True bugs . . .

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Consperse Stink Bug

Consperse stink bug feeding on the fruit causes sunken areas or dimples on the surface under which white corky areas form in the flesh. (See fig. 1 and 2.) The bug usually feeds near the stem end, although it may attack other parts of the fruit. While feeding, the adult bug often leaves small, dark blotches of excrement on fruit and leaves.

Consperse stink bug damage is often confused with that caused by lygus bugs—especially late-season injury. The lygus bug can injure pears any time after bloom. Early-season lygus bug feeding punctures (fig. 3) frequently become elliptical-shaped ruptures on the fruit. Late-season punctures do not often rupture but appear as small raised surfaces inside circular sunken areas (fig. 4). In both cases, stone cells, which form in the pear flesh, are evident when the fruit is peeled and are unlike the white corky areas caused by the consperse stink bug.

The adult stink bug (fig. 5) is approximately ½ inch long, shield shaped, and greenish brown with a green or brown abdomen. The legs are yellow; the antennae are yellow with a black tip. Numerous small black dots cover the upper part of the body and legs.

The five nymphal stages vary from black and reddish in the early instars to various shades of yellow and brown in the later stages (fig. 6). The dorsal part of the body and legs are also covered with small black dots in the later nymphal instars.

Barrel-shaped eggs (fig. 7) are laid in clusters of 7 to 20, but most commonly 14. The eggs are light green at first but become white or cream colored before hatching. A ring of spines around the top of each egg helps distinguish consperse stink bug eggs from those of other stink bugs.

Consperse stink bugs overwinter as adults in weeds and other protected places in or near the orchard. In early spring the bugs feed on cover crops, mate, and deposit eggs on host plants, such as barley, dock, mustard, and other weeds.

The first generation completes its development in late June, when adults begin to attack the developing fruit in the orchards. Often only border rows of trees are attacked, indicating most of the infestation came from outside the orchard.

In early spring, overwintering adults may be visible on cover crops. On warm sunny days, the stink bug can be detected by sweeping the cover crop and wild areas near the orchard with a sweep net. If stink bug adults are found before they start laying eggs, a spray directed at the cover crop will provide control. Frequently only one part of the orchard needs to be treated at this time, because distribution of the bug is often localized in early spring before migration begins.

The second generation is sampled with the sweep net, beating tray, and visual observation. Excrement on the fruit is often the first sign of stink bug in an orchard. Again, a border treatment may be sufficient to control a local infestation.

In 1975 a test was conducted using stink bug adults collected along the Sacramento River. In one set of treatments (sprayed-caged), each chemical was applied to limbs bearing fruit and allowed to dry before adult bugs were confined to the treated limbs by fine-mesh sleeve cages. In the other set (caged-sprayed), the bugs were placed on the limbs inside sleeve cages and the bugs, limbs, and cages were sprayed.

Cygon (dimethoate) was effective whether or not it was sprayed directly on the bugs (table 1). Cygon sprayed directly on the bugs gave 100 percent control after 5 days, and no fruit was injured. On the limbs sprayed before caging, one bug was still alive after 5 days, and 4 of 29 fruit had been fed on before the stink bugs died.

Carzol (formetanate), when sprayed directly on the bugs, was effective, and none of the 42 caged fruit were injured. However, when the bugs were added after the spray had dried, 22 of 40 bugs were still alive 5 days later, and 2 of the 40 were alive 12 days after treatment. Fourteen of 35 fruit were injured in this treatment. This indicated thorough coverage is a must if using Carzol.

It should be noted that, although Cygon and Carzol are presently registered for pears, the labels do not list the consperse stink bug on this crop.

Thiodan (endosulfan) did not control the consperse stink bug in this test, although the chemical has been used effectively for many years and is still effective in many orchards. Local experience must guide the choice of materials for this bug.

Another stink bug commonly found in California orchards and easily confused with the consperse stink bug is the sulcate rough shield bug, *Brochymena sulcata* Van Duzee. This bug does not feed on pears and is reported to be a predator.

In the adult stage, the sulcate rough shield bug is gray or brownish, covered with whitish specks. It is generally larger than the consperse stink bug and has a somewhat flattened appearance (fig. 13). The immature stages can be distinguished from those of the consperse stink bug by the small whitish specks on the body and legs in contrast to tiny black specks present on the consperse stink bug.

Positive identification is extremely important before applying chemical treatments for stink bug control.

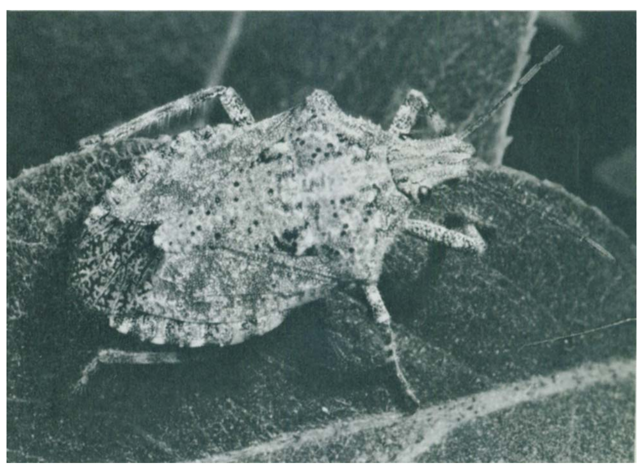

Fig. 13. Adult sulcate rough shield bug.

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Western Boxelder Bug

Western boxelder bugs, *Leptocoris rubrolineatus* Barber, can severely damage pear fruit in orchards near the insect's primary host, boxelder trees. This insect is normally host specific to boxelder trees (*Acer negundo*) and infrequently to maple and ash in California. It feeds on boxelder seeds, foliage, and tender twigs; large infestations are usually found on the female pod-bearing trees.

The adult is flat and narrow, approximately ½ inch (10 to 14 mm) long, and gray to brownish black with red lines on the thorax and wings (fig. 8). The abdomen is reddish; the head, antennae, and legs are gray to black. The early nymph stages are bright red (fig. 9) and darken in their later instars. The eggs are minute, red, bean shaped (slightly indented), and are laid singly or in clusters (fig. 10).

The adult boxelder bug overwinters in dry, protected places, under bark, hollow tree trunks, wood piles, or any sheltered place. However, we have not found them in pear orchards during the winter, which is strong evidence that they migrate out of the orchard in the late summer.

In March and April the overwintering adult population becomes active; in April and May eggs are laid and hatch in about 12 to 14 days. The nymphs go through five instars before adulthood. The first generation of adults are found in orchards in April and May, and these adults lay eggs on pear leaves and fruit in June. The second-generation egg-laying starts by the end of June. These eggs are laid on the undersides of pear leaves (rarely on the upper surfaces) and on developing fruit.

This insect causes little damage to its native host, but it can severely injure developing pear fruit, entailing considerable loss to the grower. Nymphs of the first and second generations and the first-generation adults puncture maturing fruit, so that they become deformed with irregular depressed areas (fig. 11). The most important injury is the deep, corky area, caused by each puncture, under the skin surface of the fruit (fig. 12). These areas turn brown or black when exposed to air. Unlike the consperse stink bug, the western boxelder bug shows no preference for feeding on any particular part of the pear surface.

An extensive survey was conducted in 1974 after severe injury to pears—at first attributed to consperse stink bug—was reported along the Ukiah-Hopland and Russsian River area in Mendocino County and Scott's Valley in Lake County. Investigations showed a very high population of boxelder bug.

In 1975, to confirm that boxelder bug was causing the primary damage, 36- by 16-inch, fine nylon-mesh sleeves were used to protect early developing fruit from insect damage. Sleeves were also used to introduce seasonal western boxelder nymphs and adults, while excluding other insect species. At harvest the sleeves were removed and injury evaluated (table 2).

Orchard survey counts were also made at harvest in 1975 and 2 weeks before harvest in 1976. The orchard, which is on the Russian River, showed a migration pattern of injury; fruit in the outside rows had the most damage, ranging from 24 to 30 percent. Such fruit is a total loss both for shipping fresh and for canning.

The sleeve test gave conclusive evidence that western boxelder bug nymphs and adults can cause extensive damage to pear fruit.

Monitoring this insect is not difficult because of its specific host requirements; overwintering populations of adults can be detected in the spring before they enter pear orchards at fruit stage. One way to prevent infestations is to replace nearby female boxelder trees with nonhost plants. However, this would be difficult along rivers, where boxelder thrives in abundance.

The best chemical control method is to spray boxelder trees for nymphs in the spring before they migrate to pear orchards. Several materials control the young nymphal population, including Sevin (carbaryl), malathion, or diazinon. The standard treatment of Thiodan (endosulfan) for consperse stink bug also controls boxelder bug.

TABLE 1. CONSPERSE STINK BUG CONTROL UNDER VARIOUS CHEMICAL TREATMENTS

Treatment*	Amount/ 100 gal	Number bugs alive, days after treatment 5	12	Percent fruit infested
Thiodan 50% WP, sprayed-caged	1 lb	29	14	97
Thiodan 50% WP, caged-sprayed	1 lb	33	28	100
Carzol 92% SP, sprayed-caged	.25 lb	22	2	46
Carzol 92% SP, caged-sprayed	.25 lb	0	—	0
Cygon 267, sprayed-caged	1 pt	1	0	13
Cygon 267, caged-sprayed	1 pt	0	0	0
Check†	—	37	33	100

* Each treatment consisted of four replicates, with 10 adult bugs per replicate.
† Ten bugs caged per limb, no treatments applied.

TABLE 2. PEAR DAMAGE CAUSED BY THE WESTERN BOXELDER BUG (*Leptocoris rubrolineatus* Barber), HOPLAND, MENDOCINO COUNTY, 1975

Sleeve tests*

Insect stage	Insects per sleeve†	Number of fruit in 8 sleeves	Fruit damaged in 8 sleeves at harvest	Punctures	Mean number of punctures per fruit
Nymphs	6	34	22	88	4.00
Adults	6	54	42	132	3.14
Check (no insects added)	0	47	0	0	0

Orchard survey

Year	Fruit sample	Fruit damaged	Fruit damage (percent)
1974	500	150	30
1975	500	120	24
1976	500	135	27

* Mesh sleeves, 36 x 15 inches, placed over fruiting branches.
† Insects introduced into sleeves on June 4, 1975.

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