CRANBERRY TIPWORM: PRELIMINARY RESULTS OF 1990 SANDING STUDIES

Daniel L. Mahr
Department of Entomology
University of Wisconsin - Madison

Cranberry tipworm, Dasineura oxycoccana, is a tiny insect which dam- ages the growing tips of cranberry uprights. Damage late in the season kills the fruiting bud for the following year, thereby reducing yield. Information on the biology and control of this insect was presented by Mahr and Kachadoorian in the "Proceedings: 1990 Wisconsin Cranberry School".

One on the approaches to tipworm control is the use of winter sanding to cover up the overwintering tipworm. Wisconsin growers have had varying success with sanding, which prompted a research project to evaluate this practice. This paper presents first-year results of the effects of sanding on tipworm populations. I also present data on fruiting status of first-year regrowth uprights from previous tipworm injury.

Methods Used in the Study

The study was conducted at the Meadow Valley Division of Northland Cranberry Company, 4 miles northwest of Mather, WI. The bed of Howes where the study was conducted had a past history of significant tipworm injury. The width of the bed was divided into four approximately equal strips. The center two strips were sanded by conventional means during the winter of 1990-91, with 1/2 - 3/4 inch of sand being applied. The two outer strips were left unsanded. Each strip was divided in half length-wise, resulting in four sanded plots and four unsanded plots.

Sampling for tipworm activity was conducted twice, on 20 June and 6 July. These dates coincided with approximate times of first and second generations, as determined in other studies. However, there is some overlap of generations. In each of the eight plots, four sites were arbitrarily chosen, each at least four feet from the edge of the plot. At each site, a handful of at least 25 adjacent uprights were removed for laboratory analysis. In the laboratory, 25 uprights were arbitrarily selected from each sample site and microscopically examined for tipworm presence and damage. Therefore, the total sample for each of the eight plots consisted of 100 uprights.

In addition to tipworm infestation, I also assessed the impact on flowering of the previous year's (1989) tipworm damage. Each of the 100 terminals per plot (800 terminals total) from the 6 July sample, were evaluated for 1989 tipworm damage, subsequent regrowth of side branches, and flowering characteristics of undamaged terminals vs. regrowth terminals. For each terminal, records were kept of branching and combined total of buds, flowers, and set fruit (called "flower units).

Results of Sanding

Sanding significantly reduced the amount of immature stages (eggs, larvae, pupae, and spent cocoons) of tipworm found (Fig. 1) and number of terminals damaged (Fig. 2). In the unsanded plots, 33% of the terminals were infested or damaged in the first generation, as compared to only 4% in the sanded plots. Infestation levels increased in second generation, but the sanded plots had only half the level of infestation of the unsanded plots.

Although it would be natural for some increase between first and second generations, even in the sanded plots, the observed increase from 4% in first generation to 36% in second generation is somewhat problematical, and could result in part from the narrowness of the plots and close proximity of the large population in the adjacent unsanded strips. The tiny winged adult midge is capable of flight and being borne on wind currents, and reproductive females undoubtedly moved from the unsanded strips into the sanded strips. A study using entire beds as plots would be necessary to resolve this question.

Effects of Tipworm Damage on Regrowth and Flowering

Undamaged terminals rarely spontaneously branch from previous year's growth. Of the 800 terminals examined on July 6, 562 (70%) had been undamaged the previous year. Of these, only 13 (2%) had branched from previous year's growth; 11 were singly branched and 2 were doubly branched.

The majority of the terminals damaged in 1989 developed a single regrowth terminal. Of the 238 damaged 1989 terminals, 209 (88%) had a single regrowth terminal, 28 (12%) were doubly branched, and 1 (<1%) was triply branched. Therefore, the 238 terminals which were damaged in 1989 gave rise to a total of 268 terminals in 1990.

In summary, undamaged terminals which branched spontaneously resulted in a net increase in terminal density of 2.7%. In contrast, regrowth from damaged terminals resulted in a net increase in terminal density of 12.6%.

Although tipworm damage resulted in an increase in terminal density, of more importance is the fruiting productivity of the regrowth terminals. There- fore, the total numbers of flower units (buds, flowers, or fruits at the time of sampling) was compared between the undamaged terminals from 1989, and the regrowth terminals resulting from 1989 damage. Of the 562 undamaged terminals from 1989, 196 (35%) produced flowers. In contrast, of the 268 regrowth terminals from 1989 damage, only 3 (1%) produced flowers. A total of 459 flower units were produced on the 562 undamaged terminals, an average of .82 flowers per terminal. In contrast, the 268 regrowth terminals produced only 6 flowers total.

Implications for Tipworm Management

The results reported above, and the following interpretations apply to the set of conditions in this study. Tipworm damage to other varieties, or in combination with other crop or pest management practices may result in a different outcome. However, the general implications should apply in similar situations. It is evident that 1/2 - 3/4 inch of winter-applied sand significantly reduces first generation tipworm the following spring, with an equally significant reduction in damage. In the research reported herein, second generation tipworm populations were about 1.8 times higher than first generation in the unsanded plots. In the sanded plots, the second generation population was about 16.7 times higher than first generation. This suggests that there may have been significant migration of reproductive females from the unsanded plots into the sanded plots. This has important implications for managing sanding as a tipworm control method. Instead of sanding randomly or arbitrarily chosen beds in any given year, an effort should be made to sand contiguous beds. Sanding all beds in a block in one year will reduce the rate of reinfestation from adjacent beds.

Prof. Marucci (cranberry entomologist retired from Rutgers University and the New Jersey cranberry experiment station) reported that early season tipworm damage created regrowth terminals that eventually became fruiting uprights. In the study reported herein, regrowth uprights in their first full year produced virtually no flowers. Therefore, without control of tipworm, it would be expected that such vegetative terminals would continue to be damaged, resulting in an overall reduction of fruiting uprights. The fact that only 35% of the undamaged uprights in this study produced flowers supports this conclusion. The ultimate conclusion is that damaging levels of tipworm should be reduced by pest management practices.

Acknowledgements

I thank John Stauner of Northland Cranberry Company for providing the research site and for helping to coordinate this study. Richard Ness conducted the laboratory counts. This research was funded, in part, by a grant from the Wisconsin Cranberry Board, Inc.

FIGURE 1. NO. OF TIPWORM PER 100 TERMINALS

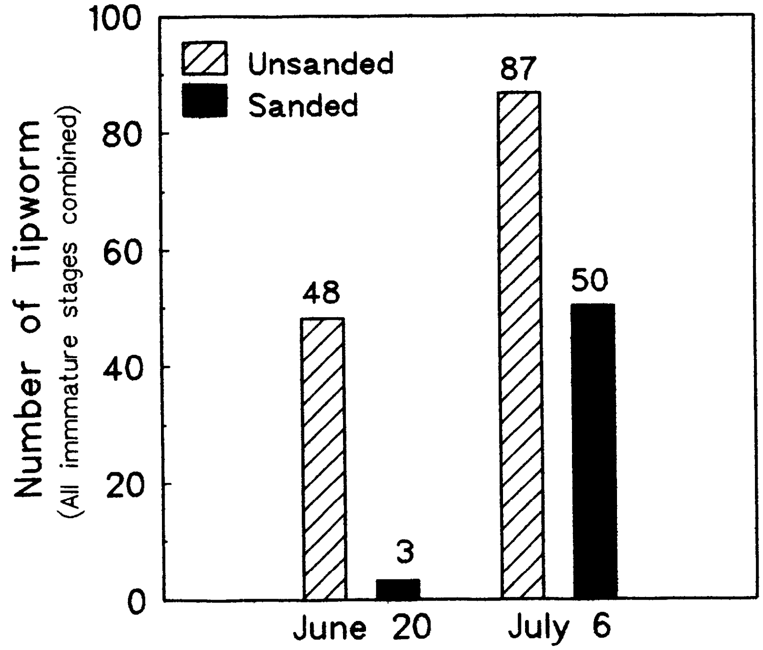

FIGURE 2. PERCENT OF TERMINALS DAMAGED BY TIPWORM