

# A Food Industry Perspective on Root Weevils

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## Introduction

Insects have long played a major role in the production of the foods we eat. Studies discussed at seminars such as this tend to center on insects that cause direct economic injury to food crops, i.e., root weevil research on strawberries and mint, represented here by Drs. Ralph Berry and Jim Fisher. I intend to present the role of root weevils as indirect pests *on* food, as contaminants of harvested fruit. This is a different perspective that I trust will reveal the challenge that these particular Curculionids present to the small fruit food processing industry here in the Pacific Northwest (PNW), and even in regions outside the United States.

While I do not have here today statistical data, charts, and graphs, I speak from 22 years of experience

working as an applied entomologist for Smucker's, the world's leader in preserves, jams, jellies, ice cream toppings, etc. Seeking to minimize pesticide residues on berry crops, we have quietly implemented integrated pest management (IPM) strategies with many of our growers since the late 1970's.

Throughout this discussion, when I refer to root weevils, I am speaking primarily of the black vine weevil (BVW, *Otiorhynchus sulcatus* Fabricius) and the obscure root weevil (*Sciopithes obscurus* Horn). These two species account for over 90 percent of the weevils that I have identified in harvested caneberries in the PNW since 1978. The remaining 10 percent are distributed rather equally among various species of the *Dyslobus*, *Otiorhynchus*, and *Nemocestes* genera.

## The Problem

The focus for this presentation will be on the red raspberry portion of the 130 million pounds of caneberries produced in the PNW annually. Red raspberries represent over 60 percent of that volume. While root weevils have been found periodically on all varieties of harvested caneberries, incidents of contamination occur most frequently on red raspberry. What is particularly interesting about this situation is that relatively few red raspberry acres even have weevil populations present (less than 25 percent of approx. 9,700 acres). There are two key points to understanding why these critters pose such an industry problem.

First, during the process of mechanically harvesting red raspberries, it takes anywhere from two-thirds to 1 full acre of berry plants to yield a pallet of 80 crates (plastic trays). Each crate is filled with about 10 pounds of berries. This represents the "concentrating" of up to 1 acre of potential insect contaminants into a single pallet of fruit. As we know, root weevils cannot fly, and have adapted excellent clinging behavior to manage windy situations. Hence, they are difficult for the mechanical harvester's blowers to remove. When I pre-harvest a sample (using a small sheet, striking canes with a stick), as few as 2-3 weevils per 10 samples down 1,000 ft of row (about one-fourth acre) often equates to an infestation great enough to cause significant economic impact.

Weevil contamination results in downgrading (dockage) or dumping of fruit if weevils are too numerous or tenacious to remove economically. Fruit processors are forced to process otherwise excellent red raspberries as juice grade because of weevil contamination, or reject such loads. Every processor has his or her own set of guidelines, or thresholds, for determining the impact of contamination. Typically, four weevils per sample would cause a load to be downgraded to juice, with a resultant price drop of 50 percent or more. Rejection of a load can occur if more than 10 weevils per sample are found.

The downgrading goes beyond just the contaminated load only, which leads to my second key point. In many processing plants, several belts carry fruit to a common container area for filling (i.e., 55-gal drums). If the contaminated load is not discovered soon enough (or if fresh fruit sampling failed to identify the actual level of contamination), perfectly good fruit gets cross-contaminated, and *all* the fruit that was mixed with the weevil-infested fruit must be downgraded. This compounding typically magnifies the infestation as much as six-fold by volume, posing a significant economic impact to a processor. For example, one contaminated load of 5,000 lb of red raspberries can eventually affect and downgrade 30,000 lb of fruit.

## Control Strategy

Although weevil populations are reported from a relatively small portion of the total red raspberry acreage, the problem became steadily worse following the loss of chlorinated organic insecticides in the late 1970's. Azinphosmethyl and Malathion remain labeled for use, but their efficacy is not satisfactory. Emergency exemptions for the use of carbofuran and permethrin during the 1980's and early 1990's provided the raspberry industry moderate relief.

The availability of bifenthrin, beginning with emergency EPA exemptions in 1993, has provided outstanding control of weevil infestations. During the first year of use (0.1 ai per acre, 3 day PHI), growers known to have weevils in their raspberry fields applied bifenthrin approximately 1 week before the initiation of harvest (late June). Red raspberry harvest usually extends 4–6 weeks. Excellent weevil control lasted 2–3 weeks. However, it became apparent that late emergence of new F1 generation adult black vine weevils was causing renewed downgrading of the late-season harvested fruit. (Obscure root weevil control lasted the entire harvest.)

Results from my dissections of the ovaries of BVW collected from berry fields over several years had shown BVW to have a 3-6 week preoviposition period. This knowledge prompted a slightly different strategy for BVW control in our second year of bifenthrin applications. Surmising that early emerging adults

would not be depositing eggs until after the balance of the adult weevils had emerged, and given bifenthrin's fairly persistent residual, I recommended delaying the initial treatment (only two are allowed by EPA) until *after* the first week or so of harvest. This strategy required both the grower and the processor to concede to the risk of weevil contamination of first deliveries.

The strategy worked. In all raspberry fields (excluding one that had very dense foliage) there was total control of root weevils. No second application was necessary. Remarkably, those same fields did not require treatment for weevils in subsequent years.

An interesting "twist" to this story (and one that runs counter to common perceptions) concerns raspberries from a foreign country. About 5 percent of the red raspberries consumed in the United States are imported from Chile. Like growers in the United States, Chilean raspberry farmers have battled root weevils. As discussed, United States growers "cleaned up" their weevil problem with bifenthrin. The Chilean government does NOT allow the use of bifenthrin on berries in Chile. As a result, there are buyers now declining significant sales of Chilean red raspberries *into* the United States because of weevils. This story illustrates a fact opposite to the common belief that foreign growers have an "unfair advantage" when it comes to the use of pesticides. And, it illustrates the international reach of the weevil contamination issue.

## Summary

This report shows the tremendous impact that root weevil populations can have on an industry, even when densities are present far below a level that could cause noticeable physical injury to crops.

Insect contaminants on crops bound for processing often require an entirely different perspective as to economic thresholds and IPM strategies. Even the presence of the "good guys" like honeybees and other highly beneficial insects in harvested crops can raise contamination issues in the food industry. The consumer does not differentiate between pests and beneficial insects. All too often, consumers seek litigation to win the "food lottery" whenever an insect contaminant is found in their food, despite the fact that "a bug" rarely presents a health risk.

In addition, when fresh fruit or vegetable grading standards are applied to grower deliveries, the "tolerance" or "threshold" for contaminants can vary substantially between food processors, all while remaining within the established guidelines of the FDA and the USDA. Establishing IPM programs that can address such large variations in grading standards presents a serious challenge, indeed, to the practitioner.

The education and training of entomologists specializing in IPM should include an understanding of the ramifications of food contamination and the resulting search for successful control strategies in the field.