Survey of Agricultural Water Microbial Quality on Kansas and Missouri Farms

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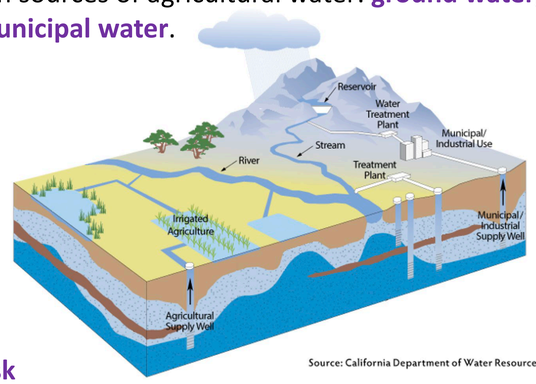
Introduction

"The ***Food Safety Modernization Act (FSMA) Produce Safety Rule (PSR)*** states that all agricultural water ***must*** be of safe and adequate sanitary quality for its intended use (§112.41)"

What is Agricultural Water?

Agricultural water is water that is intended or likely to contact the edible portions of produce or food contact surfaces during growing (production) or during/after harvest (post-harvest). The PSR outlines three common sources of agricultural water: **ground water**, **surface water**, and **municipal water**.

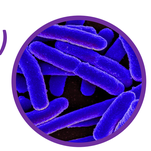


Microbial Risk

- **Low** — **Municipal Water** is water that is treated and monitored by a local water utility
- **Med.** — **Ground Water** is water that is found beneath Earth's surface (ex. wells, aquifers)
- **High** — **Surface Water** is water that is found or stored on the Earth's surface (ex. rivers, creeks, ponds supply tanks)

How do we determine microbial water quality?

The bacteria generic ***Escherichia coli (E. coli)*** is used as an indicator of water quality because it is a bacteria **commonly found in animal feces!**

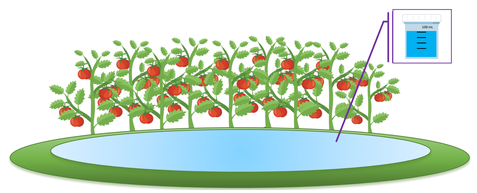


Objective

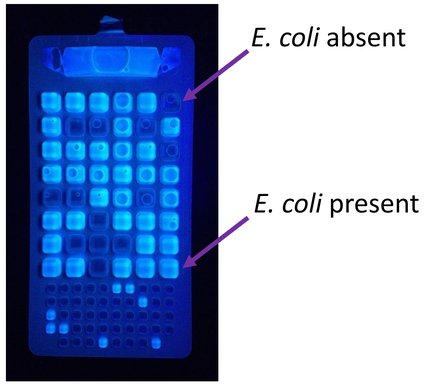
Determine the prevalence of *E. coli* in agricultural water sources on fresh produce farms in Kansas and Missouri

Materials and Methods

Colilert™ Quanti-Tray/2000 method



1. Samples were collected in 100mL sample bottles by growers, extension specialists, or trained personnel
2. One snap-pack of Colilert reagent was added to each 100mL water sample
3. Reagent was completely dissolved through vigorous shaking
4. Sample + reagent was poured into a tray and sealed
5. Sample incubated for 24 hrs at 35ºC ± 0.5ºC



Results & Discussion

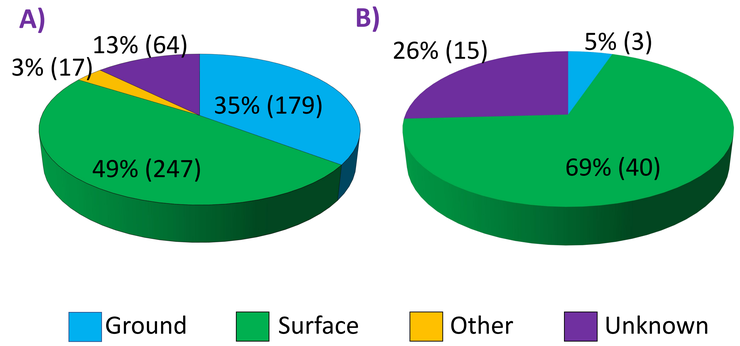


Figure 1. (A) Shows the distribution of water samples submitted and (B) the number of samples exceeding 126 MPN *E. coli*/100mL for each source type

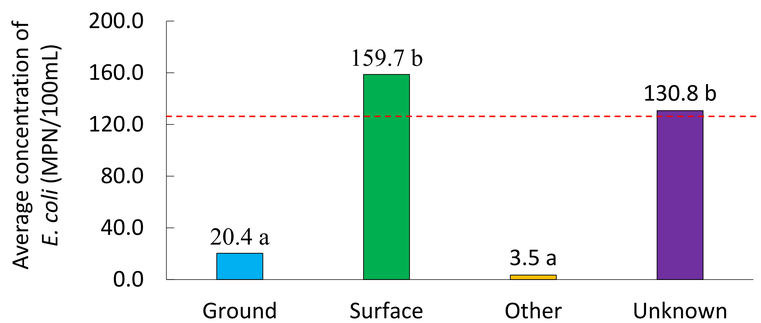


Figure 2. Shows the average (MPN/100mL) of the samples received for each source type. The letters denote statistical significance at $p<0.05$.

- Overall, **surface water** was the most common agricultural water source type but also had the highest concentration of generic *E. coli* (159.7 MPN/100mL) and the greatest number of samples exceeding the 126 mL/100mL level (n=40).
- **Ground water** was the next most common source type but had a significantly lower average *E. coli* concentration than surface water (20.4 MPN/100mL).
- The average *E. coli* concentration of **unidentified water sources** exceeded the 126 MPN/100mL limit (130.8 MPN/100mL).

Future Implications

1. Surface water was the most common source of agricultural water but has the highest risk for *E. coli* contamination.
2. Control measures should be used to mitigate the risk of generic *E. coli* contamination from *ag surface water.*
3. Identifying the water source for each sample would improve the reliability of the results

Acknowledgements

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