



FACTSHEET

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WATER QUALITY STANDARDS IN AGRICULTURE

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Introduction

Water is an important resource for all types of agriculture. It is used in each step of production, from irrigating crops to washing in a packing plant. Different standards of water quality exist depending on the water's purpose; a description of the types of water used in agriculture and applicable requisites follows.

Contaminants

There are two forms of contamination to be concerned about, biological and chemical. Biological contamination is caused by the presence of bacteria, viruses, and other microorganisms. These organisms can cause food borne illnesses and are a serious concern in agriculture. Specific groups of organism such as coliforms and generic *E.coli* are used as indicators of contamination. While these indicator organisms are unlikely to cause illness by themselves, they point to the possible presence of more pathogenic organisms such as *Salmonella* or *E.coli* O157:H7. The total coliform parameter is used as an indication of potential contamination. *E.coli* is used as a specific indicator of fecal contamination.

Chemical contamination arises when chemicals from industrial, municipal, or agricultural sources enter a water source. Certain chemicals can cause illness or impact food safety or quality.

Potable Water

Potable water is also referred to as drinking water and it is safe for human

Table 1: Examples of water quality parameters that have Maximum Acceptable Concentrations and Aesthetic Objectives for potable water (for full list see Health Canada, 2014)

Maximum Acceptable Concentrations
<ul style="list-style-type: none">• <i>E. coli</i>• Total coliforms• Select chemical elements such as Boron, Cyanide, Fluoride, Lead, Mercury, Nitrate, and Nitrite
Aesthetic Objectives
<ul style="list-style-type: none">• Total dissolved solids• Colour• Select chemical elements such as Chloride, Copper, Iron, Manganese, Sodium, Sulphide, and Zinc

consumption. To meet the microbiological standards, potable water requires a total coliform count of 0 colony forming units (CFU) per 100 mL and *E. coli* count of 0 CFU per 100 mL (Health Canada, 2014).

Potable water must also meet additional parameters which have either maximum allowable concentrations (MAC) or 'aesthetic objectives' where it is suggested to keep the maximum concentration below a certain level to enhance visual appearance or taste (Health Canada, 2014). Certain chemical compounds like lead, mercury, and nitrogen compounds have MACs whereas total dissolved solids and zinc have objectives for aesthetics (Table 1).

Pre-Harvest Water

Water used in production activities such as irrigation, pesticide and fertilizer

applications, frost protection and equipment cleaning fall under the pre-harvest water category. This water comes from surface water sources like lakes, ponds, rivers, and streams, from groundwater sources, or from stored sources water like cisterns.

Regulations dictate that water used for agricultural purposes, specifically irrigation and pesticide and fertilizer applications, must meet defined minimum water quality standards. It must have less than 1000 CFU total coliforms per 100 mL of water and less than 100 CFU *E.coli* per 100 mL of water. The water must be tested at minimum twice per year; once prior to the season and again mid-season. It should be tested at both the source and the point of delivery.

Post-Harvest Water

Processes that require water after harvest include fluming, washing, final rinsing, misting, making ice, cleaning of equipment and hand washing. The sources for this type of water include ground water, municipally supplied, and stored water from cisterns.

The legislation is clear that potable water must be used for final rinsing. Untreated and recycled water or non-potable water may only be used for pre-washing and must be followed by a potable rinse. The sampling guidelines for post-harvest water are the same as pre-harvest water; it must be tested pre- and mid-season and at the source and point of delivery. If water is to be stored, tank cleaning is required to ensure that the water does not lose potable water status while in storage.

Water Recycling

When planning to reuse water, several steps need to be followed. The quality of the water should be tested to determine its suitability. If the water is to be used in pre-harvest applications then treatment may be minimal but if it is to be recycled within post-harvest uses then treatment becomes increasingly important. The post-harvest water for final rinses will need to meet potable water standards. Treatment necessary could include reducing solids, removing chemical compounds, removing microorganisms, and increasing the oxygen content depending on the quality of the incoming water.

Record Keeping

There are several different types of records associated with water that should be kept. Maps of the various water sources showing the inlets must be kept as well as diagrams demonstrating the water flow through treatment systems and washing lines. All water tests and treatment and monitoring records should be stored. Auditing programs for food safety will require records be kept for a certain length of time; for example, CanadaGAP requires records be saved for two years.

References

Health Canada. (2014, October). Guidelines for Canadian drinking water quality - summary table. In *Environmental and Workplace Health*. Retrieved August 6, 2015, from http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/sum_guide-res_recom/index-eng.php

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