Floodwaters contain contaminants such as chemicals, heavy metals, molds, bacteria, sewage, human (disease) pathogens, and fungi that can cause and speed fruit and vegetable rot or spoilage (1, 8). For this reason, flooding of produce fields is considered a high risk to produce safety and quality. There are two types of water events that adversely affect the quality and safety of produce described as follows:

Flooding versus Pooling

Flooding:
- Occurs when water flows or overflows onto land, out of control, after heavy rainfall or other events.
- Water travels and collects contaminants that will sully produce and can settle onto plants and soil as the floodwaters crest and recede.
- Considered high risk.

Pooling:
- Standing water.
- Occurs after rain or irrigation when the topography of the land contains a depression where water collects and pools.
- Not considered high risk to produce safety.

The bottom line: Floods adulterate produce. Under FDA guidance, adulterated produce cannot be sold or consumed, fresh or as a processed product, due to the high risk of contamination by pathogens from sewage and animal manure, chemical contaminants, and physical debris (1, 8).

There is no effective sanitation method for fresh produce after a flooding event (1). Although the safest strategy would be to destroy the crops that have been affected by flooding, this might not be the most practical solution. Depending on when flooding occurs during the crop growing cycle, and what portion of the crop came in contact with floodwater, it may be appropriate to perform an assessment of food safety risks for the flood-affected crop (2).

When edible portions of crops come into direct contact with floodwater…
- The crop is adulterated and should not enter the human or animal food chains.
- There is no known or accepted method to recondition the edible crop to assure human food safety.
- Crop must be disposed of and kept separate from crops that will enter the food chain.
This applies to ALL crops (grown above or below ground, with durable rind, grains, and nuts).

This applies to harvested produce that may have contacted floodwater in a flooded facility as well.

...THEY MUST BE DISPOSED OF. Disposal procedures should ensure that tainted produce does not cross-contaminate unaffected crop (1). Ensure runoff or leachate from cull piles do not contaminate unaffected fields. Clean and sanitize bins and tools that were used to remove flooded crop or equipment used to till under crop.

BUT, when EDIBLE PORTION OF CROP DOES NOT CONTACT FLOODWATER...

• Separate produce affected by flood from other products immediately to prevent cross-contamination.

• Perform a risk assessment to determine if the crop is suitable for human consumption.

A DECISION TREE is included in this fact sheet to help perform a risk assessment of the flooded field based on the FDA guidance for flooding (1).

Here also are some assessment tips that apply to all scenarios of flooding in agricultural fields (1):

1. Floodwater origins and movement patterns.
   a. Determine where the water originated. What land has the water traveled over and what could the water have collected on that path?
      i. For example: if water flowed through livestock areas, chances are the water is contaminated with fecal microbes and is a high risk.

2. Likelihood of crops absorbing or internalizing contaminants from floodwater or flooded soil:
   a. Research is still being done on these topics but early results suggest that internalization such as this is dependent on contaminant levels, contaminant type, soil type, water temperature, and crop type.
   b. It is highly recommended to consult expert regulators or other officials when considering this factor.

3. Degree and duration of exposure to flood water conditions.
   a. How deep did it get? How long did it stand? How quick did it dry up?
   b. Associated weather conditions (rain splashing, high winds, temperature).
   c. Associated molds, spoilage microbes, and produced toxins.

4. Waiting period.
   a. Recommended waiting period between soil drying and re-planting vary.
   b. Recommendations of 30–60 days (6) up to 120 based on raw manure application guidelines (7). Waiting periods are recommended to allow time for contaminant levels to diminish. However, while pathogens may decrease, chemical and heavy metal contaminants may remain despite time (1, 8). The only sure way will be to test your soil to know if soil is suitable for planting again (1).

The OSU Fruit and Vegetable Safety Team recommends the most conservative approach for flood events and recommends NOT eating or selling any produce that has grown in a flooded field. However, it is up to every individual farm to perform a risk assessment of their farm after flooding to determine their course of action and possible consequences, pending any final ruling from the FDA or personal customer demands. This document is not a final ruling and is offered for educational purposes only.
Your field has flooded...

Have you planted that field yet?

Yes

Now

Low risk
Recommend Action A

No

Has the crop sprouted or did you use transplants?

Yes

Moderate Risk
Recommend Action A

No

Is / was the edible portion underground (root vegetables) or in contact with the flood water (greens of leafy greens or fruit of plant)?

Yes

High Risk
Recommend Action C

No

Can crop be harvested without cross-contamination from soil, equipment, bins, or tools?

Yes

Low to Moderate Risk
Recommend Action B

No

High Risk
Recommend Action C

Note: Floodwater may wash away seeds, necessitating re-plant. Risk level is raised here because seeds may absorb contaminated floodwater that taints final product.

Note: FDA states that all edibles that have contacted floodwater are adulterated (1). Adulterated food cannot be sold & should not be consumed by human or animal regardless of whether it is fresh or processed, cooked or raw.
Resources


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