Extraction of Blueberry Maggot Larvae from Harvested Blueberry Fruit

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Introduction

The blueberry maggot (BBM), *Rhagoletis mendax* Curran, is present in all major blueberry growing areas of New Jersey, and can regularly infest blueberry fruit. Management of this insect includes the use of sticky traps for monitoring adult emergence and population density, accompanied by repeated insecticide applications after first adult emergence. Even with careful management practices, fruit can occasionally become infested with maggot larvae. Markets can be strict in their lack of tolerance for insects in fruit, and often require a “0%” infestation level for insects, particularly maggot larvae in packed fruit. An “effectiveness check” of the field procedures used in BBM pest management programs can be accomplished by boiling samples of mature berries and extracting any maggot larvae that are present. This is a required procedure for any shipment of blueberries bound for Canada. Maggot larvae are usually first found in berries about 3 to 4 weeks after adult flies are first seen on sticky traps. A simple stovetop or microwave boiling method is presented below.

The Blueberry Maggot: General Background

The insect overwinters in a puparium in the soil, anywhere from 1 to 6 in. deep. Adults start to emerge anytime from early through mid-June. Peak emergence and migration from wild hosts continues from mid-July through mid-August. After 7 to 10 days eggs are deposited on green or ripening fruit just under the skin. Larvae hatch in 2 to 7 days and develop inside the fruit for about 3 weeks. Infested fruit may drop. Mature larvae emerge and pupate in the ground. Pupae may remain in the soil for up to 2 to 3 years. There is one generation per year.

Infested berries become soft and watery. The full grown larva is about 7/16 to 1/2 inch long and white. The body is tapered, with an indistinguishable head at the narrow end (figures F, G, and H).
**Processing Fruit for Maggot Identification**

What you will need (figures A, B, C and D):

- A hotplate, stove, or microwave oven.
- A shallow metal baking pan – 9” x 13” painted black, or a larger black plastic utility pan, usually 20” x 26” x 6” and available in hardware stores.
- A sieve made with 1/4” hardware cloth and sized to fit just inside the pan.
- Two metal saucepans for stove top cooking and/or two microwavable plastic bowls. Each container should hold at least 1.5 qt.
- A wooden spoon or spatula.
- Two 5 gal. buckets, one for water and the other to discard examined berry pulp.
- A well lit work area and counter, and a water source.

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**Procesando fruta para identificar los gusanos**

Lo que va a necesitar (figuras A, B, C and D):

- Un plato caliente, estufa, o horno de microondas
- Un sarten de horniar de metal – 9” x 13” pintado de negro, o un sarten plastico negro normalmente 20” x 26” x 6” y disponible en ferreterias.
- Un colador hecho de tela de ferreteria de ¼” que quepa dentro de el sarten.
- Dos cazuelas de metal para usar en la estufa o dos sartenes platico para usar en el horno de microondas. Cada contenedor debe tener capacidad para 1.5 qt.
- Una cuchara o espatula de madera.
- Dos cubos de 5 galones, uno para agua y el otro para deshechar la pulpa ya examinada.
- Una area bien alumbrada, mesa, y agua disponible.

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Figures A, B, C, and D showing (A) 1 quart of berries cooked and ready to be strained, with a small amount placed on the sieve (B), and being crushed and worked through the sieve (C and D). Process a few ounces at a time, and rinse through the sieve with enough water to cover the bottom of the pan about ½” deep.

Figuras A, B, C, y D ensenado (A) 1 quarto de bayas cocinada y lista para ser colada, con un poco puesto en el colador (B), y siendo aplastado y empujado por el colador (C y D). Procese una pocas onzas a un tiempo, y enjuague por el colador con suficiente agua para cubrir el fondo de el envase como ½” de ondo.
**Process:**

1) Place 2 pints (1 qt.) of berries in a pot, cover with water and bring to a boil. Gently boil for about 2 minutes, or until skins are well broken. A 2 qt. sample is required for fruit that is bound for Canadian markets.

Berries may also be placed in a microwave oven in 1.5 to 1.75 qt. bowls. Set the oven at high for 6 to 8 minutes, being careful not to let the berries boil over.

2) Place a number 4 mesh sieve (or ¼ in. hardware cloth) over a shallow black pan and empty boiled contents onto the sieve. Empty ¼ to ½ cup at a time in a small pan, or ½ to 2/3 cup in a large pan (figure B).

3) Gently crush the boiled berries through the sieve with the wooden spoon (figure C).

4) Repeatedly rinse the remainder of the cooked berries through the screen with water (figure D), and add enough water to the pan to evenly suspend the pulp. The water and pulp mix should be no more than 1/2” deep in the pan. Turn the sieve over and tap it to get all remaining berry pieces into the water.

5) Examine the water and pulp mix for small white maggot larvae from 1/8” to 7/16” long. Count the maggot larvae and repeat the process until the entire 1 to 2 qt. sample has been examined.

**Proceso:**

1) Ponga 2 pintas (1 qt.) de fruta en un sarten, cubra con agua y hierba el agua. Hierba lentamente por 2 minutos, o hasta que las pieles estén bien fracturadas. Se requiere una muestra de 2qt. cuando la fruta está destinada para los mercados de Canada.

La bayas se pueden poner en un horno de microondas en un envase de 1.5-1.75qt. Ponga el horno en alto de 6 a 8 minutos, cuidando para que no se boten las bayas.

2) Ponga un colador con huecos numero 4 (tela de ferretería de ¼”) sobre un sarten y vacie el contenido herbido en el colador. Vacie ¼ a ½ tasa a un tiempo en un sarten pequeño o de ½ a 2/3 tasa en un sarten grande (figura B).

3) Aplaste las bayas herbida con cuidado por el colador con la cuchara de madera (figura C).

4) Enjuague las bayas herbida que quedan por el colador con agua repetidas veces (figura D), y anadele suficiente agua a el envase para suspender la pulpa. La mezcla de agua y pulpa debe de ser no mas de ½” pulgada de ondo en el sarten. Dele la vuelta a el colador y agitelo hasta que las bayas que quedan pegada caigan en el agua.

5) Examine la mezcla de agua y pulpa para ver si encuentra gusanitos blanco de 1/8” a 7/16” de largo. Cuente los gusanos y repita este proceso hasta que la muestra de 1 a 2qt. sea examinada por completa.

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Figures E, F, G, and H. E shows an adult blueberry maggot fly laying an egg on a berry. Figure F shows a maggot larva as it appears floating in the water pan after sieving the berries. Additional detail of a fully grown maggot larva can be seen in figure G, while various sizes of maggot larva are picture in Figure H.

Figuras E, F, G, y H. E enseña una mosca adulta de el gusano de los arandanos depositando huevos en una baya. Figura F enseña una larva como aparece flotando en el agua después que las bayas fueron colada. Detalles adicional de un gusano se pueden ver en la Figura G, mientras que diferentes tamaños de los gusanos se pueden observar en la Figura H.