Evaluation of Monitoring Techniques for Detecting Cranberry Tipworm in Rabbiteye and Southern Highbush Blueberries

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Abstract

Cranberry tipworm, *Dasineura oxycoccana* Johnson (Diptera: Cecidomyiidae) is a key pest of rabbiteye blueberries, *Vaccinium ashei* Reade, in the southeastern United States. In an attempt to develop monitoring protocols for detecting *D. oxycoccana* in blueberry fields, four colored (yellow, white, green, and blue) sticky traps were evaluated for monitoring *D. oxycoccana.* There was no significant difference in attraction of *D. oxycoccana* to colored sticky traps. In a separate study, three sampling techniques (unbaited yellow sticky boards, bud emergence and bud dissection) were evaluated for their effectiveness in detecting *D. oxycoccana* populations in rabbiteye and southern highbush blueberry plantings.

Emergence techniques detected significantly more *D. oxycoccana* adults from floral buds compared with sticky boards or bud dissection sampling methods. Emergence and dissection methods were not significantly different in detecting *D. oxycoccana* in either floral buds or leaf buds. Overall, the only sampling technique that was capable of detecting *D. oxycoccana* eggs was bud dissection.

INTRODUCTION

Several insect pests including flower thrips (Thysanoptera: Thripidae), leaf footed bugs (Hemiptera: Coreidae), flea beetles (Coleoptera: Chrysomelidae) and cranberry tipworm (Diptera: Cecidomyiidae), attack blueberries in the southeastern United States. The cranberry tipworm, *Dasineura oxycoccana* (Johnson), locally called blueberry gall midge appears to be the most serious threat to rabbiteye, *Vaccinium ashei* Reade, blueberries in the southeastern USA. Up to 80% of the crop can be damaged if no adequate control measures are taken. Leaf buds of southern highbush, *V. darrowi* Camp X *V. corymbosum*, blueberries also appear to be susceptible (Sarzynski and Liburd, 2003). Prior to 1994, the vast majority of *D. oxycoccana* injuries in blueberries were misdiagnosed as frost damage (Lyrene and Payne, 1995). Agricultural personnel including extension agents and agricultural consultants were unable to recognize *D. oxycoccana* or its injury and there was no effective monitoring tool for detecting *D. oxycoccana* in blueberry fields. Our ultimate goal was to evaluate monitoring techniques for detecting *D. oxycoccana* in rabbiteye and southern highbush blueberry fields. The specific objectives were: 1) to evaluate various colored commercially available sticky traps for monitoring *D. oxycoccana* in blueberry plantings; 2) to compare sticky traps with other sampling techniques including larval/adult emergence and dissection and; 3) to compare infestation rates of floral and leaf buds in rabbiteye and southern highbush blueberries for the presence of *D. oxycoccana* larvae and eggs.

MATERIALS AND METHODS

Evaluation of Colored Sticky Traps

Various colored rectangular traps (surface area 394 cm^2) were hung in a vertical position within the canopy of blueberry bushes and spaced 10 m from each other. Trap colors were pantone yellow, safety white, walnut husk green and thrips blue. Experimental design was randomized complete block with four replicates. Sticky traps

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were collected weekly and re-randomized when new traps were placed into the field. All insect caught on traps where observed under a 10x dissecting microscope to identify and count the number of *D. oxycoccana* captured in each treatment.

Sampling Techniques: Comparison

Based on the results from the previous trial we selected pantone yellow traps to be used for further comparison with other sampling techniques (Figure 1). Yellow traps were compared with bud dissection and larval emergence techniques. For the bud dissection and larval emergence techniques we collected 140 floral and 140 leaf buds for each technique (35 per replicate/technique). These buds were collected while they were between stages 2 to 4 as recommended by Spiers (1978). For the dissection technique the buds were dissected and observed under a 10x dissecting microscope. For the larval emergence technique buds were placed in Petri-dishes at 27°C with 70% relative humidity. Petri-dishes were monitored three times per week for 15 days and the total number of larvae that emerged in each treatment was recorded.

RESULTS AND DISCUSSION

Captures of *D. oxycoccana* on yellow sticky boards were low and there was no significant difference in attraction of *D. oxycoccana* to colored sticky traps (Fig. 1). Overall, the emergence technique performed better than the other sampling techniques in detecting *D. oxycoccana* adults in rabbiteye and southern highbush floral buds (Table 1, Table 2). The only technique capable of detecting *D. oxycoccana* eggs in rabbiteye and southern highbush blueberries was bud dissection. Southern highbush leaf buds contained the highest number of *D. oxycoccana* eggs (Fig. 2), despite having the lowest number of larvae. Larval infestation by *D. oxycoccana* in rabbiteye floral buds was significantly higher than other bud types evaluated (Fig. 3).

The emergence and dissection techniques were equally effective in detecting *D. oxycoccana* larvae in the highly infested rabbiteye floral buds (Table 1). In southern highbush floral buds with fewer larvae, the emergence technique performed better than the dissection technique (Table 2), which may be important from a management perspective. A strategy based on the emergence technique may be implemented to suppress *D. oxycoccana* populations before significant damage is done. The disadvantage of this technique is that many eggs could be laid during the time (10-15 days) the grower is awaiting the results.

With respect to leaf buds in rabbiteye or southern highbush species, neither of the techniques (emergence or dissection) were superior. Both techniques were able to detect *D. oxycoccana* at relatively low populations. Generally, the dissection technique is labor intensive and requires a microscope to see the eggs. The advantage of using the dissection technique is that it gives information about the egg stage before any damage is recorded in the field.

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Tables

Table 1. Comparison of techniques for monitoring *Dasineura oxycoccana* in rabbiteye blueberries.

	Mean ± SEM *D. oxycoccana*					
	Flower Buds			Leaf Buds		
Sampling Techniques	**Adults**	**Larvae**	**Eggs**	**Adults**	**Larvae**	**Eggs**
Yellow Boards	12.8 b	0.3 b	-	12.8 a	0.3 b	-
Emergence	122.5 a	175.0 a	-	4.3 b	6.0 a	-
Dissection	0.0 c	182.3 a	27.5	0.0 c	4.0 ab	31.3

Rows with different letters are significantly different when LSD (α=0.05) test is used

Table 2. Comparison of techniques for monitoring *Dasineura oxycoccana* in southern highbush blueberries.

	Mean ± SEM *D. oxycoccana*					
	Flower Buds			Leaf Buds		
Sampling Techniques	**Adults**	**Larvae**	**Eggs**	**Adults**	**Larvae**	**Eggs**
Yellow Boards	0.3 b	0.0 c	-	0.3 b	0.0 b	-
Emergence	19.8 a	28.0 a	-	4.0 a	5.8 a	-
Dissection	0.0 b	13.8 b	0.0	0.0 b	6.3 a	52.5

Rows with different letters are significantly different when LSD (α=0.05) test is used

Figures

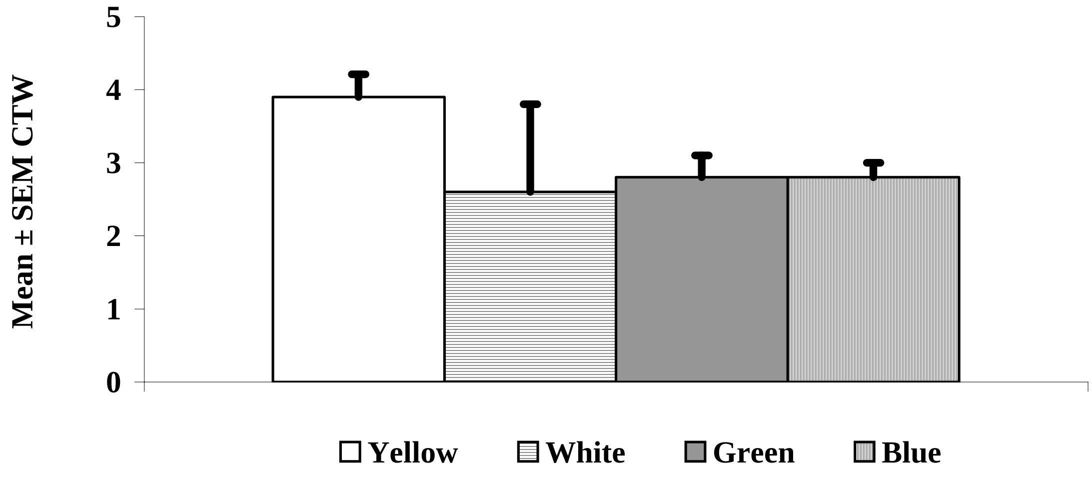

Fig. 1. Average number of *Dasineura oxycoccana* captured in sticky traps by color.

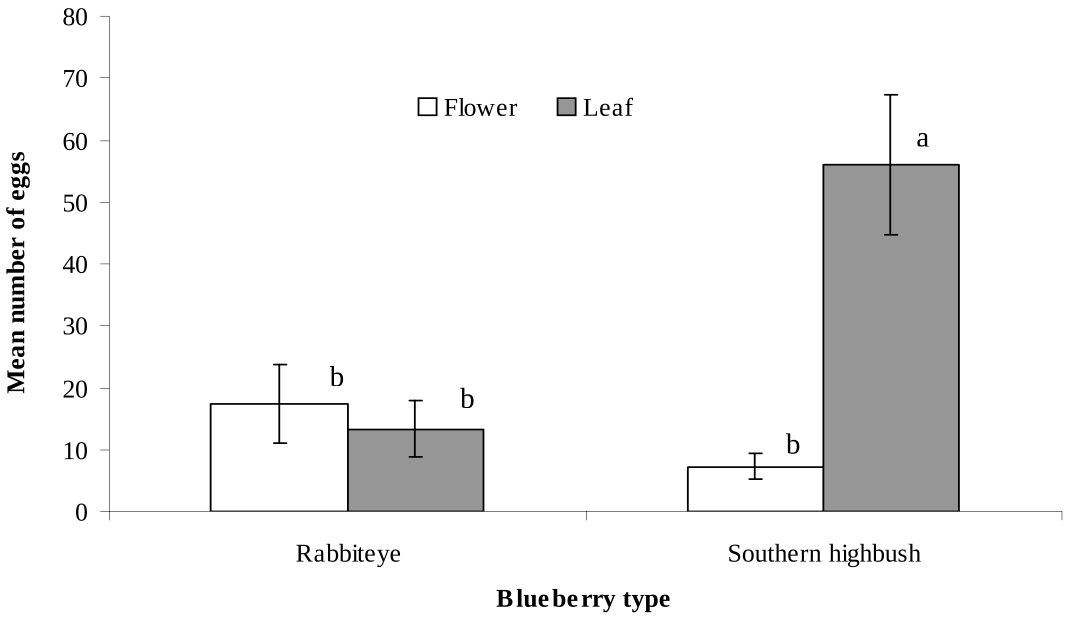

Fig. 2. Average number of *Dasineura oxycoccana* eggs collected from dissected flower and leaf buds from rabbiteye and southern highbush blueberries. Bars with different letters are significantly different when LSD (α=0.05) test is used.

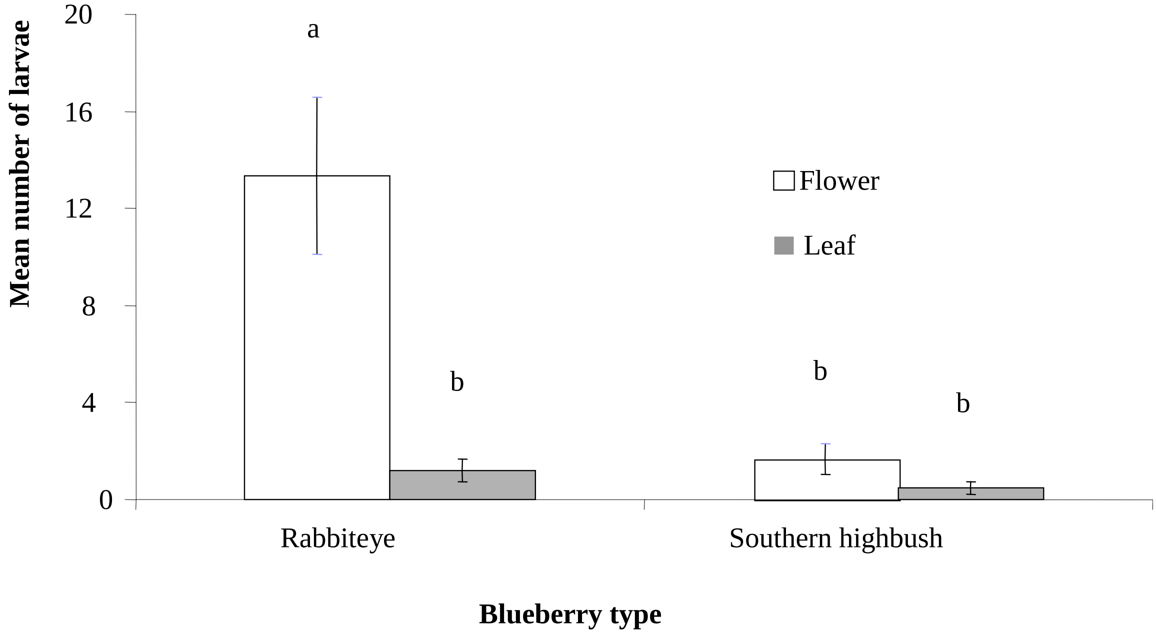

Fig. 3. Average number of *Dasineura oxycoccana* larvae collected from dissected flower and leaf buds from rabbiteye and southern highbush blueberries. Bars with different letters are significantly different when LSD (α=0.05) test is used.