

Wash water safety

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Water is used during growing for irrigation and spraying, and after harvest for washing, unloading of field containers (water dumps), chemical treatment, hydro-cooling and top icing. In some hydroponic systems, water is constantly in contact with the roots of produce.

In assessing the risk of contaminating produce from using water, factors that need to be considered are the source of the water, when and how the water is used and the type of produce.

Taste, odour and colour may be the first indication of a potential food safety hazard, but should not be relied upon to assess water. Microbes used as indicators of faecal contamination of water are *E. coli*, thermotolerant coliforms and faecal coliforms.

Source of water

Water is sourced from creeks and rivers, dams, bores and water storage tanks, and may be contaminated by microbes or chemicals. Water sources used for produce need to be managed to minimise potential contamination by factors impacting on the water quality.

- Water from creeks and rivers may be contaminated with microbes if it flows near intensive livestock operations such as feedlots, dairies, piggeries and near areas of high human population. Chemical contamination may occur near industrial or agriculture areas that may release chemicals into the water sources.
- Water from dams may be contaminated by microbes from surface run-off and entry of livestock or bird life, or by chemicals if the chemical storage or spray rig washing and filling areas are close to the dam or watercourse.
- Water from bores may be contaminated by microbes from seepage from septic systems or from heavily grazed catchment areas.
- Water storage tanks (commonly used for rainfall



storage) may be contaminated by microbes from birds, rodents or other animal faeces on the roof and in the gutters of the roof where water is collected, and from dead birds, rodents and other animals in the gutters or tank.

- Water from rivers, creeks or dams with toxic algal blooms

Different water sources may also have different levels of contamination. It is therefore important to test each water source used to assess the suitability of that water source for different preharvest and postharvest uses. For example, water in one dam may be suitable to irrigate a potato crop but may not be suitable to irrigate a lettuce crop. Records need to be maintained to identify where water is sourced and used, so if there is a food safety problem there is traceability to clearly show which water was used on each crop. This does not mean that a record is needed each time water is used, a general statement can be made and then any changes in use recorded.

Reclaimed water

Reclaimed water is defined in Australia as water derived from sewage systems and industrial processes. Reclaimed water used on produce must meet the specifications for water for use on commercial food crops or meet the specifications for use on commercial food crops **consumed raw or unprocessed** (defined in the Australian Guidelines for Water Recycling as log reductions of 6, 5 and 5 for viruses, protozoa and bacteria respectively. The water quality objective of treatment is *E. coli* < 1/100 ml).

Lower quality water may be used for irrigation of fresh produce. However, there will be restrictions on the method of irrigation for most crops (i.e. reclaimed water should not come into contact with the harvestable part of the crop). If reclaimed water is used, guidelines recommended by the Environmental Protection Agency (EPA) or other relevant authorities must be followed. Purchase reclaimed water from a supplier approved by the EPA (or other relevant authority) and obtain certification of water conformance with the requirements.

Type of produce

The part of the produce that is harvested and the way it is consumed affects the risk of microbial contamination. The risk for produce that has an edible skin and is generally eaten uncooked can be higher than for produce that is peeled or cooked before eating.

Use of water

The risk of microbiological contamination is higher if the water is applied to the edible parts of produce immediately before harvest or during packing. This may include overhead irrigation applied just before harvest, wash water, water in post-harvest chemical dips/sprays, water in unloading tanks and troughs, water in hydro-coolers and water used for top icing of packages.

The risk is greater for water that is recycled and not adequately treated or maintained, particularly for washing produce. Irrigation water that does not contact produce, such as trickle irrigation, is a low risk. The quality of the water used for washing hands and cleaning surfaces or equipment that come into direct contact with produce needs to be considered as a potential risk.

Testing water

It is impractical to test water for every possible microbiological pathogen. An easier approach to assess the risk of microbiological contamination is to test for the presence of a group of bacteria called faecal coliforms. They are also known as thermotolerant coliforms because they can tolerate high temperatures (up to 45°C). Some of these thermotolerant coliforms, such as strains of the bacteria *E. coli*, have caused outbreaks of food-borne illness.

What to test for

Sometimes tests may be carried out for thermotolerant coliforms. Thermotolerant coliforms are a group of bacteria, including, *E. coli*. Testing for thermotolerant coliforms is a less precise indicator of faecal contamination.

Testing water for *E. coli* provides an indication of faecal contamination of the water, which may lead to microbial contamination of the produce. The acceptable levels of *E. coli* depend on how the water is used, the type of produce and whether the organisms will survive on the produce. In addition, the extent of the contamination of the water source, and hence the likely contamination of the produce, will determine the program of produce testing needed to verify effective control.

The following table identifies the acceptable microbial levels for different water uses:

| Water Uses | Acceptable limit |
|--|---|
| Preharvest water contacting the harvestable part of a crop that has an edible skin and is generally eaten uncooked | <i>E. coli</i> ≤ 126/100ml |
| Preharvest water contacting the harvestable part of a crop that is peeled or generally eaten cooked | thermotolerant coliforms < 1000/100 ml |
| Preharvest water that does not contact the harvestable part of the crop | thermotolerant coliforms < 1000/100 ml |
| Postharvest water used for water dumps and initial washing of produce that is peeled or generally eaten cooked | thermotolerant coliforms < 1000/100 ml |
| Postharvest water used for final washing or treatment of produce that is peeled or generally eaten cooked | <i>E. coli</i> <1 /100 ml (i.e. potable water) |
| Postharvest water contacting produce with an edible skin and that is generally eaten uncooked | <i>E. coli</i> <1 /100 ml |
| Handwashing and cleaning water | <i>E. coli</i> < 1/100 ml |

Treating water

Where there is a significant risk of contaminating produce from the water used, treatment of the water with sanitisers may be used. Sanitisers used on-farm for fresh produce need to be approved by the Australian Pesticides and Veterinary Medicines Authority (APVMA, website www.apvma.gov.au or phone (02) 6210 4700).

There are a number of chemical sanitisers and non-chemical sanitising methods that can be used to treat water and technical advice should be sought to ensure that the best option is used for the type of microorganism to be targeted. The common options include:

- Chlorine
- Iodine
- Chlorine dioxide
- Ozone
- Chloro-bromine compounds
- Ultraviolet light
- Hydrogen peroxide

- Peracetic acid
- Peroxy compounds (combinations of hydrogen peroxide and peracetic acid)

Many factors determine how well a sanitiser reduces microbial loads. These include the:

- type of produce
- type of microorganisms present
- numbers of microorganisms on the produce and in the water
- chemical conditions of the water such as pH
- physical conditions of water such as temperature and amount of organic material present
- concentration of the sanitiser
- contact time between the produce and the sanitiser

It is important to carefully review the best water treatment for the operation, based on sound technical advice and following the manufacturers guidelines. Treatment of water must be monitored to ensure that it achieves the desired level of microorganism control. Records must be maintained, including the method, frequency and results of treatment.

Assessing the risk of microbiological contamination from water

Water used for irrigation

The risk of microbial contamination is higher if the water is applied to the harvestable parts of produce immediately before harvest. Irrigation water that does not directly contact the harvestable part of the crop, such as trickle irrigation, is a low risk.

Water used for crop spraying

Water used for preharvest spraying and to apply chemicals and foliar fertilisers generally poses a lower risk of microbial contamination, as the sprays are usually not applied immediately before harvest. Where sprays are applied to the harvestable parts of crops that have an edible skin and are generally eaten uncooked, the risk assessment and hazard analysis for preharvest water should be used.

Water used for hydroponics

Water used in hydroponics may pose a significant risk of microbial contamination of produce for systems where the nutrient solution contacts the harvestable part of the crop. For these systems, the risk assessment and hazard analysis for preharvest water should be used.

An example is the nutrient film technique used for hydroponic lettuce. The nutrient solution is recirculated and in constant contact with the roots,

and may splash onto the lettuce head during harvesting and packing. The nutrient solution should be sanitised and monitored to maintain the water quality during the solution life cycle.

Run-to-waste systems generally pose a lower risk as they are mostly used for crops where the nutrient solution does not come in contact with the harvestable part of the crop.

Water used during or after harvest

Water may be used during or after harvest for some produce during the following process steps:

- unloading of field containers and bins (water dumps and troughs)
- washing
- chemical treatment with fungicides and insecticides
- hydro-cooling
- top-icing

For produce with an edible skin that is generally eaten uncooked, water applied during or after harvest can pose a significant risk and all water used after harvest must be potable (*E. coli* <1/100ml). Water applied during or after harvest to other produce generally poses a lower risk of contamination of the harvestable portion. For these types of produce the water used for the final rinse / wash must be potable. For example, water used for



the initial dirt removal wash steps for potato needs to conform to the preharvest water microbial standard of thermotolerant coliforms < 1000/100ml whereas the final wash water must be potable.

Use the Postharvest water risk assessment to assess the risk of microbial contamination of the produce.

Cross contamination of hands and cutting knives can occur in food service and home kitchens if there is gross contamination of the skin. Where gross contamination may occur (for example, water from a dam beside an animal feedlot), test a sample of the produce using *E. coli* as the indicator organism. If the level of *E. coli* exceeds 20 /g, either treat the water or use an alternative water source.

Water used for hand washing

Water used for hand washing should be potable. Use town water or treated water supply if it is available. If a treated water supply is unavailable,

test the water for presence of *E. coli*. The acceptable level is *E. coli* < 1 /100 ml (i.e. potable water). Hand sanitiser must be available for workers upon exiting toilets. If the water used for hand washing is prone to faecal contamination, all workers directly handling produce should use hand sanitisers.

Useful links and contacts

Freshcare and food safety resources

http://www.frontlineservices.com.au/Frontline_Services/INFO.html

National

Recycled Water web hub with links to each state's guidelines

<http://www.recycledwater.com.au/index.php?id=2>

and for brochures

<http://www.recycledwater.com.au/index.php?id=97>

Australian Drinking Water Guidelines (2011)

http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/eh52_aust_drinking_water_guidelines_1.pdf

State

New South Wales

Office of Environment and Heritage, EPA

Ph: 131 555 info@environment.nsw.gov.au

Guidelines for effluent reuse by irrigation

<http://www.environment.nsw.gov.au/resources/water/effguide.pdf>

Northern Territory

Dept of Health

Ph: 1800 095 646

Guidelines for private water supplies

[http://www.health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/42/67.pdf&siteID=1&str_title=Guidelines for Private Water Supplies.pdf](http://www.health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/42/67.pdf&siteID=1&str_title=Guidelines%20for%20Private%20Water%20Supplies.pdf)

Advisory service

ph: 08 8999 4455

water.nretas@nt.gov.au

General water resource information includes some factsheets translated into Vietnamese.

<http://www.nt.gov.au/nreta/publications/natres/waterfactsheets.html>

Queensland

EPA

Ph: 137468 info@derm.qld.gov.au

Water recycling guidelines

<http://www.derm.qld.gov.au/water/regulation/recycling/guidelines.html>

Food safety and other information

<http://www.health.qld.gov.au/foodsafety/>

South Australia

EPA

Ph: 08 8204 2000 epainfo@epa.sa.gov.au

Reclaimed water guidelines

http://www.epa.sa.gov.au/xstd_files/Water/Guidelines/Imria.pdf

Tasmania

Department of Environment, EPA

Ph: 03 6233 6518

EnvironmentEnquiries@environment.tas.gov.au

Guidelines for using recycled water

<http://www.environment.tas.gov.au/file.aspx?id=1698>

Victoria

EPA

Ph: 1 300 EPA VIC or 1 300 372 842

contact@epa.vic.gov.au

Guidelines for the use of reclaimed water

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/515bc2fde7bf93f44a2565b6001ee896/64c2a15969d75e184a2569a00025de63/\\$FILE/464.2.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/515bc2fde7bf93f44a2565b6001ee896/64c2a15969d75e184a2569a00025de63/$FILE/464.2.pdf)

Western Australia

Water Corporation

Ph: 131385 customer@watercorporation.com.au

general publications on water quality

http://www.watercorporation.com.au/P/publications_water_quality.cfm

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