Progress Report 2007

Cranberry tipworm: Screen of reduced-risk insecticides and impact of cultural practices on damage

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Summary*:*
Of ten compounds tested in laboratory dip assays, by looking at the proportion of dead third instars in the final check (6 DAT), two showed excellent promise (both are neonicotinoids): clothianidin (Clutch) and dinotefuran (Venom); HGW showed good activity. Least promising were metaflumazone (BAS 320) and flubendiamide (NNI). Only about half of larvae died in the DPX-E2Y treatment, known to be active in WI trials.

Impacts of cultural practices could not be completed as proposed since all beds where the grower had pruned had also been sanded; no prunedStevens beds were located. Sampling proceeded anyway on sanded/pruned vs not sanded/pruned beds on two 'Early Black' and two 'Howes' sites. There was a general trend of lower tipworm damage/infestation on sanded/pruned sites, a not surprising finding since it is known that sanding suppresses tipworm levels. However, surprisingly high tipworm infestations were found at the 'Howes' sites in the late season, raising concerns about MA bud set for this cultivar.

Work over the next two years will focus on field tests of promising compounds and evaluation of yield parameters where tipworm has been eliminated with insecticide.

Objective 1. Screen new reduced-risk insecticides

Ten compounds (Table 1) were selected from reduced-risk as well as from OP-replacement options that could be likely candidates for cranberry registration, with the exception of Leverage, which is a mix of the neonicotinoid imidacloprid and the pyrethroid cyfluthrin. This was added only to see the impact on the OP-resistant MA populations: it is a restricted-use compound used in cotton and potatoes and is highly unlikely to ever be labeled for cranberry.

In the lab, infested uprights were dipped into insecticide solutions made up to recommended field rate in the equivalent of 100 gpa. In Trial I, 25 infested tips were examined 2 and 3 days after treatment and egg and larval mortality by instar was assessed (Figure 1). In Trial II, 35 terminals were assessed 3 DAT (Figure 2) and 50 terminals assessed at 6 DAT (Figure 3).

In the preliminary test of Assail, Venom, and Delegate, by 3 DAT, mortality of first instars was highest, with lower levels of dead large larvae (Figure 1).

Table 1: Compounds used in trials, showing range of mode of action and rates.

Chemical subgroup	***Mode of action***	***Active ingredient***	***Product name and field rate/A used in tests***	***US-EPA reduced-risk status***
Neonicotinoids	Nicotinic acetylcholine receptor agonists/antagonists	Nitroguanidine subclass		RR
		clothianidian	Clutch 2 oz	
		dinotefuran	Venom	RR/OP replace-ment
		Pyridylmethylamine subclass		
		thiacloprid	Calypso 3.9 oz	
		acetimiprid	Assail	RR/OP replace-ment
Spinosyns	Nicotinide acetycholine receptor agonists	spinoteram	Delegate 6 oz	RR
Diamides	Ryanodine receptor modulators	flubendiamide	NNI 4 oz	
		chlorantraniliprole	DPX-E2Y 4 oz	
		? not released to us by registrant	DPX-HGW86 5.3 oz	
Metaflumizone	Voltage-dependent sodium channel blockers		BAS 320 16 oz	RR
Neonicotinoid + Pyrethroid	Nicotinic acetylcholine receptor agonists/antagonists + sodium channel modulator	Nitroguanidine subclass: imidacloprid cyfluthrin	Leverage 2.7 2.2 oz	

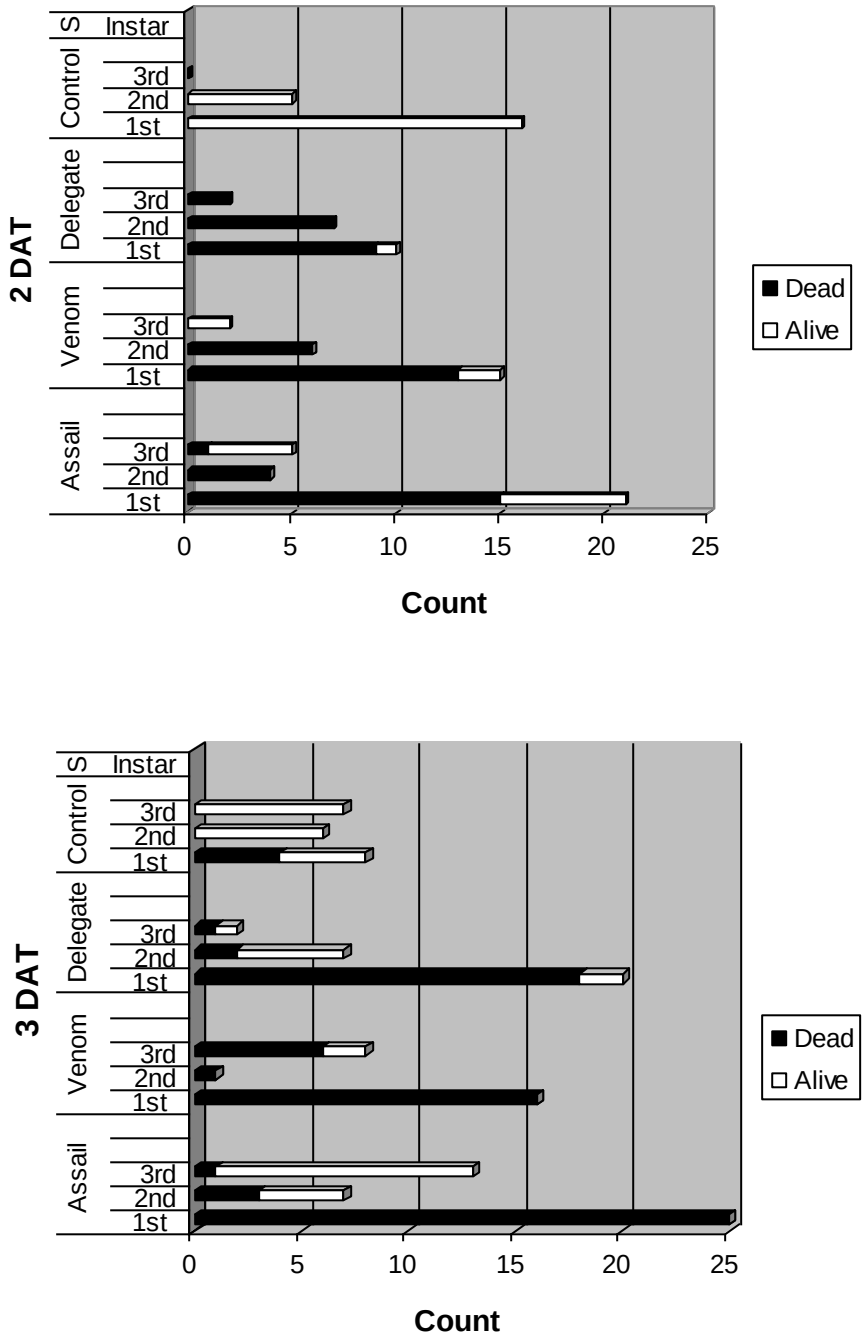

Figure 1. Laboratory screening trial I.

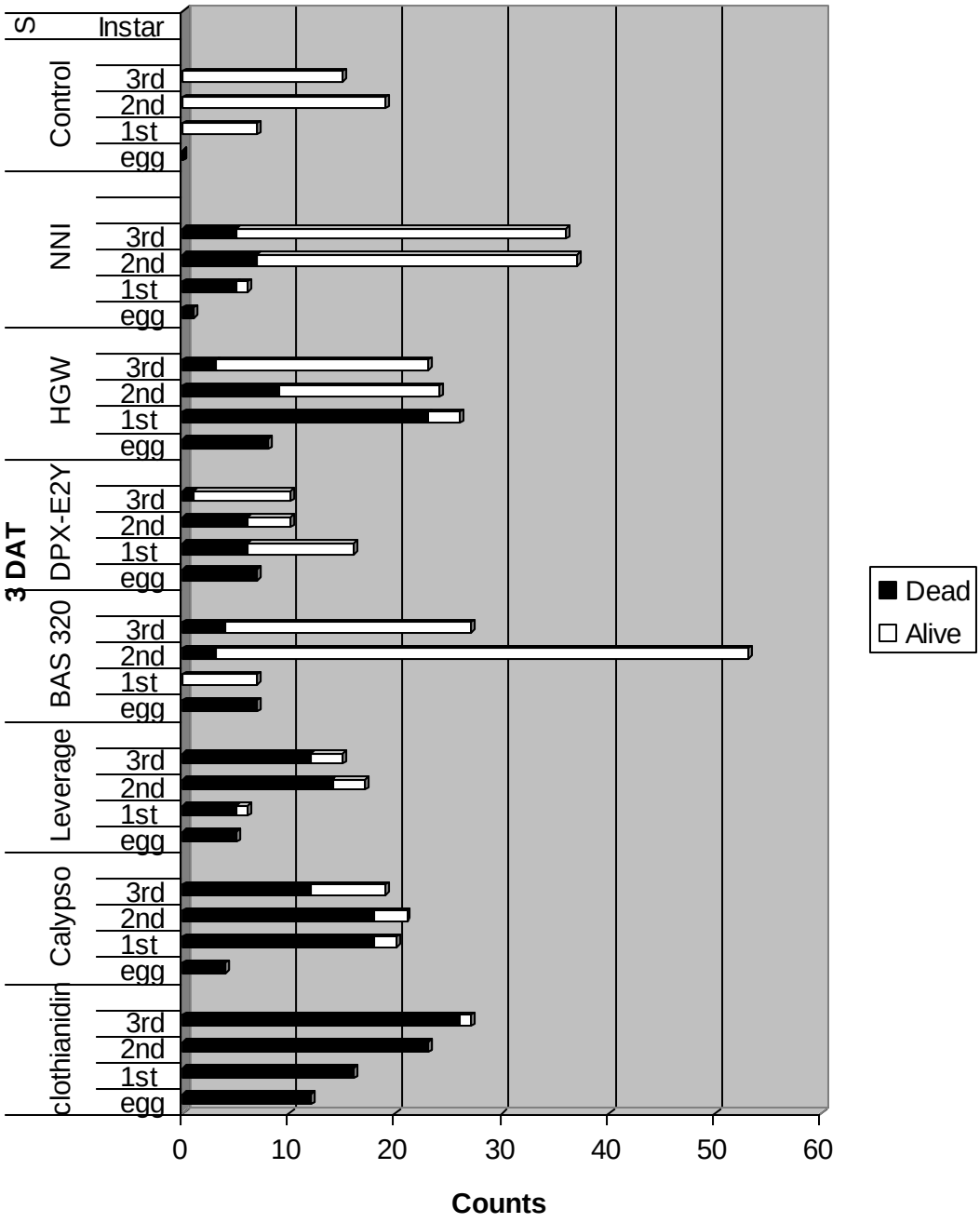

Figure 2. Laboratory screening Trial II, 3 DAT

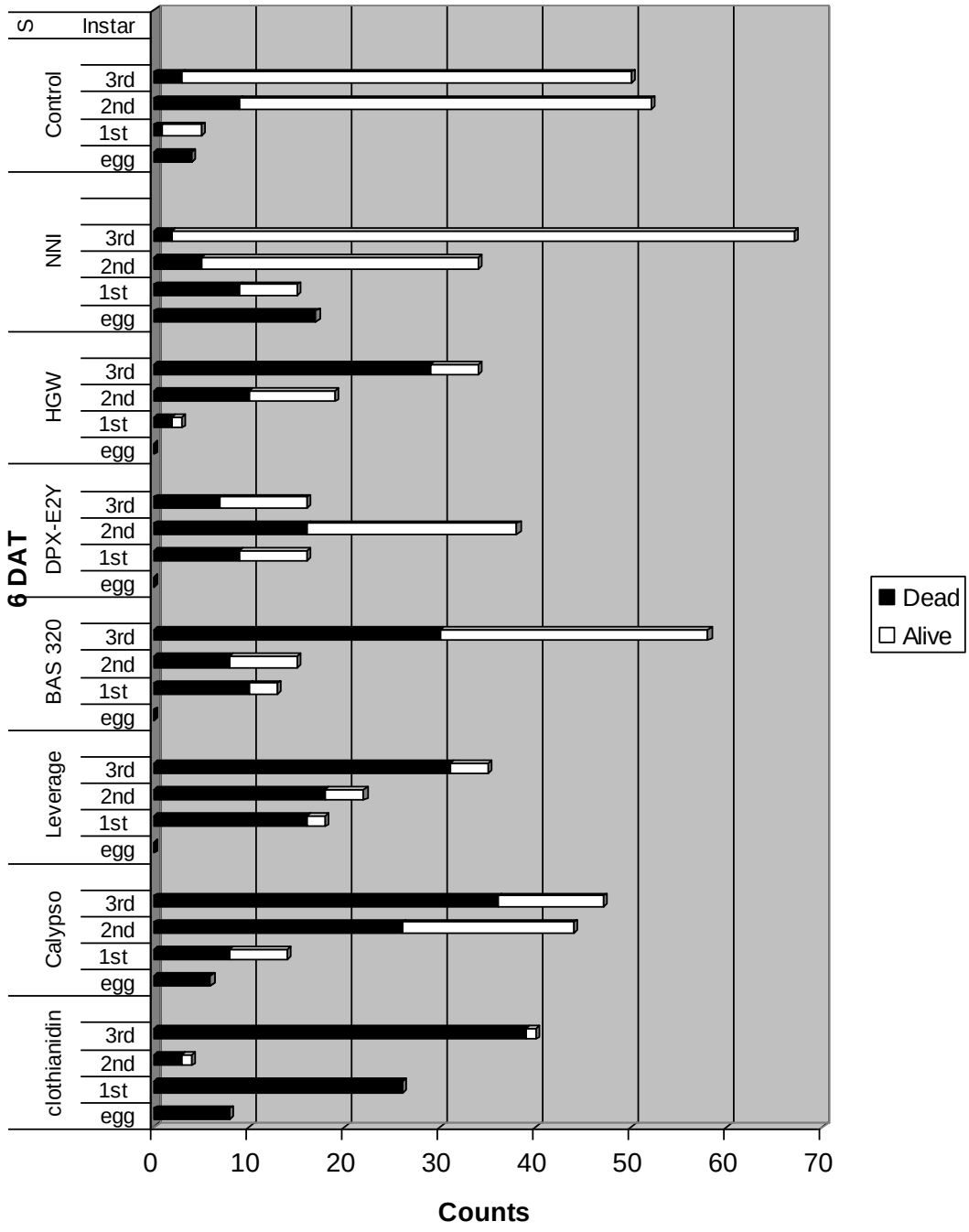

Figure 3. Laboratory screening trial II, 6 DAT

In Trial II, survivorship remained high in the control uprights, even six days after being cut. Mortality was highest for all stages in the Clutch treatment and lowest in the NNI treatment. By 6 DAT ca. 50% mortality was observed in the BAS 320 and DPX-E2Y treatments and was ca. 60-80% in the HGW, Calypso, and Leverage treatments.

Our lab data are only sometimes in agreement with previous field insecticide screens. Cesar Rodriguez-Saona (Rutgers) showed that for cranberry tipworm on blueberry, when damaged tips were assessed following treatments, HGW and Avaunt provided some control. Assail and Venom were no better than untreated. A large field trial run by Dan Mahr and Jack Perry (University of WI-Madison) on cranberry ('Ben Lear') in 6x6 ft plots using 3 applications at 10-day intervals (July – Aug) showed variation within chemical subgroups. Examination of uprights for larvae resulted in these findings: of several pyrethroids tested, 2 high major impact and 1 had moderate impact; of 5 neonicotinoids tested, 3 had major impact and 2 moderate impact; Avaunt was not effective; 2 spinosyns were moderately effective. They also found lower egg counts in the pyrethroid plots, suggesting that these compounds killed or repelled adults while the neonicotinoids had higher egg counts and lower larval counts. Only Guthion and an unidentified neonicotinoid completely eliminated larvae and pupae in plots. Of note, our work years ago showed that MA populations are completely resistant to Guthion.

Because the neonicotinoids, spinosyns, and diamides are expected to exhibit systemic properties and be taken up by the plant, the lab dips carried out here might underestimate mortality in the field if it is shown that the compound is translocated to the growing tips where the larvae are feeding.

Also, because of the mobility and residual of these compounds in the intact plant, use of the compound showing highest levels of mortality, Clutch (currently in the IR-4 queue for complete registration on cranberry), may require evaluation of pollen and nectar contamination and possible bee health issues.

Objective 2. Compare bog sections with different cultural practices.
This objective could not be completed as proposed. Grower cooperators that had pruned had also sanded; no paired beds of only pruned and only sanded could be located and no Stevens beds that had been pruned were located.

Sampling proceeded anyway on sanded/pruned vs not sanded/pruned beds. One hundred uprights from two Early Black beds and from two Howes beds were collected and inspected at mid-season (July) and late-season (August) to determine tipworm levels.

The results in Figure 4 show that on the pruned/sanded beds, there was a general trend of lower tipworm damage/infestation at these sites when compared to the non-treated sections, particularly the EB Site 1. This is not surprising since it is known that sanding suppresses tipworm levels. EB Site 2 had very low tipworm, while the two Howes sites, 3 and 4, had surprisingly high tipworm in the late season collection, which raises MA

concerns about bud set for the following year. In contrast, there was no/low active infestation in the EB sites late in the season.

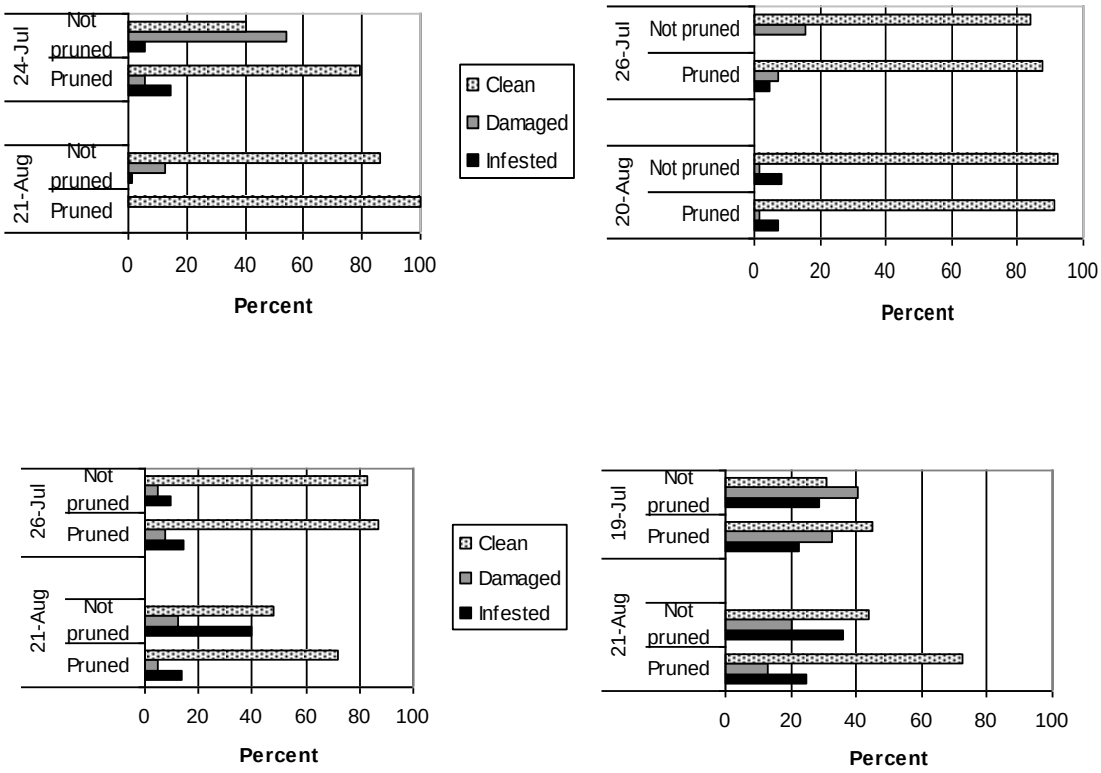

Figure 4. Percent damage, infested, or clean uprights on beds pruned (and sanded) or not pruned/sanded in year prior to tipworm sampling. The top two sites were the early-fruiting cultivar'Early Blacks' and the lower were the late-fruiting cultivar 'Howes'

Proposed work in 2008.

Objective 1. Field trials of the most active compounds in the lab will be carried out. Clear omissions in this year's insecticide screen were two registered compounds, indoxacarb (Avaunt) and thiamethoxam (Actara), and these will be added.

Objective 2 on cultural control impacts may need to be dropped if no 'Stevens' cooperators can be identified.

Objective 3, controlling tipworm and monitoring yield in the year during control (2008) as well as in the subsequent year (2009), will be carried out next season using clothianidin in crop-destruct plots on Stevens and Howes beds. We willalso observe development of vegetative and reproductive buds.

Additionally: A single ‘Stevens’ and another ‘Early Black’ site showed much lower late-season tipworm activity when compared to two additional ‘Howes’ sites that we scouted at two points in the season for tipworm.

Table 2. Other data collected while searching for cooperator field sites

Site	***% tipworm infestation***	***% damaged terminals***	***% clean terminals***
Onset organic--‘Early Black’			
7/13	4.1	44.3	51.6
8/20	0	4.7	95.3
Plymouth --‘Stevens’			
7/12	11.9	59.5	28.6
8/22	0	26.4	73.5
Wareham--‘Howes’			
7/19	30.6	40.8	28.6
8/21	12.3	42.0	45.7
Rochester --‘Howes’			
7/13	40.4	35.7	23.8
8/20	28.6	3.1	68.3