



UCGAPs GROWER GUIDE TO IRRIGATION WATER SAMPLING FOR MICROBIAL FOOD SAFETY AUDIT COMPLIANCE

Routine monitoring of irrigation sources and water used in crop management for all foliar contact applications or treatments has become a global expectation for preharvest management of edible horticultural crops including fruits, vegetables, edible flowers, sprouted seeds, and tree-nuts.

Standard irrigation water sample collection and submission for analysis should be a relatively simple process. If you or your farm supervisory staff is taking the sample, the key elements to remember are;

- Contamination of your water sample by careless handling and collection may put you over the audit compliance limit.
- Sanitizing and purging a well-head sample port or valve is in your best interest and should be a standard practice
- Careful handling of sample bottles during surface water collection to prevent sediments from entering is in your best interest and should be a standard practice.
- Failure to keep the sample cool during transport may result in an invalid test.
- Failure to submit and analyze the water sample within 24h results in an invalid test.*

*See special note in ***Taking a Water Sample***.

What to test for?

There are currently no uniform industry or regulatory standards regarding microbiological criteria for irrigation water; what to test for, how often to test, and what levels or limits define acceptable from unacceptable microbial quality. Based on the available science and practical, low-cost methods currently applied to diverse crops and regions, the following minimal sample scheme for *Microbial Water Quality Indicators* is recommended to growers;

- Wells, bore-holes, spring-boxes, water-tower, rainwater cistern – Total Coliform and Fecal Coliform/E. coli (requires an analysis of two 100 ml samples at 35C and 42-44.5C, respectively)

- Reservoir, pond, stream, creek, river, tailwater return (field runoff), or sedimentation pond water – E. coli
- Reclaimed wastewater – Total Coliform

At this time, due to variable commodity, regional, and local or federal requirements for threshold value, no specific frequencies, numbers, or limits are defined. Additional factors that influence or result in variable microbial indicator limits include mode or irrigation, timing of application, crop developmental stage, and certain historical commodity: pathogen associations in surveillance testing detection or known illness outbreak events.

Preparing to collect a sample

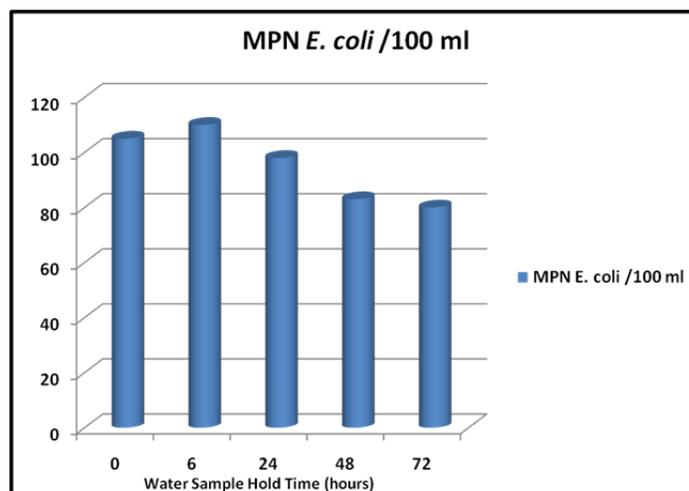
1. Organize supplies –
 - ***Sterile sampling containers***; most contract labs will provide a packaged, sterile sample container as a 100ml snap-lid or screw-capped vessel for both sample collection and shipment. Some provide a break-away dip handle for extra reach and to prevent hands being immersed in the water or touching the rim and contaminating the sample to be analyzed.
 - ***Indelible (water-proof) pen or marker***; use the marker to complete all information requirements on the label, which should already be attached to the sample container (date; location code; time; initials). The location code should correspond to a position or well-head number on a Water Sanitary Survey Map.
 - ***Sterile, single-use gloves***; use gloves on clean hands between each sample site.
 - ***Packaged alcohol swabs or wipes***; if sampling from a spigot or shunt-valve, wipe the inside orifice (opening) first with one side of the wipe and then the outside rim with the opposite side.
2. Organize holding and shipping containers-
 - Clean insulated cooler
 - Racks to hold sample containers upright is preferred
 - Frozen gel-ice inside cooler to pre-cool

Taking a water sample

1. Prevent dust, soil, or other debris from contacting the sample container during transportation to and at sampling site.
2. Do not open the sample collection container until immediately before labeling and sampling at site.
3. Do not allow glove finger-tips to contact the underside of container lid, container lip, or inside of container rim at any time.
4. Orient the container with the label angled and facing up from the water collection side.
5. Fill the container slowly to minimize any splashing onto the outside of the container
6. Do not fill the container above the designated Fill-Line or 100 ml mark.
7. Carefully re-cap the container and wipe the outside rim with a single-use alcohol wipe;
8. Place on gel-ice or in rack in cooler

9. Transport or ship the sample(s) to the service lab. Standard Operating Procedures (SOP) for water analysis for many agencies, including the US EPA and USGS, specify a 6h delivery time from sample to lab and a maximum of 24h between sample collection and start of analysis. In practical terms for on-farm food safety, it is generally accepted that adequately chilled samples must be received by the service lab within 24 hours of collection.

* **SPECIAL NOTE:** While adherence to agency standards for prompt processing of water samples is a Best Practice the remote nature of many agricultural areas, relative to available test labs may make this expectation impractical. While the hold time under refrigerated conditions (<40F) can be critical for on-farm water quality standards for domestic use or crop foliar sprays, where indicator levels are expected to be very low, it is not as critical for surface water sources intended for irrigation. *E. coli* populations decline over time at 40F but don't experience a precipitous drop within 72h. Short hold times also allow for re-testing samples if the outcome is unexpected and duplicate samples from the same location and time-point are taken; very high counts (> 1000 *E.coli* /100ml) may reasonably trigger a re-test of a retained refrigerated sample to eliminate a lab anomaly. High counts should always trigger an on-site investigation at the same time a re-test may be in progress.



Collection at a Well or Pressurized Distribution System

1. Run water through spigot or service connection for at least 3 minutes to purge line
2. Collect sample in a clean and sanitized container of at least 1L; ex. wide mouth plastic jars or beakers. Larger containers make sample collection from pressurized sources easier to handle.
3. Pour (or by edge immersion) required sample volume(s) into labeled container for submission to service lab as above.

Collection of Surface Water

1. Ideally, collection should be at the location and depth of the water intake to the irrigation distribution or booster pump. Preferably, the sample should be taken from the pump discharge vent or a sample-shunt valve.
2. Follow guidance in ***Taking a Water Sample*** to minimize the chance of contamination with sediments from a shoreline. Rule-of-thumb practice is to take samples at least 0.5 m from the edge of a reservoir or flowing source. For ponds and reservoir, slow moving surface waters and canals, or cisterns it is common practice to clear an arms-width area within immediate reach of all leaves, debris, pollen, algae, and other foreign materials before taking a sample, as practical for the conditions.
3. When sampling surface water from canals at the farm/field level, it is in the growers interest to run water through the field canal and sump accumulation reservoir for at least 5 min (if last irrigation was within 48 h) or 15 min (if last irrigation greater than 48h), especially if daily air temperatures exceed 25C (77F).

Collection at the Point of Crop Irrigation

1. Several produce food safety guidance schemes strongly emphasize water testing at the field level including, sprinkler-heads, micro-sprinkler emitters, and either drip-line manifolds or individual drip tape lines. The purpose is to monitor the Water Sanitary conveyance or distribution system for each specific production lot or block. Sprinkler pipe and gated pipe sections, in particular may be susceptible to contamination by soil or small animals during storage, handling, and during placement in the field.
2. Special caution should be taken to prevent contamination of the sample container with field soil during collection.
3. Run water through nozzle-head for at least 3 minutes to purge line
4. Collect sample in a clean and sanitized container of at least 1L; ex. wide mouth plastic jars or beakers. Larger containers make sample collection from pressurized sources easier to handle.
5. Cap collection container and walk to a dry edge of the field outside the area being irrigated. Carefully clean hands and put on a new pair of gloves.
6. Pour (or by edge immersion) required sample volume(s) into labeled container for submission to service lab as above.

For more information on issues in Water Quality Standards for Irrigation of Fresh Produce please see Suslow, T. 2010. Analysis of the Standards for Irrigation and Foliar Contact Water. Peer- Reviewed Issue Brief available at <http://www.producesafetyproject.org/>