MANAGING CRANBERRY TIPWORM, WITH REFERENCE TO 2005 INSECTICIDE TRIALS

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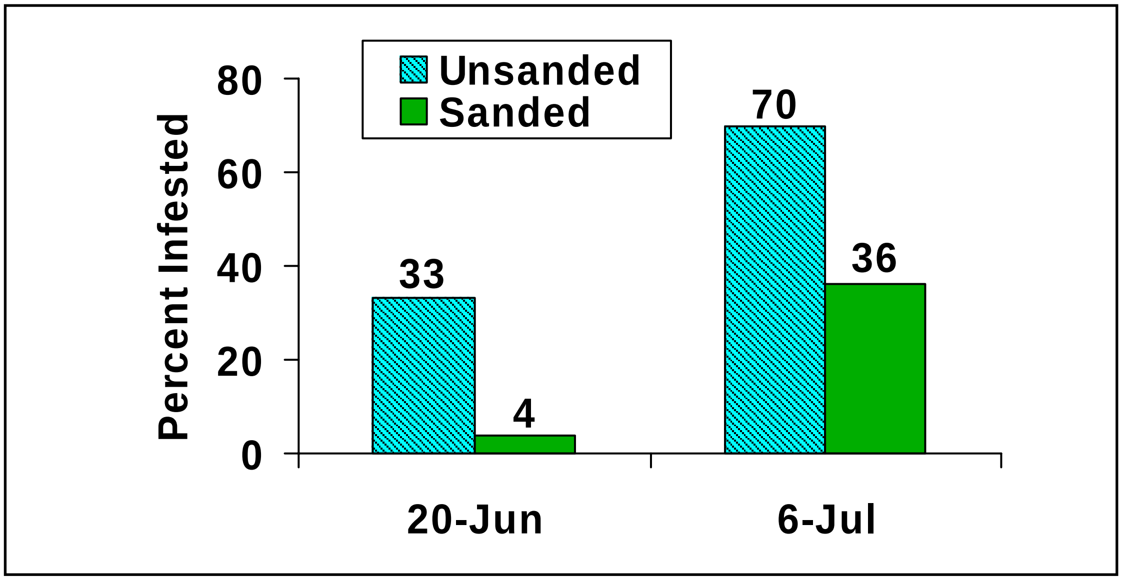
Introduction. Cranberry tipworm has long been considered a pest of commercial cranberry production. The significance of its injury varies with location. In areas with a long, warm growing season, plants often compensate for damage without loss of yield. In more northern growing areas with a shorter growing season, plants are less able to compensate, resulting in yield loss the subsequent year. Insecticides registered for tipworm control include the organophosphates azinphosmethyl (such as Guthion®), diazinon, and phosmet (Imidan®). The first two of these products are the standards used by the industry. We have not previously had data regarding the efficacy of phosmet. The effectiveness of other products is unknown. Uses of azinphosmethyl and diazinon are likely both soon to be cancelled. The purpose of this paper is to give a brief overview of life cycle and damage of tipworm, summarize current control recommendations, and discuss results of our 2005 insecticide trials.

Life Cycle and Damage. Cranberry tipworm is a tiny midge, about 2mm long (about 1/10 the size of a mosquito). There are generally 5 generations per year, with the first three being the most important and most abundant. Females lay eggs in the tips of actively growing vegetative stems, usually avoiding stem tips with flower buds. They are very abundant in recently-mowed beds, as well as in over-fertilized beds with rampant vegetative growth. The tiny larvae feed at the apical meristem, eventually killing it. This results in secondary branching and these secondary stems can be reinfested by subsequent generations. Late-season damage results in secondary stems that are vegetative rather than fruitful in the following growing season, thus reducing yield. Although tipworm is common in Massachusetts, researchers there have concluded that it does not cause economic losses. However, further north in Maine, losses attributed to tipworm can be substantial. Many growers in central Wisconsin do not consider it a significant pest because of new stem production by injured plants. However, growers in northern Wisconsin have attributed significant yield losses to this insect. Our research conducted in the late 1990s confirmed yield losses in the Manitowish Waters area, where only 9% of damaged terminals flowered and fruited the following year. In such cases, controls are warranted.

More detailed information, including color pictures, on tipworm biology and damage can be seen at the website http://www.hort.wisc.edu/cran/mgt_articles/articles_pest_mgt/insects/profiles_insects/TIPWORM.pdf

Control Options. Winter sanding is an effective method of controlling tipworm. Tipworm pupae overwinter in the debris beneath cranberry vines, and a layer of sand 2-:” deep covers the tiny insects and the fragile adults are not able to dig through this layer in spring. Results of one of our sanding studies are shown in the following graph.



In this study, sanded and unsanded plots were arranged in broad strips the length of the bed. Populations rose quickly because of the adjacent unsanded strips. This demonstrates the importance of sanding adjacent blocks of beds in the same year, to reduce the rate of reinfestation from unsanded beds. Regardless, tipworm is an abundant insect on cranberry farms, and reinfestation will begin to occur the year after sanding.

Azinphosmethyl and diazinon are both labeled and efficacious for controlling tipworm. The use of both products on cranberry is soon to be discontinued. Phosmet is labeled for tipworm control, but no previous trials had been conducted in Wisconsin. No other products are known to be effective. Because of tipworm's high reproductive capacity and short generation time, reinfestation of treated beds can occur quite quickly. It is recommended that growers target the first generation when the entire population is roughly in the same stage. The first application should be targeted toward the egg-laying period as both adults and young larvae are killed by the currently-available organophosphates. A second and even third application may be necessary to reduce large populations. These should be timed for the second and third flights (if the bed is not in bloom), respectively.

2005 Insecticide Trials. In light of the impending loss of the two primary insecticides used for tipworm control, in 2005 we conducted preliminary small-plot screenings of 17 insecticidal products, representing seven insecticide classes. Some of these products currently have cranberry registration; others do not. All products tested were known to be effective against one or more pests in the insect order Diptera (the flies and their relatives), which includes cranberry tipworm.

The trials were conducted on a bed of Ben Lear in the southern growing region. The bed was mowed for vines during the third week of April 2005. Our grower-cooperator applied Guthion to the entire bed on July 7, followed by an application of diazinon (but not to our plot area) on July 14. Plot size was 6x6 ft and each treatment was replicated four times. Materials were applied at high-end label rates with a CO_2 sprayer.

Three applications were made at 10 day intervals, on 19 and 29 July and 8 August. Terminals taken for evaluation were transported to our lab in Madison on ice and kept refrigerated until counted. Twenty terminals per plot were dissected under a microscope and the condition of the terminal and life stages of tipworm present were recorded. Insecticides evaluated are shown in the following table.

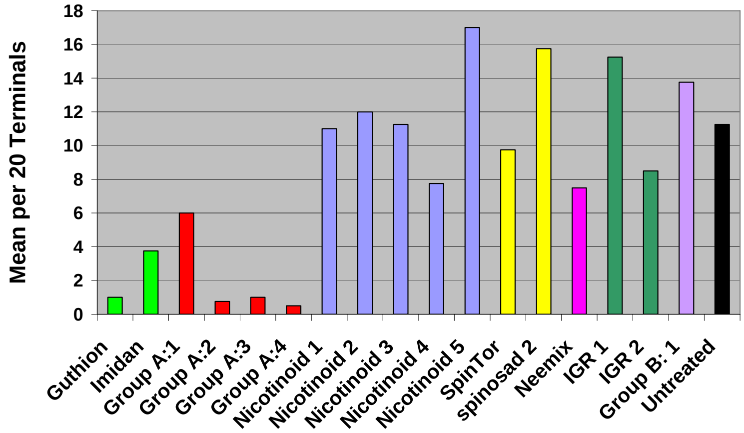
Insecticide Class*	Common Name*	Brand Name*
Organophosphate	azinphosmethyl	Guthion
	phosmet	Imidan
Group A	A:1	
	A:2	
	A:3	
	A:4	
Neonicotinoid	neonicotinoid 1	
	neonicotinoid 2	
	neonicotinoid 3	
	neonicotinoid 4	
	neonicotinoid 5	
Spinosad	spinosad	SpinTor
	spinosad	formulation 2*
Botanical (neem)	azadirachtin	Neemix
Insect Growth Regulator	IGR 1	
	IGR 2	
Group B	B:1	
Untreated control		

* In accordance with an agreement with the Wisconsin State Cranberry Growers Association, names of unregistered insecticides and unregistered pesticide classes are not provided.

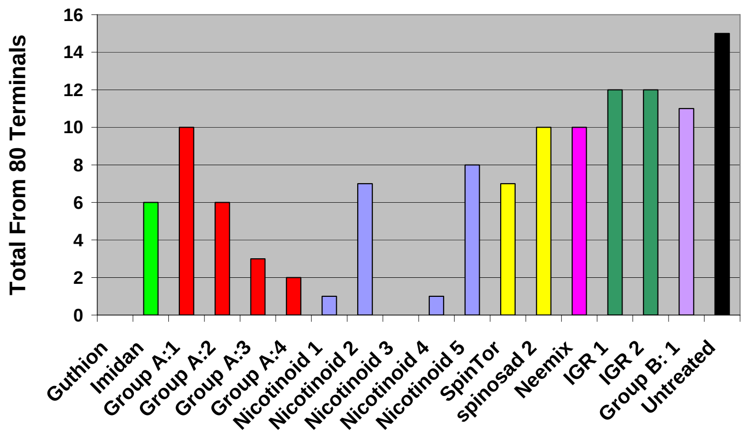
There was a heavy infestation of tipworm in the experimental bed. In our first (pre-treatment) sample, 1139 of 1440 terminals (79%) were damaged or infested. In our second sample, 78% of control terminals were infested or recently damaged, and 100% of control terminals had been injured during the season.

Representative results are presented in the following three graphs.

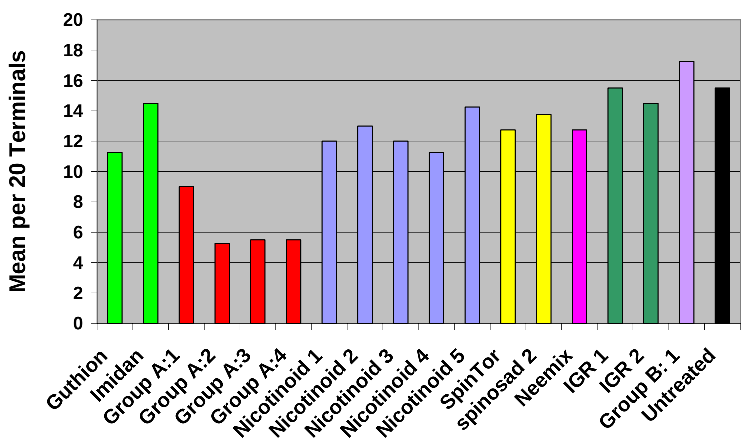
Number Eggs Per Sample - 17 August Sample



Total Live Larvae and Pupae - 17 August Sample



Damaged Terminals - 17 August Sample



In summary, Guthion performed well. Imidan performed less well. Several Group A products performed well, but registrants of these materials have thus far been unwilling to register their products on cranberry. Neonicotinoids had high egg counts but low larval counts (comparatively, but not statistically), suggesting that they do not control adults but may kill larvae. These results may relate to our small plot size, especially if the materials do not control the flying adults. The spinosads, insect growth regulators, Neemix, and Group B material all performed poorly.

In 2006, we hope to continue these trials. In particular, we will evaluate additional registered organophosphates and carbaryl, and re-evaluate the neonicotinoids using larger plots.