



United States Department of Agriculture

**Safeguarding Protocol for the Transport of
Cherry Fruit for Processing Outside the
ECFF Quarantine Zone**

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Agency Contact:

Miami Laboratory
Science and Technology
Plant Protection and Quarantine
Animal and Plant Health Inspection Service
United States Department of Agriculture
13601 Old Cutler Road, Bldg. 63
Coral Gables, Florida 33158

Background:

European cherry fruit fly (ECFF), *Rhagoletis cerasi*, is among the most serious pest of cherries. Larvae feed in the fruit pulp, and may be introduced to new areas through the transport of infested fresh cherries, soil, or fruit from host plants grown in areas where this pest is found. In 2017, APHIS found ECFF on traps hung in wild honeysuckle plants and sweet cherry trees along the Niagara River in New York. This was the first U.S. detection of ECFF, and the distribution has continued to spread in New York. At a meeting with stakeholders in September 2019, cherry growers requested a way to move cherries from within the quarantine area to processors outside of the quarantine. A protocol with necessary safeguarding measures is needed to mitigate the risk of spreading ECFF outside of the quarantine area when fruit are transported for processing.

Current Industry Practices:

Tart cherries being transported from the quarantine areas are handled by a single company, who conducts the harvest and transport of fruit to the processing facilities. Tart cherries are primarily destined for either pitting/processing or juicing. The destination of the fruits are as follows; for juicing, fruit is handled by Bittner-Singer Orchards whose fruit goes to Westfield, New York for juicing. For processing, fruit is transported to either Knouse Foods in Peach Glen, Pennsylvania or to Cahoon Farms in Wayne County, New York. The limited number of individual operations involved in the shipping and processing of fruit is beneficial, as it simplifies the process of communicating safeguarding requirements and ensuring compliance.

Fruit transported for juicing may be shipped “dry” in an unrefrigerated cargo truck. Fruit being shipped for pitting is held in stainless steel bins filled with water and shipped in a refrigerated trailer. In both situations the same container is used, a stainless steel harvest bin with a 42 x 42 inch footprint. Fruit destined for pitting is first chilled for several hours to “firm up” the fruit, making it more amenable to the pitting and processing steps.

The harvest in the quarantine area spans approximately 10 days. The harvest volume is variable, but approximately 80,000 lbs. of cherries per day may be moved from the quarantine zone. This equates with roughly 4 to 5 truckloads per day being moved from the quarantine zone over a 10 day span. Knouse Foods in Peach Glen PA, one of the larger processors, receives between 2-3 truckloads per day from the quarantine zone during the 10 day harvest period. Approximately 20% (by weight) of each load may be waste (this includes the cherry pits and culled fruit), with 6% of the load being culled-intact cherries. Thus a total of 4,800 lbs. of culled-intact cherries may be produced from quarantine fruit each day. However, most of the sites in the quarantine zone are expected to have less than 2 flies captured during the harvest period (based on prior season results), and thus significantly less than 4,800 lbs. of intact-culled fruit will be produced daily.

In general, during processing, various waste, including stems, leaves, pits and culled fruit, are diverted into a water flume which transports the waste to a waiting dump truck where the waste is deposited (the flume water is removed prior to deposition). Waste is then transported offsite for disposal, generally by being spread onto a field.

Safeguarding Protocol:

The following protocol is intended for fruit produced in orchard blocks where 2 or more ECFF have been captured, or where the sugar/salt floatation method indicates ECFF infestation. Fruit produced in an orchard following the APHIS-developed systems approach where less than 2 ECFF have been captured, and where fruit sampling via sugar/salt floatation method does not indicate ECFF infestation, are exempt from the proposed protocol. Fruit which meet this criteria (ECFF-free) may be treated the same as fruit produced in a non-quarantine area.

For harvest/transport/delivery, compliance agreements must designate the process for receiving a permit to move fruit out of quarantine. Additionally, the requirements for safeguarding must be outlined. Key safeguarding measures at this stage involve preventing fruit “spillage” during transport, and ensuring quarantine fruit is properly labeled and not comingled with non-quarantine fruit.

For processing plants the major risk is from mishandling culled fruit which may contain ECFF larvae. The primary safeguarding procedures involve ensuring all fruit delivered from the quarantine zone is either processed or properly disposed of via an approved method.

1. Harvesting and transport:
 - a. Fruit must be transported in an enclosed truck-trailer.
 - b. Bins used for transport must be resistant to fruit spillage, achieved either by the following:
 - i. Filling bins such that sufficient space remains between the rim and the upper limit of loaded fruit. Proposed limit is 6 inches.
 - ii. Use of a lid or other physical barrier.
 - iii. Fruit is submerged in water.
 - c. Fruit bins must be labeled in a way that clearly denotes fruit came from an orchard located in a quarantine zone.
 - d. Prior to closing trailer door, trailer must be visually inspected for flies near the tail gate/loading area.
 - e. Trailer door / tailgate should be kept closed when fruit is not being loaded.
2. Delivery at processing facility
 - a. At the point of delivery the recipient should be made aware that fruit has originated in a quarantine zone. Fruit may only be delivered to a facility under a compliance agreement with PPQ for processing fruit from quarantine zones.
 - b. During the unloading of harvested fruit any spilled fruit will be either returned to the harvested fruit for processing or treated as culled fruit / quarantine waste.
 - c. After unloading of fruit at the processing or refrigerating facility the truck trailer should be thoroughly inspected for any plant material, including spilled fruit. All plant material removed from the truck-trailer should be treated as culled fruit / quarantine waste.
3. Processing
 - a. Fruit processed from a quarantine zone should be isolated from non-quarantine fruit and processed separately. If quarantine fruit is not isolated, then all fruit and fruit waste

- from the processing facility should be treated as quarantine material when processed in the same run as the quarantine material.
- b. Processing must result in a product that cannot contain viable fly pupae. Individually-quick-frozen fruit, heat-processed canned fruit and juiced fruit are acceptable treatments. The end products produced by the processing facility must be listed on the compliance agreement.
4. Destruction of culled fruit, pits and waste from blocks with 2 or more ECFE detections (positive sites).
- a. Inspection of a large sample of fruit (see pre-treatment option under the treatment options section) may be conducted. If no *Rhagoletis* larvae (any species) are found during this inspection the shipment can be processed without any additional requirements. Fruit which passes the intensive inspection as described in the pre-treatment option is treated the same as fruit produced in an area with zero ECFE trap capture.
 - b. If the shipment fails the pre-treatment option, or the pre-treatment option is declined, then all fruit waste, including culled fruit and fruit collected from floor of processing plant, must be treated via an approved method (pits do not require treatment, provided they are separated from the rest of the fruit waste).
 - c. The following processes are acceptable:
 - i. Heat treatment at 132 Fahrenheit for 1 hour (option A).
 - ii. Submersion for 14 days (option B).
 - iii. Return to quarantine zone for disposal within quarantine zone (option C).
 - iv. Deep burial, at least 12 inches of soil (option D).
 - d. The design and equipment of the selected treatment option must be certified by APHIS-PPQ prior to the arrival quarantine fruit.
 - e. Waste fruit can be held on-site prior to disposal provided the following occur:
 - i. Waste bins are held on a paved surface at least 20 feet from soil.
 - ii. Waste bins are properly labeled, indicating they contain quarantine fruit.
 - f. Dumpsters or other storage containers which previously held quarantine fruit shall not be used for non-quarantine fruit unless they are thoroughly cleaned between uses.
 - g. Following heat or submersion treatment, the waste can be handled at the discretion of the facility.

Treatment Options for Fruit Waste:

The following treatments are only necessary for culled fruit (not including pits), which come from a site with positive trap capture (2 flies or more).

Pre-treatment Option: Intensive fruit sampling

The pre-treatment option is designed to allow fruit to be processed without the additional handling requirements for culled fruit. It operates under the assumption that intensive fruit sampling will provide a more accurate estimate of the ECFE infestation rate than trap capture alone. If no larvae of *Rhagoletis* (any species) are detected following the intensive fruit sampling

the fruit shall be considered pest-free and may be handled the same as fruit from a non-quarantine area. Intensive sampling via sugar/salt flotation method should be performed as follows and indicated in the 2019 S&T ECFR BSF Review Report:

- a. Each shipment lot is converted into 20 lb container equivalents by dividing the total shipment lot weight (in lbs) by 20.
- b. The number of cherries sampled per 20 lb container equivalent is based on the original lot size, as shown below.
 - Lot Size: 1,000 to 19,999 lbs – sample 5 cherries per 20 lb container equivalent
 - Lot Size: 20,000 to 39,999 lbs– sample 4 cherries per 20 lb container equivalent
 - Lot Size: 40,000 and over lbs – sample 2 cherries per 20 lb container equivalent
- d. If no *Rhagoletis* (any species) larvae are detected, the shipment may be treated as if it came from a fruit-fly free production area. Additional precautions for handling intact-culled fruit are not needed.
- e. If a larvae of *Rhagoletis* (any species) is detected then all intact-culled fruit must be treated using one of the approved methods (described below).

Option A: Heat treatment

Research indicates that exposure to temperatures of 55.1 °C / 132 °F for 60 minutes will result in greater than 99.99% mortality¹. Acceptable methods for heat treatment include:

- 1) Steam Heating
 - a. Treated materials are held in a container with a lid. The lid should not form a tight seal with the container as pressure may build in the container.
 - b. Steam is introduced into the container at a level below the midpoint of the container.
 - c. Air temperature readings are taken at the surface layer of the fruit at the location furthest from the steam source.
 - d. Once temperature readings surpass 55.1 degrees Celsius allow for continued steam introduction for 1 hour.
 - e. Allow fruit to return to ambient temperature before removal of lid or other manipulation of treatment environment.
- 2) Submersion/immersion heating
 - a. Treated materials are held in a watertight container.
 - b. Container is not more than 80% full.
 - c. Water is added to the container such that contents are completely submerged.
 - d. An immersion type water heater (or multiple units) is added to the container.
 - e. The water is heated to 56 degrees Celsius as determined by a temperature reading made at the surface from three separate locations on sides opposite the heating apparatus.
 - f. Once a temperature of at least 56 degrees °C is obtained heating can be terminated.

¹ Source: Dr. Wee Yee, USDA-ARS, manuscript in preparation. Dr. Yee's research was conducted on *Rhagoletis pomonella*, testing over 24,000 puparia.

- g. Allow container to return to ambient temperature before draining water and other manipulation of fruit.

Option B: Submersion treatment

The following procedure is experimental in that it has not been previously used as a disinfestation method for plant wastes. The procedure is based on the knowledge that *Rhagoletis* larvae and pupae cannot tolerate submersion indefinitely, and that the environmental conditions in decaying organic matter will result in anoxic & low pH conditions that will further increase mortality. Studies on other Tephritidae indicate that larvae and pupae do not survive or pupate normally when submerged in water or highly saturated soil for prolonged periods of time (Taschenberg et al. 1974, Eskafi & Fernandez 1990, Xie and Zhang 2007, Li et al. 2019, Yee unpublished 2019).

Submersion/fermentation treatment

- a. Treated materials are held in a watertight container such as a plugged roll off dumpster or a large capacity tilt truck.
- b. Culled fruit is added to the container, not to exceed 90% of the containers volume.
- c. Water is added to the container such that contents are submerged.
- d. A lid is placed on the container, with a vent or other means which would allow air to escape.
- e. Container is placed on paved surface at least 10 feet from bare ground/soil
- f. Container remains on premise, covered, for 14 days.
- g. Fruit from separate shipments can be accumulated in the same container during the harvest period. The container should be "topped off" with water to the level of the accumulated whenever fruit is added.
- h. Contents can be disposed of as regular waste at the discretion of the operator following the 42 day period.

Option C: Return to quarantine zone

Fruit can be returned to the quarantine zone provided it is transported in a manner which eliminates the possibility of fruit being spilled or otherwise lost during transport. Fruit must be disposed of upon arrival and the disposal must take place entirely within the quarantine zone.

- a. Fruit is loaded in a truck or conveyance which eliminates the possibility that fruit will be spilled. For open air transport (i.e. in a dump truck), the fruit should be loaded no higher than 1 foot below the lowest edge of the container.
- b. The shipping container should have no openings on the sides or bottom of the container which may allow fruit parts or fly larvae to escape.
- c. Once fruit has entered the quarantine zone it can be disposed of via field spreading, dumping at a landfill site or other legal means, provided the fruit will remain in the quarantine zone thereafter.
- d. After dumping, the container used to transport the fruit should be thoroughly cleaned, so as to remove any fruit remnants, emerged larvae, or pupae. The cleaning must occur in the quarantine area.

Option E: Deep burial

The new pest response guidelines for ECFE recommend fruit stripped from infested orchards be double bagged and buried to a depth of at least 1 foot (APHIS PPQ 2017). Double bagging is not feasible based on the volumes and work flow of the processing facilities. There is strong evidence that burial in soil at depth of 20 centimeters (7.87 inches) would prevent the emergence of adults from pupae (Renkema et al. 2012). Burial without double bags at a depth of 1 foot would likely be sufficient to reduce the risk of adults emerging from the burial site. Any additional depth burial depth would provide a buffer.

- a. Fruit is buried under no less than 12 inches.
- b. Fruit from the 10 day harvest period may be held and buried at the same time.
- c. Fruit may be left un-covered in a trench or pit until the end of the 10 day harvest period, provided the fruit is buried immediately at the conclusion of the harvest period.
- d. Sand and soil are acceptable substrates for deep burial. The burial area must be firmly packed and in a location not prone to erosion or other events which may disturb the buried content.

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