

Information concerning produce crops and home gardens after flooding, September 19, 2013



Crops in direct contact with floodwater from rivers

If the edible portion of a crop is exposed to flood waters, it is considered adulterated under section 402(a) (4) (21 U.S.C. 342(a)(4)) of the Federal Food, Drug, and Cosmetic Act and should not enter human food channels.

Available from:

(<http://www.fda.gov/food/guidanceregulation/guidancedocumentsregulatoryinformation/emergencyresponse/ucm287808.htm#eval>) (October 2011)

Crops in or near flooded areas but where flood waters did NOT contact the edible portion of the crops

Growers should evaluate the safety of the crops for human consumption on a case-by-case basis for possible adulteration.

See "Produce Safety and Flooded Fields" (<http://ohioline.osu.edu/anr-fact/pdf/0027.pdf>) (2012) for detailed risk assessment criteria.

It is recommended to discard leafy greens (lettuce, cabbage, spinach) and berries because these are highly susceptible to contamination which is difficult to remove and these crops are often consumed raw.

If the edible portion of a crop was grown underground, and the crop can be safely harvested without cross-contamination from soil, equipment, bins or tools, then some types of produce such as carrots, turnips and potatoes (root crops), can be harvested. Other firm produce such as winter squash, pumpkins, and peppers—if the crop can be safely harvested without cross-contamination from soil, equipment, bins or tools—can be washed, sanitized, and rinsed.

Sanitation information for produce

Please note this information from the Colorado Department of Health and Environment: water for washing produce before taking it to market must be from an approved source. Water should not be used if under a Boil Advisory unless it has been adequately boiled. Due to the extent of the flooding there is likely raw sewage,

chemicals, toxics and numerous other unknowns present in the water that may not be deactivated or killed by traditional bleach.

Chlorine bleach solutions, made with water from approved sources, may be used for sanitizing raw fruits and vegetables. Most resources for produce harvested from a field WITHOUT direct contact from flood water recommend a sanitizer concentration of **200 ppm total chlorine** to achieve the desired sanitizing effect. Contact times of **one to two minutes** are typically sufficient to achieve a thorough kill.

Step 1) Dip produce in wash water to remove soil

Step 2) Dip in sanitizer solution* for 1-2 minutes

Step 3) Rinse in potable water, changing rinse water as needed

200 ppm chlorine = 2 Tablespoons 5.25% unscented bleach per gallon of potable water*

*Soil and organic material in water will reduce chlorine impacts with successive washing, so testing with chlorine ppm test strips is advised to maintain desired ppm

From: Oklahoma State University, Guidelines for the Use of Chlorine Bleach as a Sanitizer (2010) <http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-963/FAPC-116web.pdf>

The regulations (21 CFR Part 173) specify two conditions for the permitted use of hypochlorite solutions in washing produce:

- The concentration of sanitizer in the wash water must not exceed 2000 ppm hypochlorite.
- The produce must be rinsed with potable water following the chlorine treatment.

The regulations do not specify a permissible residual level of chlorine. Presumably, the fresh water rinse eliminates any potential problem with residual chlorine. As a practical matter, residual chlorine would in most foods produce highly objectionable flavors and odors well before becoming a safety hazard. Typical municipal water systems produce potable water with a residual available chlorine level of 0.25 to 2 ppm.

From Iowa State University Extension GAP Center

<http://blogs.extension.iastate.edu/iowagap/2013/06/24/using-produce-from-flooded-gardens/> (2013)

Never use or share produce from a flood-damaged garden until you are sure that all contamination has been removed from the garden, usually a period of at least one month after the last incidence of flooding.

Another way to think about this, is to assume that the floodwater contained manure and refer to the Good Agricultural Practices related to using untreated manure:

- Incorporate untreated manure into soil prior to planting (to induce microbial competition).
- Do not apply untreated manure or leachate from manure to produce fields during the growing season prior to harvest.

- Maximize the time between application of manure and harvest of produce (at least 120 days).
- Do not use untreated manure where the above GAPs are not possible, such as for fresh produce harvested throughout most of the year.

CSU Extension resource with information about flooded garden produce:

http://www.floodsafety.com/media/pdfs/cleanup/Cleanup_after_flood.pdf

Resources for Flood-Damaged Field Crops, Purdue University; this information is primarily for corn and soybeans but has assessment and crop insurance information.

<http://www.agry.purdue.edu/ext/corn/cafe/flood/> (2011)

Resource for Organic Production

Impact of Flooding on Organic Food and Fields, Univ. of Minnesota:

http://swroc.cfans.umn.edu/prod/groups/cfans/@pub/@cfans/@swroc/documents/asset/cfans_asset_229667.pdf (2007)

CSU Fact Sheet 6.704, Emergency Water Supplies and Treatment

<http://www.ext.colostate.edu/pubs/natres/06704.html> (6/11)

Link to CSU Extension's Flood Recovery Resources

<http://www.ext.colostate.edu/pubs/drought/flood.html>

Link to The Disaster Handbook from Univ. of Florida, especially chapter 6:

<http://disaster.ifas.ufl.edu/chap6fr.htm>

For more specific information regarding produce crops or garden produce, please contact your county or regional CSU Extension Office.

Information below provided by the Produce Safety Alliance, Cornell University, 2013

Food Safety for Flooded Farms

In the aftermath of flooding, fruit and vegetable crops may pose a food safety risk.

These catastrophic events can have a lingering and potentially hazardous impact on public health. Crops and other food commodities exposed to flood waters can be considered adulterated and not suitable for human consumption or animal feed. The U.S. Food and Drug Administration (FDA), as well as Universities and Extension Programs across the country, have provided guidance on how to handle manage flood crops, keeping food safety in mind.

Assessing the Risk

Before cleaning up or destroying crops in flooded fields, check with your crop insurance and/or their local Farm Services Agency (FSA) representatives regarding exact documentation to certify losses, procedures for initiating claims, and possible financial assistance.

Several questions should be answered in order to assess the safety of flood covered or damaged crops. The first assessments should involve determining the extent of flooding, what type of contaminants could be in the flood water, and what types of crops are being affected.

Types of Flooding

There are two types of flooding. The first is more typical and occurs after a heavy downpour when fields become saturated and water pools on the soil surface. This type of flooding can reduce yields and even kill plants, but usually will not result in contamination of produce with human pathogens. The second type of flooding is more severe and occurs when water or runoff from surface waters such as rivers, lakes, or streams overflow and run into fields. Flood waters, as described in the second definition, are likely to contain chemical and biological contaminants that may be harmful to the health of humans and animals.



Keith McCall—Photo Courtesy of the National Resource Conservation Service

Sources of Contamination

There are two primary types of contamination that are of concern for food crops. Not only are these contaminants a concern for human health, they can also be harmful if fed to livestock.

Microbial Contamination

1. Pathogens may include bacteria, parasites, and viruses.
2. Sources of microbial contamination might come from upstream farms, rural septic systems, overflow from industrial sewage systems, and raw manure or feces.

Chemical Contamination

- Chemical contaminants may include heavy metals, petroleum products, pesticides, or other agricultural chemicals.
- Sources of chemical contamination will vary greatly depending on the severity of flood, proximity to operations using chemicals, or runoff from roadways.

Determining Whether Your Crop Is 'Safe'

If the edible portion of the crop has been exposed:

Unfortunately, if the edible portion of a crop has been exposed to flood waters, it is considered adulterated by the U.S. Food and Drug Administration and should not enter human food channels. There is no practical method to recondition the edible portion of a crop to provide reasonable assurance of human food safety.

If the crop comes in proximity to or is exposed to a lesser degree:

Crops near flooded areas or those that were flooded without the edible part of the plant coming in contact with the flood water (such as sweet corn or staked tomatoes) need to be evaluated on a case by case basis. These crops as well as those in which the edible portion develops after flood waters recede are not automatically deemed adulterated.

1. Is the edible part of the plant developing and if so, how far above the flood water was it?
2. Is there any evidence that floodwater splashed up onto edible portion of the crop? Floodwater almost certainly contains some pathogens and/or chemicals.
3. If feeding to livestock, was the crop exposed to prolonged periods of moisture and stress that could promote fungal growth or molds that could produce mycotoxins?

Additional Concerns and Considerations

- Place markers at the high water line so you can identify the areas where crops were in contact with flood waters.
- Leave a 30 foot buffer between flooded areas of fields and adjacent areas to be harvested for human consumption; this is to accommodate a generous turn-around distance for equipment to prevent contact with flooded soil and avoid cross-contamination of non-flooded ground.
- Workers should wear protective clothing such as rubber boots and rubber gloves when working in fields that were flooded. Protective clothing should be discarded or thoroughly cleaned after working in flooded areas.
- If your well head was submerged, re-test your well water to make sure that only safe, potable water comes into direct contact with produce.
- Allow at least 60 days to elapse between flooding and planting of the next human food crop. In absence of known or suspected biological or chemical contaminants in flood waters (such as sewage discharge or run-off from industrial sites) you can replant after 60 days.
- Organic growers should contact their certifier to discuss damage to the crop. Flood waters might contain residues of prohibited substances.

Recommended Resources

FDA Notice for Floods, Hurricanes, and Power Outages: <http://www.fda.gov/Food/FoodDefense/Emergencies/FloodsHurricanesPowerOutages/ucm112723.htm>

FDA Definition of Adulterated Food:

<http://www.fda.gov/RegulatoryInformation/Legislation/FederalFoodDrugandCosmeticActFDCAAct/FDCAActChapterIVFood/ucm107527.htm>

The Questions on Salvaging Flooded Crops, John E. Rushing, Ph.D. North Carolina State University. Department of Food Science, FSE 91-21.

<http://www.ces.ncsu.edu/depts/foodsci/ext/pubs/salvagingfloodedcrops.PDF>

Impact of Flooding on Organic Food and Fields, Jim Riddle - Organic Outreach Coordinator, University of Minnesota.

http://swrcc.cfans.umn.edu/prod/groups/cfans/@pub/@cfans/@swrcc/documents/asset/cfans_asset_229667.pdf

Produce Safety Alliance

web: <http://producesafetyalliance.cornell.edu>