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Demystifying Agricultural Production Water Testing under the FSMA Produce Safety Rule

Laura K. Strawn, Assistant Professor and Extension Specialist, Food Science & Technology, Eastern Shore Agricultural Research and Extension Center,
Amber D. Vallotton, Extension Specialist, School of Plant & Environmental Sciences,
Renee Boyer, Professor and Extension Specialist, Food Science & Technology
Cameron Bardsley, Graduate Student, Food Science & Technology, Eastern Shore Agricultural Research and Extension Center

Defining Agricultural Water?

Under the Food Safety Modernization Act (FSMA) Produce Safety Rule (PSR), agricultural water is defined as "water used in covered activities on covered produce where water is intended to, or is likely to, contact the harvestable portion of the crop" (FDA, 2015).

Covered activities refer to activities described in the FSMA PSR: growing, harvesting, packing and holding of covered produce.

Covered produce refers to produce that is typically consumed raw, and is a raw agricultural commodity. FDA has a list of produce non-covered by the rule; www.fda.gov/media/107445/download.

IMPORTANT DISTINCTION

FSMA PSR standards are different from Good Agricultural Practices (GAP) certification standards.

Under GAP, regardless of crop type being grown, and whether or not the water contacts the harvestable portion of the crop, production water is assessed for microbial quality (USDA, 2011).

What is Production Water?

Production water is agricultural water used during produce growing activities prior to harvesting. Examples of production water include irrigation, fertigation, spray applications, dust abatement, frost protection, among others. Remember production water has to meet the definition of agricultural water to be regulated under the FSMA PSR.

Source: iStock/Thinkstock

This document and its contents refer only to production water under the FSMA PSR and **not** to harvest or postharvest water.

Why Test your Production Water?

Since microbes are not visible to the human eye, it is impossible to evaluate water quality without testing. Testing each water source, such as wells, ponds, creeks, etc. allows you to understand the microbial quality of each

source, determine appropriate uses for each source, and implement corrective measures if water does not meet microbial quality standards (PSA, 2019).

It is important that when you test your water, you need to get a number (in other words quantitative testing); not presence/absence.

What to Test your Production Water for?

To be compliant with the FSMA PSR, a farm's production water that meets the definition of agricultural water, needs to be tested for generic *Escherichia coli* (FDA, 2015).

Generic *E. coli* is used as an indicator of fecal contamination (PSA, 2019). The presence of generic *E. coli* in a water sample does not indicate pathogen contamination, however the levels of generic *E. coli* in a water sample indicate the microbial quality of a water source, where larger values of generic *E. coli* may indicate a potential contamination issue.

Water testing under the FSMA PSR requires a 100 mL water sample per water source.

CFU or MPN?

Water test result units are either in colony forming units (CFU) or most probable number (MPN) per 100 mL water sample.

For the purposes of water testing in produce safety, CFU and MPN are often used interchangeably.

Remember to ask for a quantitative generic *E. coli* test, where the lab will provide the number or estimation of generic *E. coli* in the water sample. It is important to obtain a count of generic *E. coli* for production water samples, as some generic *E. coli* in a sample is possible.

A test for the presence/absence of generic *E. coli* will not provide you with the flexibility to evaluate your water quality, as a positive generic *E. coli* result does not indicate if only a few *E. coli* or hundreds of *E. coli* are in a water sample.

How to Sample your Production Water?

It is important to find a laboratory to analyze your water sample(s) before you start. Each laboratory will provide specific instructions for water sample collection and handling including the maximum hold time (the time between collection of a water sample and delivery to the laboratory).

A list (see references for link) has been compiled of laboratories in Virginia who perform water testing to satisfy the FSMA PSR (VDACS, 2018).

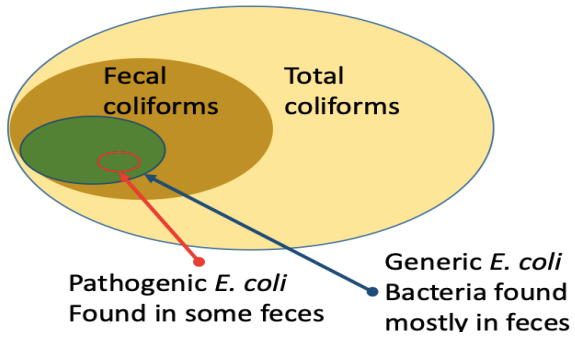
Source: L. Strawn

For a detailed, step-by-step procedure on how to collect production water samples from both groundwater and surface water sources, see Virginia Cooperative Extension publication "*Sampling Agricultural Production Water*" (Vallotton et al, 2019).

Also, refer to our instructional video on YouTube (see references for link) demonstrating the water sampling process for ground water and surface water sources (Ling et al, 2017).

How to Interpret your Production Water Test Results?

Remember, for production water, the count of generic *E. coli* is the target metric. Total coliforms will always be higher than generic *E. coli* in a water sample (unless both are below the limit of detection) because generic *E. coli* are a kind of coliform. The count you receive for total coliforms includes generic *E. coli* and several types of other bacteria. Total coliforms are important because they are used as an indicator in the EPA drinking water standard.



Source: T. Suslow
http://postharvest.ucdavis.edu/files/269366.pdf

FOLLOWING ON THE NEXT PAGE is a sample water test result from one of the Virginia Department of Agriculture and Consumer Services (VDACS) laboratories. In this example, three water sources were sent for testing: water from a well (A) and water from two surface water sources (A & B).

The VDACS laboratory uses the IDEXX Colilert-18 and Quanti-Tray/2000 (standard method 9223B), therefore, the results will display the most probable number (MPN) of total coliforms and generic *E. coli* per100 mL water sample. Since we are interested in the FSMA PSR, production agricultural water testing, we only need to focus on the generic *E. coli* number.

Example Interpretations for Water Sample Result Sheet (on Next Page)

Well water sample A has zero detectable generic *E. coli* or a result of <1 MPN/100 mL water. This test result supports the water source being of good microbial quality. Laboratories will not report a test of zero; instead, laboratories only report the limit of detection (or lowest amount detectable for the test). This is important to remember when looking at water test results.

Surface water sample A has 10.9 MPN/100 mL water of generic *E. coli*. This test result also supports the water source being of good microbial quality. Continue sampling this water source to demonstrate long-term water quality as outlined by the FSMA PSR.

Surface water sample B has 524.9 MPN/100 mL water of generic *E. coli*. This test result does not support the water source being of good microbial quality. While water test results may vary due to natural fluctuations in the environment including weather events, this result should trigger further investigation into determining the root cause of the evaluated level of generic *E. coli* in the water sample. This means assessing possible causes for the evaluated generic *E. coli* in the water, and performing any interventions/corrective measures. Once you have investigated and hopefully solved the issue, the water source should be re-tested to check that the corrective measures worked.

Virginia Dept of Agriculture and Consumer Services
WRAHL
Warrenton Regional Animal Health Laboratory
272 Academy Hill Road
Warrenton VA 20186-
Phone: (540) 316-6543 Fax: (540) 347-6404

Report Date: 4/26/2019

Final Report

Date Submitted: 4/23/2019
Collection Date: 4/22/2019

Case Coordinator: SuperLabTech

Accession No: BETATEST

TEST FARM WATER TESTING

Email: testFarm@vt.edu

Associated Parties

Business	TEST FARM
Other	FSMA PSR Water Testing
Other	

Reference Data

Time Sample Taken: 9:09 am

Animal Information

Name
Test Farm

Lab Findings

Water Testing

Specimen	Test Name	Total Coliforms	*E. coli*
Test Farm			
Water - Well - A	Water testing - 4/26/2019 9:42 AM	<1 mpn/100 ml water	<1 mpn/100 ml water
Water - Surface A	Water testing - 4/26/2019 9:42 AM	387.3 mpn/100 ml water	10.9 mpn/100 ml water
Water - Surface B	Water testing - 4/26/2019 9:42 AM	1203.3 mpn/100 ml water	524.9 mpn/100 ml water

Client Report History

Report Type	Delivery Method	Sent To	Date Sent
Final	Email	testfarm@vt.edu	4/26/2019 10:37 AM

Bulletin(s)

Note: Condition of the sample(s) was adequate unless otherwise noted

Test Report authorized by SuperLabTech, PhD
Program Manager, Office of Laboratory Services

References and Resources

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Produce Safety Alliance (PSA). 2019. Produce Safety Alliance Grower Training. Module 5, version 1.2. https://producesafetyalliance.cornell.edu/curriculum/

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