



Woolly Apple Aphid

Eriosoma lanigerum (Hausmann)

The woolly apple aphid (WAA), reportedly native to North America, occurs in most apple-growing areas of the world. The WAA feeds mainly on apple, but can also be found on pear, quince, mountain ash, hawthorn, and cotoneaster. Its reproduction on these hosts is asexual (parthenogenetic). Sexual reproduction has been thought to occur only when elm grows in close proximity to the other host plants. The portion of the life cycle occurring on elm has become more doubtful and less important than in the past, since most elms have disappeared from Eastern forests because of Dutch Elm Disease. The WAA tends to be a sporadic pest in orchards in the northeastern United States, occurring in noticeably high numbers only every few years.

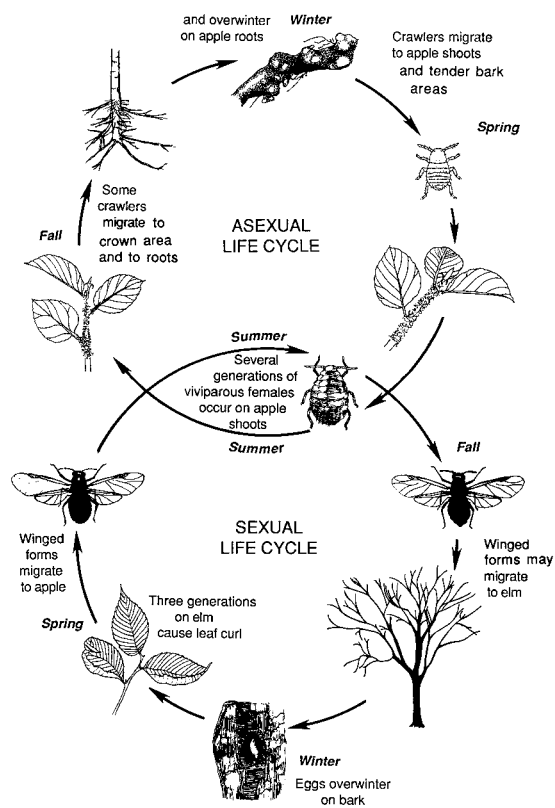
The Adults

Adult woolly apple aphids are wingless until a generation is produced that can migrate to a different host. Wingless adult females bearing live young are found on apple trees during the summer (see bottom of asexual life cycle). This adult form is dark brown to purplish, and 1.8 mm (.07 in.) long. In aerial colonies, it has a long, white, filamentous waxy secretion (fig. 1 and bottom left of asexual life cycle). In underground colonies it has a more bluish-white, rodlike secretion. Several wingless generations of WAA are produced on apple trees throughout the season. Some winged females (fig. 2) are produced that could migrate to other apple trees or to elm, if it is present (see sexual life cycle). On elm, winged females produce wingless males and females that mate and lay eggs. Male woolly apple aphids are found only at this time.

The Eggs

Eggs are uncommon in the life cycle of the WAA, being produced only when an apple and an elm tree are in close proximity. Rarely, sexual forms of the WAA and eggs are produced on apple trees. The eggs are elliptical, 0.6 by 0.3 mm (approximately .02 in. long), brown to purplish in color, and embedded in a waxy secretion. The eggs overwinter in crevices of the elm bark. After three generations on elm, a winged form is produced that migrates to apple trees.

Egg	Actual Size		
	Nymphs		Adult
.	.	.	.
	1st	4th Instar	



The Nymphs

The majority of nymphs are borne alive on apple trees by an unmated female. The WAA nymph passes through four instars, changing in size from 0.6 mm (.02 in.) long in the first to 1.3 mm (.05 in.) long in the fourth instar. The nymphs are dark reddish-brown with a bluish-white waxy covering that becomes more extensive in the later instars (fig 3). The first instar nymphs (crawlers), which are considerably more active than later instars, are a dispersal stage. They initiate aerial colonies in the spring from overwintering root infestations. The crawlers are carried by wind from tree to tree within an orchard or nursery, or move downward from the branches to initiate colonies on roots.

Damage

Cottony-white aerial colonies are found most frequently on succulent tissue, such as current season's growth, water sprouts, unhealed pruning wounds, or cankers (fig. 4). Heavy infestations can cause honey dew and sooty mold on the fruit, and galls on the plant parts. Underground colonies may be found throughout the year on the root systems of orchard trees or nursery stock (fig. 5). Severe root infestations can stunt or kill

young trees, but usually cause little damage to mature trees. WAA can also transmit perennial apple canker, *Pezicula malicorticis* Jacks.

Control

The WAA is frequently parasitized by *Aphelinus mali*, a tiny wasp that is also native to North America (fig. 6). Parasitized aphids appear as black mummies in the colony (fig. 7). *A. mali* has been successfully introduced to many apple-growing areas of the world, and is providing adequate control of the WAA in several areas. It does not provide sufficient control in commercial orchards in the northeastern United States because of its sensitivity to many commonly used insecticides; however, the wasp is thought to reduce WAA populations in abandoned orchards.

Because the woolly apple aphids are somewhat protected by their waxy covering, regular spray programs may not provide adequate control. High volume applications of recommended insecticides may be necessary to penetrate the wax. Failure to control aerial infestations can result in underground infestations on susceptible rootstocks. Chemical control of root infestations is not possible; resistant rootstocks provide the only defense against underground infestations. The Malling-Merton (MM) rootstock series was developed to provide resistance to WAA infestation. The table below lists the susceptibility of various clonal rootstocks to the WAA.

Rootstock	Dwarfing character	Susceptibility
M.9	d	suscep.
M.26	sd	v. suscep.
M.27	Sd	suscep.
MM.106	sv	resis.
MM.111	sv	resis.
Mark (Mac-9)	d	mod. suscep.
P-1	sd	mod. suscep.
P-2	d	mod. suscep.
P-18	sv	suscep.
P-22	Sd	mod. suscep.
Ottowa 3	sd	v. suscep.
Ottowa 8	sv	intermed.
Ottowa 11	sv	intermed.
Robusta 5	vv	v. resis.

From: Cummins et al., 1981, *J. Amer. Soc. Hort. Sci.* 106 (1)26-30.
d = dwarf; sd = semi-dwarf; Sd = super dwarf; sv = semi-vigorous;
vv = very vigorous

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