



# ACTIVITY 5

## IRRIGATION WATER QUALITY IMPROVEMENTS

### BACTERIAL CONTROL IN IRRIGATION WATER

#### Executive Summary

The objective of this project is to evaluate the effectiveness of water treatment technology in controlling the bacteria load in irrigation water. Of specific concern is the presence of Escherichia Coli (E. Coli) bacteria. Some strains of E. Coli bacteria can cause diarrhea, stomach cramps and vomiting. Some level of E. Coli bacteria is always present in natural water sources and soil. In general, a mean concentration of less than 100 Colony Forming Units (CFU) / 100mL is considered low risk. This implies that fresh, ready-to-eat vegetables such as carrots, onions and vegetable greens should always be thoroughly washed prior to consumption.

The costs associated with the recall of contaminated produce can be significant to the producer both in terms financial costs associated with the actual recall event as well as long-term damage to the producer brand. Producers do need to consider how to manage this risk.

Two irrigation water treatment methods were evaluated to determine their effectiveness in controlling E Coli bacteria concentration. Copper-Silver Ionization and Ozone-UVC treatment methods were chosen to be evaluated due to their ability to integrate easily with high volume irrigation water flow. Irrigation systems are generally installed remotely from farm buildings employing diesel-powers pumps.

The operating conditions dictate that an irrigation water treatment system must:

- Provide no restriction to irrigation water flow
- Require low electrical power
- Require low on-going maintenance requirements



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#### E Coli Bacteria Levels in Untreated Irrigation Source Water

E Coli bacteria concentration levels in the irrigation source water measured throughout the 2023 grow season were highly variable. There was a measurable amount of E Coli bacteria in all the samples collected. The measurements ranged from a low of <1 CFU/100mL (very low risk) to a high of 6,300 CFU/100mL (very high risk). The high E Coli concentration levels were measured after rain events. There was no visible difference between untreated irrigation water with low and high E Coli concentration levels.

#### Treatment System Evaluation

Evaluation of the two treatment systems involved the collection of irrigation water samples before and after treatment. The collected samples were then submitted to ALS Global Labs for evaluation. Testing included the measurement of E Coli bacteria concentrations and total bacteria concentrations in the water. The E Coli bacteria test result specifically measures the E Coli concentration present in the sample. The total bacteria test results measure all bacteria (good and bad) present in the sample.

The Copper-Silver Ionization system tested was developed by Fluidyne Corporation. The evaluation test results demonstrated this treatment systems ability to reduce very high E Coli bacteria levels to levels below the 100 CFU/100mL threshold.

The Ozone-UVC system tested was developed by Econse Water Purification Systems Inc. During system testing, the E Coli bacteria concentration in the source irrigation water was very low at <1 CFU/100mL. The ozone-UVC treatment system did reduce the E Coli concentration to 0 CFU/100mL. However, this result did not really provide an indication of this treatment system ability to manage high bacteria loadings. The total bacteria concentration test results do provide an alternate indication of this treatment systems ability to treat higher bacteria loadings. The treatment system reduced the average total bacteria across all samples from 10,000 CFU/100mL to <10 CFU/100mL.

#### In summary

The untreated irrigation water samples tested always resulted in some E Coli bacteria concentration being present. The test results can exceed the maximum provincial guideline of 100 CFU/100mL. The two irrigation water treatment systems tested were both effective in reducing E Coli concentrations in the irrigation water. The implementation of irrigation water treatment should be considered by producers as part of their overall product safety management practices to minimize the risk of product recalls with the associated financial and reputational costs.