 3.1 tonnes/acre for a susceptible variety with respective applications of 4 and 8 tonnes/acre PCC. Yields of two resistant varieties in this trial were not significantly increased when PCC was applied. A similar response was observed for a susceptible and resistant variety in a second 2005

trial with an SDI of 86. Susceptible variety root yields were increased by 1.34 and 1.97 tonnes/acre with 4 and 8 tonne/acre PCC applications in this second trial. In 2005, the root yield of two Aphanomyces susceptible varieties appeared as good as two Aphanomyces resistant varieties when root disease was not mitigated and better when PCC was applied. The addition of PCC reduced visual disease symptoms at both locations in 2005, but did not reduce SDI values at one location sampled before PCC application and after harvest. Soil samples taken on October 19, 2005 from 0, 4 and 8 tonne/acre PCC treatments yielded respective SDI values of 93, 93 and 96 compared to a November 4, 2004 SDI value of 90 at this location.

In a 2006 trial with an SDI of 97, sugar beet root yield was increased by 3.33 and 2.78 tonnes/acre for a susceptible variety with respective applications of 4 and 8 tonnes/acre PCC. Root yield of a resistant variety was increased by 1.1 tonnes/acre with an application of 8 tonnes/acre PCC, but this difference was not statistically significant. The addition of PCC significantly reduced visual disease symptoms at this location, but only reduced SDI values a very slight amount for samples taken before PCC application and after harvest. Soil samples taken on September 21, 2006 from 4 and 8 tonne/acre PCC treatments yielded respective SDI values of 94 and 93 compared to an October 19, 2005 SDI value of 97 at this location.

Two trials in 2007 were conducted on land planted to sugar beets in 2006 to intensify disease pressure. One trial was conducted in an area where significant stand and yield loss were observed from Aphanomyces the previous year. Only a susceptible variety was used in this trial and a 2 tonne/acre PCC rate was included along with the 4 and 8 tonne/acre rates. Significant disease symptoms were observed on all PCC treatments; however, disease symptoms were significantly reduced and root yields were still increased by 4.83, 5.12 and 9.22 tonnes/acre with respective applications of 2, 4 and 8 tonnes/acre PCC. The check treatment in this trial only yielded 3.8 tonnes/acre.

In a second 2007 trial where PCC was applied 18 months prior to planting, significant root yield increases of 9.55 and 10.77 were observed for a susceptible variety with 4 and 8 tonnes/acre PCC, respectively. A resistant variety in this trial had root yield increases of 7.83 and 9.33 tonnes/acre with the same PCC treatments. Visual disease symptoms at harvest were significantly reduced with PCC. In the absence of PCC the susceptible variety yielded 9.02 tonnes/acre while the resistant variety yielded 12.17 tonnes/acre. Soil samples taken on September 13, 2007 from 0, 4 and 8 tonne/acre PCC treatments yielded respective SDI values of 98, 87 and 87 compared to an October 19, 2005 SDI value of 97 at this location.

The application of PCC to susceptible Alberta varieties currently appears to be the best option to mitigate Aphanomyces root rot in the southern Alberta growing region.

References:

Bresnhan, G.A., A.G. Dexter, C.E. Windels, J.R. Brantner and J.L. Luecke. 2002. The effect of spent lime on sugarbeet yield and *Aphanomyces cochlioides* suppression. Sugar beet research and extension reports. 33:273-276.