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Influence of Soil pH on Fertility, SCN and Plant Disease

By Dale Cowan, CCA

We have long known that growing crops in the proper soil pH range maximizes yield and quality. On most lab soil reports the first test that is noticed is the soil pH and with good reason. Soil pH controls nutrient availability and some key biological functions in the soil matrix. Nutrient availability both in the soil and from applied fertility are profoundly affected by the pH range of the soil. A combined fertilizer application of N,P and K at a soil Ph of 6 will have approximately 80% nutrient recovery. That same application at pH of 5.0 will only have 46% recovery¹. At current fertilizer pricing of roughly \$1300 per tonne for mixed fertilizers that is the difference between capturing \$1,040 per tonne or only \$598.00 of fertilizer dollars based on the influence of the soil pH on subsequent plant uptake.

Ontario soils are predominately neutral to alkaline in soil pH

Our parent materials from which the soils were formed are limestone based. Median pH is 7.0 with an average closer to 7.5². Approximately 16 % of our soils are either acidic or are becoming acidic and require liming to bring them to the appropriate pH range. Most of these soils are found along the “coast line” of Ontario. Starting in Kincardine in the southwest and following a path down Lake Huron around Essex County along the north shores of Lake Erie and Ontario and down the St Lawrence River. Inland, we find some sand plains in the tobacco belt, again in Alliston and

small areas scattered throughout the Southwest and low pH again dominates in Northern Ontario.

As we expand our crop production knowledge base we discover that some tried and true tests and beliefs are linked into other areas for which we are now starting to gain appreciation.

We know that soil pH is linked to plant health as plants that are grown at proper pH have less stress because of better nutrient uptake and plant diseases of note are less problematic at certain pH ranges. Take-all in wheat tends to be more of a problem in high pH soils. Potato scab is more prevalent at higher pH, club root is less of a problem at high soil pH levels to name a few.

Soybean Cyst Nematode (SCN) is also apparently affected by soil pH levels

Research work completed at University of Wisconsin Plant Pathology Dept and University of Iowa State Plant Pathology³ shows the impact of soil pH on SCN numbers and on Brown Stem Rot (BSR) development.

The highest spring populations of SCN were observed on soil pHs over 7.0. In a 4 year study all years showed higher SCN density with higher soil pH. At pH 5.8 to 6.4 egg counts were 280, pH 6.5 to 7.0 average egg counts were 1116 and at pH 7.1 to 8.0 were 2678.

“SCN is introduced into fields either by tillage operations bringing in infected soil, water or erosion and soil movement from adjacent infected areas. The survivability and subsequent variability of SCN densities from the initial point of infection could

very well be explained by soil pH patterns across the landscape.”

Soil pH could also give insight into the selection and performance of SCN Resistant varieties. In the same study soil pH also played a role in how much yield was gained by using SCN resistant varieties. At a Soil pH 5.8 to 6.4 average yield gain was 1.3 bushels, 6.5 to 7.0 was 5.6 bushels and pH 7.1 to 8 resulted in 9.6 bushels. A more effective SCN management strategy may well include a pH soil factor to be used as a sorting measurement to determine the likelihood of where SCN may flourish and a relative indicator as to yield expectations on resistant varieties in addition to egg and cyst counts we currently do or should be doing.

Brown Stem Rot (BSR) was also evaluated. The disease has less of an impact at higher soil pH although the mechanism is not fully understood. The trend with BSR symptoms with soil pH correlates well with soybean yields. BSR susceptible varieties show more diseases pressure at lower pH. The severity is greatest at soil pH 6.0 and and less severe at pH 7.0.

Soybean health management strategies that include in the decision process, effective crop rotations, SCN testing, variety selection and a strategy to modify soil pH may lead to more consistent yield results.

Consult your local Certified Crop Advisor to discover the difference agronomy professionals can make in your cropping systems.

1 Government of New Brunswick - Liming Atlantic Soils

2 Agri-Food Laboratories database 2007

3 Yields II Project “Soil pH Influences Soybean Disease Potential” http://www.plantpath.wisc.edu/soyhealth/pdf/soilph_bsr_scn.pdf

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This industry driven program helps ensure that Ontario crop producers are well served by those providing their crop production advice. This article was written by one of those CCA's.