Growing Forward 2 0251: Developing low-cost tools for in-house tracking of microbial water quality in the horticulture industry (2.5 year)

SUMMARY:

The primary objective of this project is to conduct in-field evaluation of low-cost on-site microbial water quality monitoring tools to give growers the in-house ability to assess water quality at critical points in their production systems, monitor the effectiveness of treatment systems, and identify potential sources of contamination. Furthermore, over the course of the study, a 2-year baseline data set will be compiled on microbial water quality within the industry and the performance of a wide range of water treatment and management systems.

Study outline:

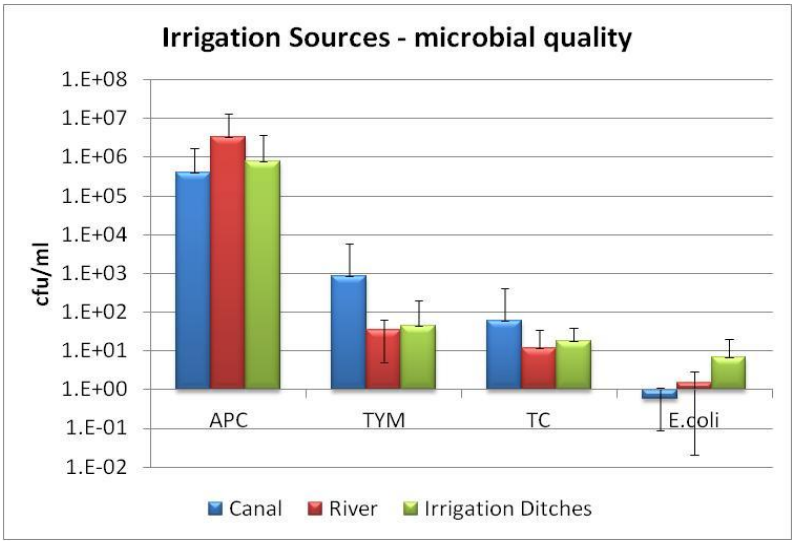
The sampling and analysis program was initiated in May, 2015 and has been carried out on a bi-weekly basis throughout the year according to each site's production system. Fifteen cooperators are taking part in the study (seven flower and eight vegetable producers). The sites cover a wide range of crop types, production and processing (washing) systems, and water treatment and management systems. At each site, critical water sampling points that are of significant interest from a water quality perspective have been identified. The number of sampling points per site varies from 1 up to 10, depending on the operation and the complexity of their water management and treatment systems. Sampling takes place at each site every 2 weeks, alternating Niagara and Holland Marsh sites.

Samples are being analyzed using 3M™ Petrifilms™ for Total Aerobic Plate Count (APC), Total Yeast and Mold (TYM), and *E.coli* and Total Coliform (TC). Temperature, pH and electrical conductivity information is also being collected at the time of sampling at each sample location. Sample sets are being submitted for DNA Multiscan analysis for plant pathogens, and correlations have been developed between this method and the 3M TY&M method being used as a 'surrogate' fungal pathogen test.

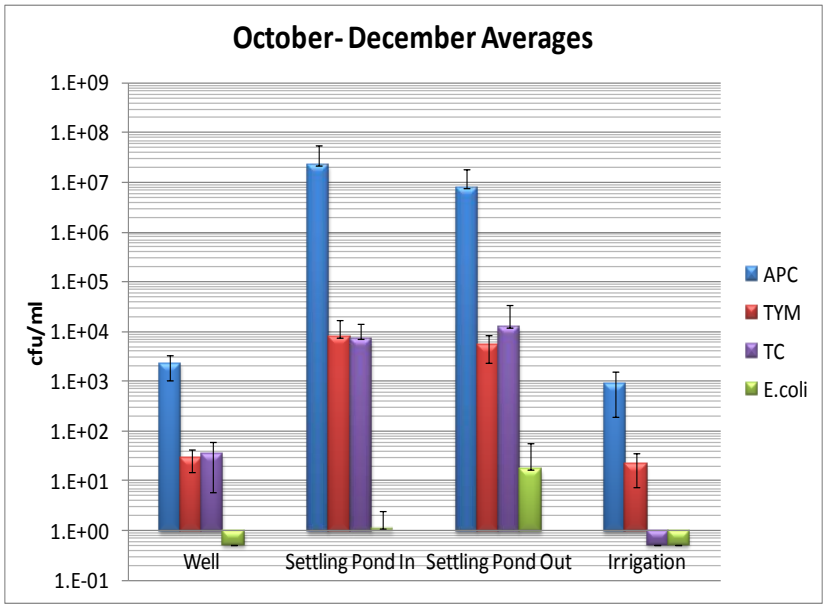
In order to provide a range of suitable tools for growers, other methods are being tested on selected samples including LaMotte BioPaddles®, Biosan Sani-Check YM, ColiTag and AgDia strips, and a range of sanitizer and nutrient test strips.

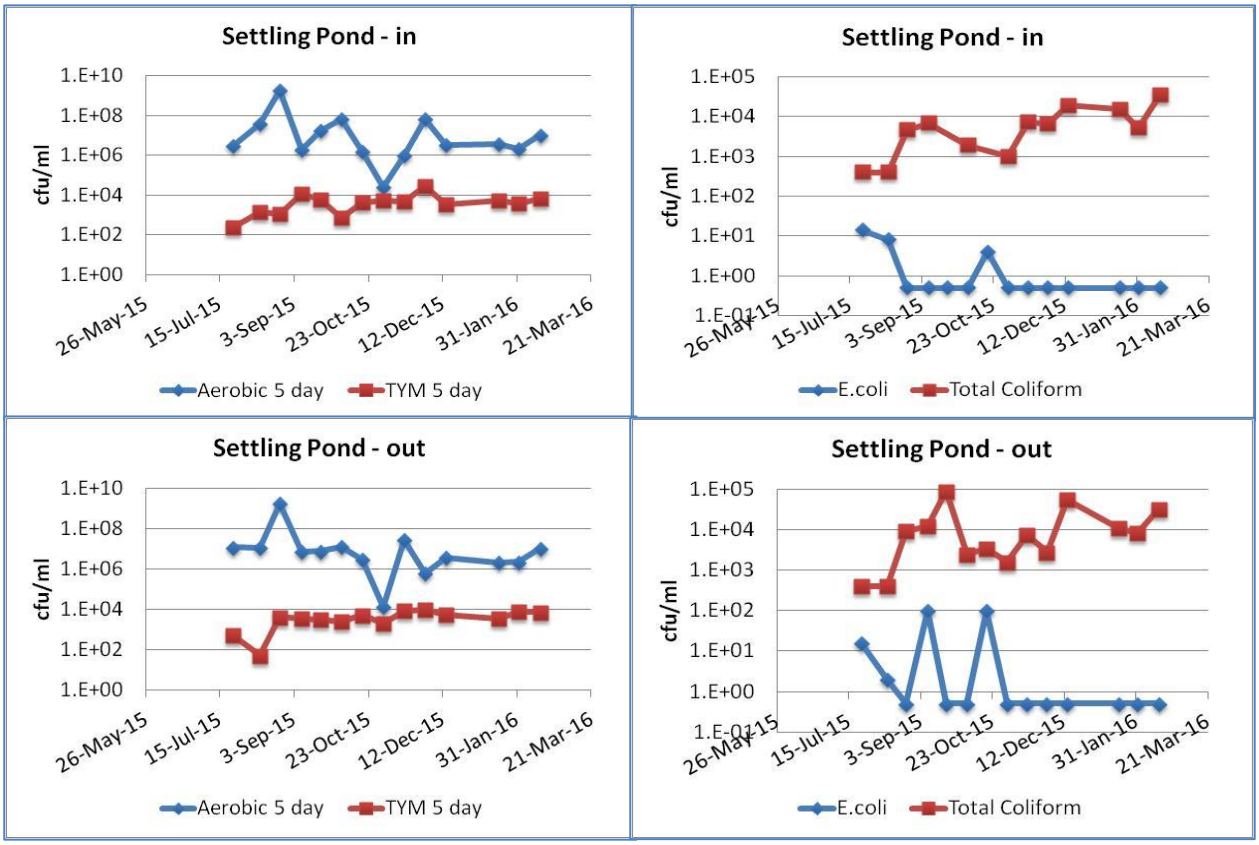
Results:

The study has generated a significant set of baseline data on relative water quality for different irrigation water sources, wash water sources and process waters, effectiveness of a range of treatment systems, and variability in water quality within and between systems. As an example, the irrigation source water data is shown on the right.



Treatment systems include filters, UV, peroxide, chlorine, chlorine dioxide, ECA (electro-chemical activation or "electrolyzed" water), ozone, constructed wetlands and woodchip bioreactors, aerobic digestion, and settling ponds. Typical site data are shown in the graphs on the right (averages over a specific time period) and below (changes over time).





Over 600 samples have been tested to date and results indicate that, while the limit of detection may not be as high as other methods, the 3M™ Petrifilm™ method is easier to interpret than several other methods; these assessments will continue.

The study has been discussed with the cooperators, and each has been given a "Resource Binder" to which their site specific data and general information is added periodically. Typical site specific data are shown to the right and below.

In several instances, growers have contacted us to get information on the data gathered to date in order to assist in addressing issues of food safety due diligence or spoilage.

Next Steps:

Monitoring will continue at sites over the production/growing period as appropriate for individual operations. Further developments on the microbial assessment techniques will be carried out.

This year, the methods developed will be used in parallel by assigned greenhouse staff to measure acceptability, practicality and utility of the testing program. This has been discussed with several growers.

At the same time, plant health information needs to be gathered. Optimally, this would be conducted by the same on-site person conducting the testing.

Working with Mary Ruth MacDonald (University of Guelph) and Anissa Poleatewich (Vineland Research and Innovation Centre) and their staff, identification of what is growing on the Petrifilms (TY&M) and ability of Petrifilms to support growth of plant pathogens of interest and the appearance of those pathogens on the films is continuing.

This project was funded in part through *Growing Forward 2 (GF2),* a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of *GF2* in Ontario.