

soil, emerging in late May through July in the Northeast. The adult Japanese beetle is copper-brown and -green in color and approximately 1/2" long. They are often found feeding during the day on leaves in small groups. Asiatic garden beetles (AGB) are small (3/8") and a velvety cinnamon brown color, showing a faint green iridescence in the sunlight. AGB feed at night on the foliage and hide during the day under plants. Feeding by Japanese beetle or AGB is easily distinguished from root weevil feeding because these scarabs principally skeletonize leaves (making holes within the leaves), rather than notching the leaf edge. Leaf feeding typically occurs in June through midAugust. Oriental beetle and European chafer adults are rarely observed because they do not feed much. Oriental beetles are slightly smaller than Japanese beetles, and are usually tan and mottled with darker spots. European chafers are slightly more than 1/2" long and are a uniform tan.

The larvae (or grubs) of these insects look quite similar to one another and are called white grubs. They are c-shaped, have 3 sets of legs, grow up to 1/2" long. They are easily distinguished from the larvae of root weevils, which have no legs. White grubs are very difficult to manage after a strawberry bed has been planted.

It is unknown how much leaf feeding can be tolerated, but if leaf area is greatly reduced it could

affect the following year's flower bud formation, which is initiated in the fall. Large numbers of beetles are of concern, especially if it increases the amount of overwintering grubs. High populations of larvae can be expected the autumn and spring following a dry summer, especially where strawberry fields are surrounded by turf. These conditions favor movement of adults into strawberry fields to lay eggs.

Management: Management of grubs in the soil is very difficult, though *Heterorhabditis* spp. nematodes may have some value. (See source reference under root weevils above.) Chemical control of adult beetles can prevent extensive leaf damage, but is not guaranteed to prevent egg laying. Combination pheromone and floral scent lures are commercially available for Japanese beetle, but their placement near strawberries may actually attract more beetles to the area. Therefore, if traps are used, they should be placed at least 20 yards from the strawberry field.

Milky spore disease is a commercially available bacterium that is incorporated into the ground and attacks the grubs (especially Japanese beetles). However, soil temperatures in the northeast are too cool for this disease to easily become established, which makes it impractical for our area.

To avoid the risk of white grub problems, do not plant on newly turned sod land. Rather, plow the field, let it lie fallow or in a rotational cover crop

Table 19. Efficacy of common insecticides and miticides used in strawberries.

Insecticide	Aphid	Clipper	Cyclamen mite	Leafhopper	Leaf-roller	Rootweevil	Root-worm	Sap beetle	Spittlebug	Thrips	TSSM	TPB	White grub
Agri-mek (abamectin)	-	-	+	-	-	-	-	-	-	-	+++	-	-
Brigade (bifenthrin)	*	++	-	-	*	+	-	++	+++	-	+	+++	-
Cythion (malathion)	*	-	-	*	*	*	-	+	-	*	*	++	-
Danitol (fenprothrin)	-	-	-	-	-	-	-	-	+++	-	+	+++	-
Dibrom (naled)	*	-	-	-	*	-	-	-	*	*	*	+++	-
Guthion (azinphosmethyl)	*	++	-	-	+++	-	-	-	++	-	-	-	-
Kelthane (dicofol)	-	-	++	-	-	-	-	-	-	-	+++	-	-
Malathion (malathion)	*	-	-	*	*	*	-	-	-	-	-	++	-
Phaser (endosulfan)	*	-	+++	-	-	-	-	-	*	-	-	*	-
Sevin (carbaryl)	-	*	-	-	++	-	-	-	++	-	-	*	*
Sniper (azinphosmethyl)	*	++	-	-	+++	-	-	-	++	-	-	-	-
Thiodan (endosulfan)	+++	-	+++	-	-	-	-	-	+++	-	-	+++	-
Vendex (fenbutatinoxide)	-	-	-	-	-	-	-	-	-	-	+++	-	-

+++ = Highly effective; ++ = moderately effective; + = slightly effective; * = labeled but insufficient data; - = not labeled.