Evaluating Microbial Water Quality in Vegetable Operations in Maryland

Pahl, D.[1], Mathew, S.A.[2], Beale, B.[3], Lantz, W.D.[3], Martin, D.A.[3], Myers, R.D.[4]
[1]Faculty Research Assistant, University of Maryland, College Park
[2]Agent, University of Maryland Extension (UME), [3] Senior Agent, UME, [4]Principal Agent, UME

Introduction

Microbial water quality is a major component of on-farm food safety and the proposed federal Food Safety Modernization Act (FSMA). Water is used in almost every phase of vegetable production, from transplanting, irrigation, chemical applications, and postharvest washing. Since water is a known carrier of pathogenic microbes, varying uses of water can carry different food safety risks. Under FSMA, the proposed regulations will require farmers to periodically test their water sources for *E. coli,* an indicator of fecal contamination. Historically the levels of *E. coli* and total coliforms in surface water sources (such as ponds and springs) tend to be higher and more variable than well sources, as surface water is subject to environmental variables and contamination. In this study we monitored chemical and physical factors (pH, turbidity, electrical conductivity, and nitrates) in addition to the biological factors (total coliforms and *E. coli*) because these can influence bacterial growth.

This study was conducted to develop baseline information by analyzing the water quality of major water sources used in Maryland vegetable operations. The information gathered in this project will help evaluate the impact of proposed food safety regulations on agricultural water sources, determine the appropriate timing of water sample collection, and will be used to train growers how to interpret water tests.

Methodology

Five geographic regions in Maryland (Western, Central West, Central East, Southern, and Eastern Shore) were identified as sampling regions, each with one University of Maryland Extension (UME) collaborator. Each UME collaborator identified fruit and/or vegetable farms with diverse agricultural water sources to sample. In total, 28 water sources (12 ponds, 3 springs, 1 spring cistern, and 12 wells) were sampled monthly during 2013 and 2014, from April through September. After being taken, each sample was sent to the Pennsylvania State University Agricultural Analytical Services Laboratory (AASL) and was tested for *E. coli,* total coliforms, pH, turbidity, electrical conductivity (in 2013) and nitrates (in 2014). The Colilert Quanti-tray system was used to enumerate total coliform and *E. coli* counts.

Results and Conclusions

In both 2013 and 2014, the highest *E. coli* counts were found in the warmer summer months: June, July, and August. In 2014, *E. coli* counts remained high through September (Figures 1 and 2). Surface sources had the greatest amount of variability in bacterial counts (*E. coli* and total coliforms). In 2013, water source and month had a significant impact on *E. coli* counts ($p<0.001$) – statistics are still being tabulated for 2014 results to determine yearly trends. With these data, we are developing recommendations for Maryland growers on interpreting their water tests and methods for mitigating water sources with high *E. coli* counts.

Figure 1. Mean log counts of *E. coli* in Maryland water sources, by month, in 2013.

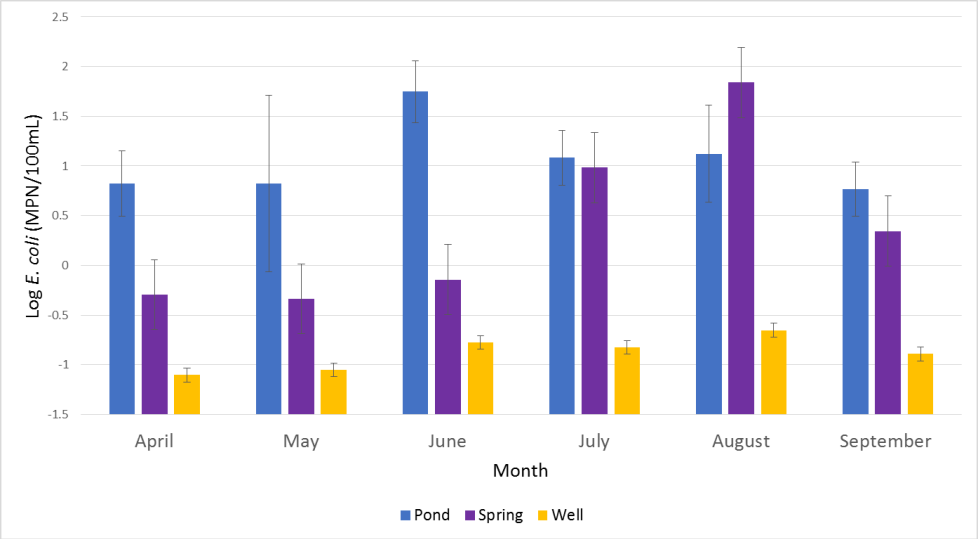

Figure 2. Mean log counts of *E. coli* in Maryland water sources, by month, in 2014.