CRANBERRY TIPWORM

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Cranberry tipworm is a tiny insect which damages the growing tips of cranberry uprights. Damage late in the season kills the fruiting bud for the following year, thereby reducing yield. This paper summarizes our knowledge of the life cycle and biology of this insect, including recent research results from the University of Wisconsin.

Identification of Tipworm

Cranberry tipworm is a member of the gall midge family Cecidomyiidae. This family is in the larger group of insects, order Diptera, that includes flies, gnats, and mosquitoes. Gall midges are small insects, often less than half the size of a mosquito. The adults have two wings, long slender legs, and bristly, beaded antennae.

The scientific name of cranberry tipworm has been Dasineura vaccinii, but a recent re-examination of the insects in this group has lead to the renaming of the insect to Dasineura oxycoccana. These two names are synonymous and refer to the same species of insect.

A closely related species of gall midge occurs on loosestrife in and around cranberry marshes. Each of the two species is fairly restricted to feeding on its preferred type of host plant. Because of their small size and close relationship, it takes a specialist to be able to distinguish the adults of the two species. This situation could confuse monitoring programs which are based on adult sampling.

Summary of Life Cycle

The insect starts life as an egg laid by the adult female midge. The eggs are laid on the leaves in the vicinity of the growing tip. The egg hatches into a tiny clear, headless, legless maggot-like larva, which is the damaging stage. As the insect grows during the larval stage, its color changes, first to white, then to a peach color. When fully grown and done feeding, the larva spins a silken cocoon in the damaged stem tip, and transforms to the pupal stage within this cocoon. An adult midge eventually emerges from each cocoon. After mating, the females begin laying eggs, thereby completing the life cycle.

The literature is somewhat confusing as to the length of the life cycle and the number of generations per year, with two to five being reported, depending upon the source of information. As part of our research on this insect, we assessed the number of generations per year in both 1988 and 1989 on a tipworm-infested marsh in the Warrens area. One hundred uprights were sampled weekly from each of two plots on each of four beds (eight plots, 800 terminals total per week). The terminals were cut and taken to our lab in Madison where they were microscopically examined for presence of tipworm stages and damage. The results of these studies are presented in the accompanying figures. To summarize, during the hot 1988 growing season, there were apparently five generations, but only four during the more typical conditions of 1989 (most easily seen in the graphs of the egg stage, Figure 1). Depending upon the time of year, the duration of each generation was from slightly over two weeks to about 3.5 weeks. Because of the relatively short life cycle, generations tend to overlap, somewhat obscuring the start and end of each generation. This is part of the explanation for the apparently lengthy periods of larval duration in Figure 2; the "peaks" which appear to last 4-6 weeks actually consist of two generations.

Distribution of Larvae Within and Between Beds

When developing monitoring and management strategies for tipworm, it is important to consider the pattern of distribution of the insects within a bed and to compare population densities occurring in adjacent beds. Although the research reported here is somewhat preliminary, there is good evidence for considerable differences in population density both within a bed and comparing adjacent beds (Figures 3 and 4). We also found that population density can vary from generation to generation within a given plot. These differences can be seen by comparing the accompanying illustrations.

Damage Caused By Tipworm

The tipworm larva causes damage by killing the apical tip of the upright. Previously published reports (especially by Prof. Marucci of Rutgers University and the New Jersey cranberry experiment station) indicated that early season damage resulted in the development of secondary lateral shoots which eventually became bearing, thereby increasing the number of fruit buds, and, theoretically, increasing the yield. However, damage later in the season killed fruiting buds, which would cause a reduced yield. Because these reports did not correlate "early" and "late" damage with specific tipworm generations, the studies are very difficult to interpret for development of pest management strategies. Further, our research shows that population density is very low in later generations (Fig. 2), and therefore we expect that late season larvae do not cause significant economic injury. Our intent is to do further research to relate the time of damage with the ultimate fate of the damaged terminals.

Control of Cranberry Tipworm

Cranberry tipworm is important as a pest in Wisconsin, Massachusetts, and New Jersey. It occurs in the cranberry growing regions of the Pacific Northwest, but is not considered to be a significant pest there.

Research by Prof. Marucci showed that holding late water for control of other types of insects actually increased tipworm damage. This should not be a concern because holding late water is not a common practice in Wisconsin.

Several reports in the literature, including Extension recommendations, indicate that sanding is helpful in controlling tipworms. We expect to further evaluate this practice during 1990.

Tipworm larvae are attacked by tiny parasitic wasps that could provide some degree of natural or biological control. However, there has been virtually no research on this beneficial insect and we have not encountered it in our samples. We have, however, seen certain predatory insects (such as hover fly larvae) feeding on the tipworms, although this activity is usually of limited scope. Generally, beneficial insects such as these are highly susceptible to broad spectrum insecticides. As IPM practices become more fully adopted, and the routine use of traditional insecticides is decreased, we anticipate seeing an increase in the benefit provided by such types of natural enemies.

Insecticidal approaches to tipworm have been unreliable in all growing regions. Therefore, in 1989 we collaborated with entomologists in Massachusetts and New Jersey to evaluate eight different insecticidal products, most of which have current registration on cranberry. The products originally included in the study were Orthene, Guthion, Imidan (not currently registered), Insecticidal Soap (not currently registered), Lorsban, Malathion, Diazinon, and Sevin. All products except Lorsban and Malathion were evaluated. Sprays were applied two to four times per generation (as separate treatments in separate plots) in the hopes of finding the most susceptible stage in the life cycle. All treatments were unsuccessful at controlling tipworm and further research is necessary to develop control methods for this insect.

Acknowledaments

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Figure 1. Seasonal occurrence of tipworm eggs, Warrens, 1988 and 1989.

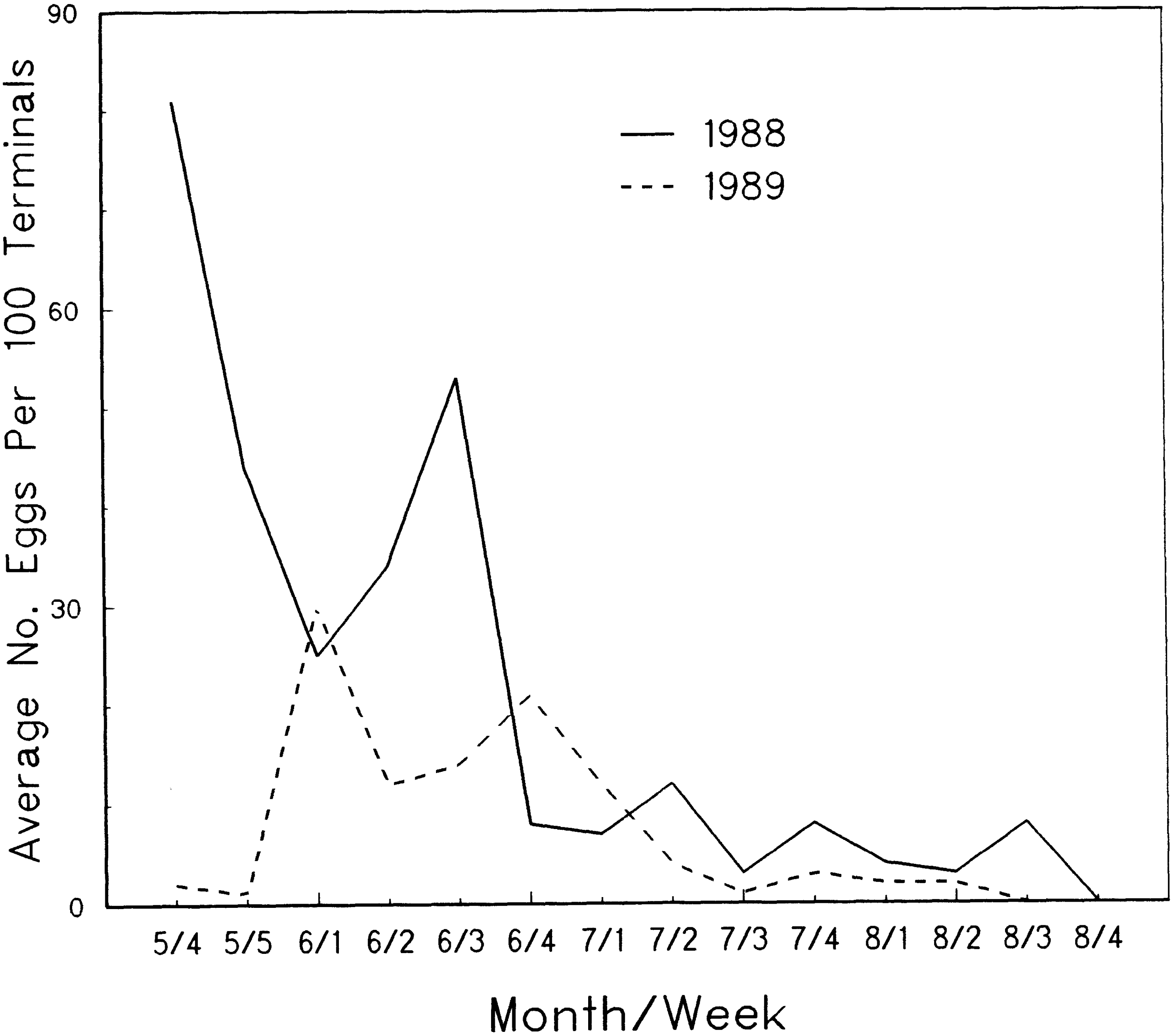

Figure 2. Seasonal occurrence of tipworm larvae, Warrens, 1988 and 1989.

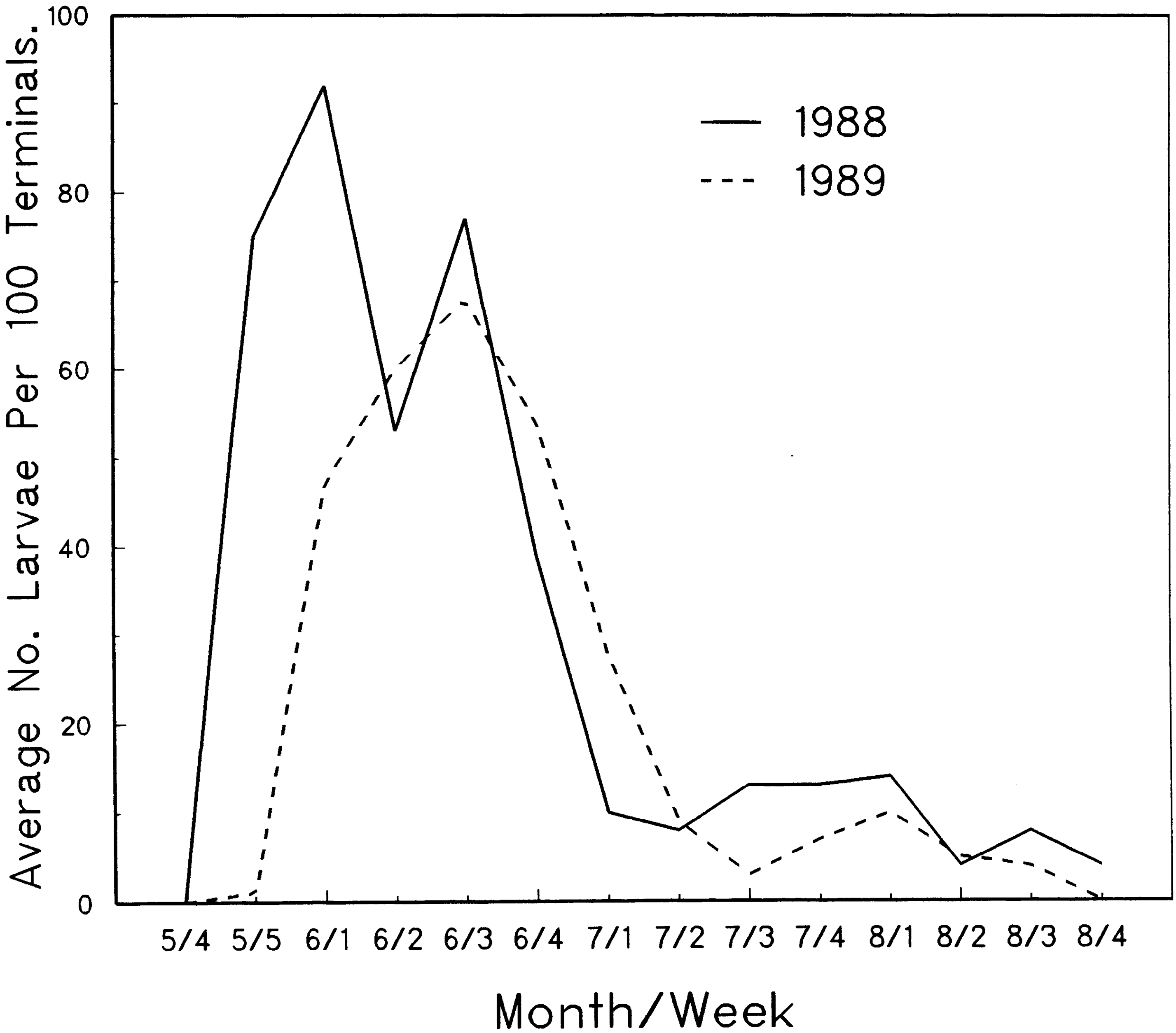

Figure 3. Number tipworm larvae per plot, June 15, 1989.

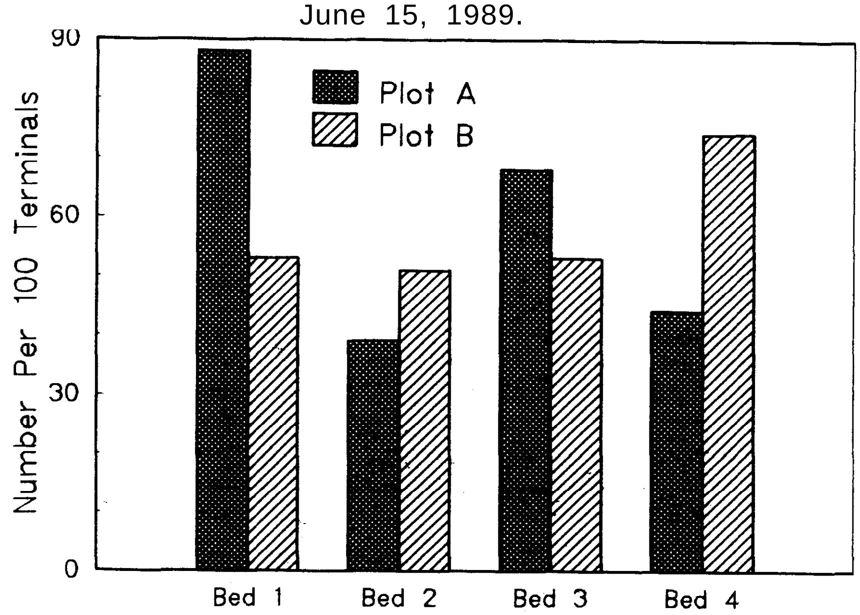

Figure 4. Number tipworm larvae per plot, June 29, 1989.