

Apple Maggot

Rhagoletis pomonella (Walsh)

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The apple maggot (AM), a native of eastern North America, originally bred in large fruited hawthorns (*Crataegus* sp.). Later, it adopted apple as another host, and it has become a major fruit pest in the northeastern United States and Canada. During the early 1980s, the AM became established in California, Oregon, Washington, Idaho, Utah, and Colorado, although it has not yet become a serious pest in the major apple production areas in these western states. Thorough control is necessary because marketed apples must be free from all AM injury.

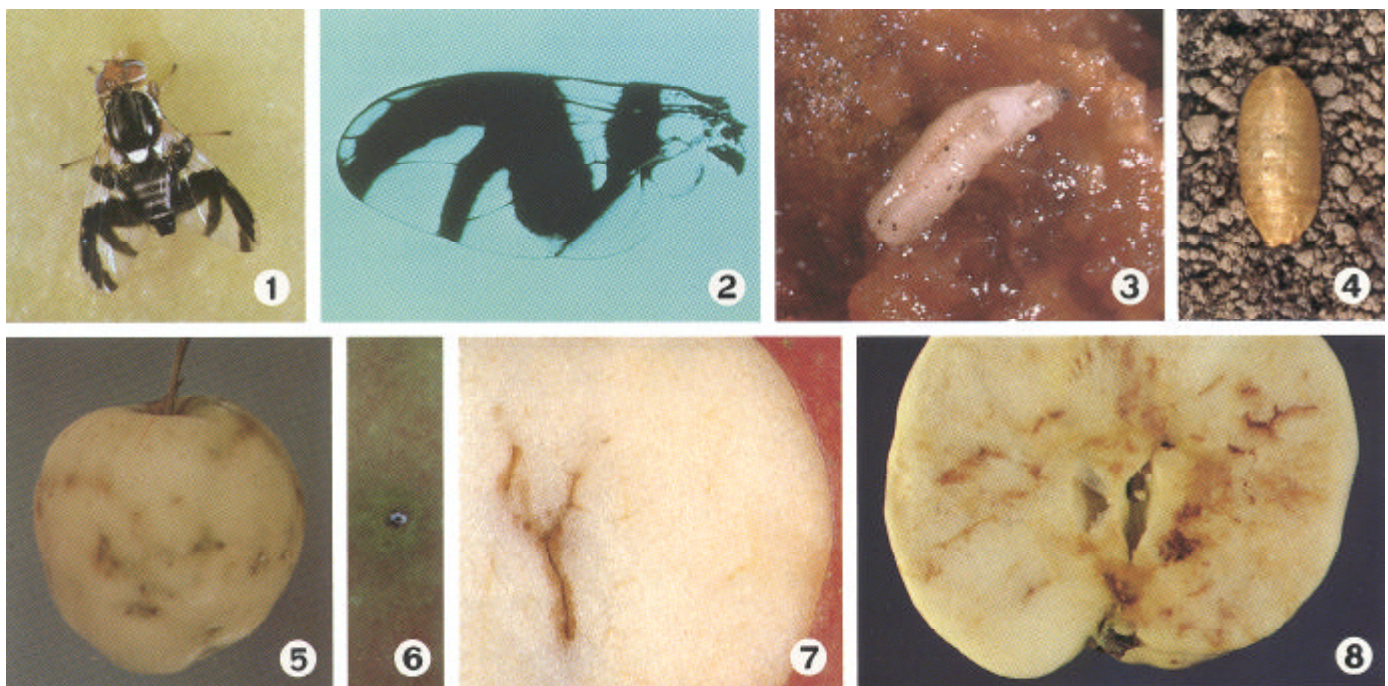
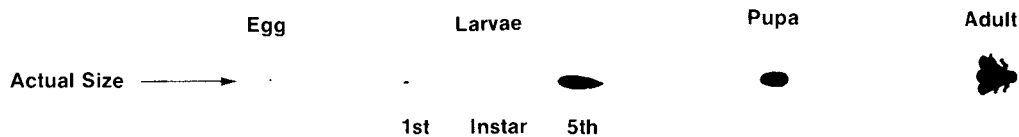
AM normally has a single generation a year, although there are two exceptions: AM may have a partial second generation in the southern part of its range, and some individuals remain in the soil two winters before emerging as adults.

Adults

The first AM adults emerge from the soil from mid-June to early July. Peak emergence occurs during mid- to late July and is usually completed by the end of August. Emergence patterns vary considerably among different geographic locations and even within a specific area, depending on the host and environmental parameters, particularly temperature, soil type, and rainfall. Female flies are black, about 5.2 mm in length, with a wingspan of about 9.3 mm. They have a painted abdomen with four white cross bands (fig. 1). The males are smaller and have three cross bands on a rounded abdomen. AM wings are clear and marked with characteristic black bands (fig. 2). Newly emerged flies are sexually immature and spend considerable time on apple leaves feeding on honeydew excreted by aphids and other insects. The flies mature sexually 7 to 10 days after emergence and congregate on the fruit, where mating occurs. After mating, the female punctures the apple skin with her ovipositor to lay eggs. Females can lay an average of about 300 eggs over a 30-day life span.

Eggs

AM eggs are usually deposited singly just beneath the skin of the apple. The elongate (0.7 mm), curved eggs are smooth and white in color. Eggs hatch after a 2- to 10-day incubation period, depending on the ambient temperature.



Larvae

The legless, cream-colored maggots are elongate, about 7 mm long at maturity, and have a blunt posterior that tapers down to a rounded point containing two black mouth hooks (fig. 3). The larvae pass through three instars, spending 20 to 30 days feeding within the fruit. The larvae develop more rapidly and mortality is lower in earlier-maturing, soft cultivars than in firmer-fleshed, later-ripening apples. Upon completing their third-instar feeding, the maggots drop to the ground, burrow into the soil, and molt to a fourth instar, which is quickly followed by another molt to the pupal stage.

Pupae

AM pupae are found within puparia made from the third-instar skin (fig. 4). The brownish-yellow puparia are about 4 mm long. The majority of pupae are located within 50 mm of the soil surface. Pupae pass the winter in diapause.

Injury

AM injury varies in appearance and severity among apple cultivars. Oviposition punctures may cause the fruit to become dimpled or distorted (fig. 5), and in softer cultivars the tissue around the wounds may darken and decay. These punctures or

stings appear as pinpricks on the fruit surface (fig. 6). Young larvae tunnel throughout the apple, leaving small, brownish, irregular, threadlike trails (fig. 7). As the larvae grow, the tunnels become more conspicuous and are further enlarged by bacterial decay (fig. 8). Eventually, the apple becomes soft and rotten. This internal breakdown proceeds more rapidly and is more severe in the softer-fleshed, earlier-maturing cultivars.

Control

AM emergence and activity in an area can be determined by placing large cages over several seedlings of infested fruit set up in late summer to monitor for the following spring and by hanging sticky traps in unsprayed apple or hawthorn trees. In pest management programs, sticky traps are placed in commercial orchards to monitor indigenous or immigrating AM flies to determine the need for and timing of insecticide sprays. Parasites and predators attack the AM but do not give adequate control. To obtain acceptable control in commercial orchards, insecticides must be applied to kill females before they oviposit. In conventional programs, the initial spraying is done 7 to 10 days after the first fly has emerged and then at 10- to 14-day intervals while adults are active. Consult Cooperative Extension for local recommendations on the use of sticky traps and the most effective insecticides against AM in your area.

GUIDE TO STAGES

Commercial orchards do not usually harbor resident apple maggot populations. Their presence and injury may be more readily observed on infested, abandoned trees.

Stage	Timing	Where to Look
Adults	June 15 through September	On early varieties and maturing fruit. Presence or migration may be monitored with sticky traps.
Eggs (Sting)	7–10 days after first emergence of adults	On sunny side of tree, more mature fruit; small but visible puncture, may cause dimpling.
Larvae (Maggot)	2–10 days after eggs are laid	In the flesh of the apple; tunneling may appear as a brownish, irregular, threadlike trail.
Pupae	Late July through early November	In soil within 50 mm (2 in) of surface.