Annual Report
North American Bramble Growers Research Foundation
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Title: Alternative tactics to prevent bramble damage by borers

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Proposal Category: _X_ Production Research

Objective
The goal is to develop a scouting and management program to minimize damage to brambles by raspberry crown borer and rednecked cane borer. Specific objectives are:
1. To compare visual and odor stimuli released by primocanes and floricanes and test visual and odor combinations for attraction for future development of monitoring tools and/or suppression tactic against rednecked cane borers and raspberry crown borers.
2. To conduct field efficacy studies of insecticides and biopesticides against raspberry crown borer and rednecked cane borer.
3. To compare blackberry cultivars of different species parentage for resistance to rednecked cane borer and raspberry crown borer.

Results
Objective 1

The comparison of visual and odor stimuli of primocanes and floricanes was not completed in 2010. Currently, we have become familiar with a new piece of equipment, Jazz spectrometer (Ocean Optics, FL), which will be used in spring 2011 to characterize the visual spectrum of primocanes to floricanes.

We did collect several odor samples, analyzed each on the GC/MS but kept seeing a large peak for methyl jasmonate. We interpreted that the plants were being damaged during odor collection which induced production of methyl jasmonate. To overcome this problem, we purchased custom (0.6 m x 0.6 m) Teflon® bags (American Durafilm, Holliston, MA) with input and output ports to collect these odors samples. We are practicing using these bags over the winter to collect volatile odors from blackberry plants in the greenhouse. In 2011, we will continue to collect and analyze the odor profiles emitted by primocane and floricane and begin to use a recently purchased GC-electroantennodetector (EAD) system to identify biologically active odor components of blackberry plants.

Our old electroantennogram (EAG) system from Syntech (Kirchzarten, Germany) that we had planned to use in 2010 became obsolete due to failure of the old computer that the

system had to interface with. We replaced this computer with a new net book computer and ordered several pieces of equipment (using a number of funding sources) to convert our Varian 3900 Gas Chromatograph (GC) into a GC-electroantennodetector (EAD): effluent conditioner assembly; heated transfer line; digital temperature controller; effluent /air mixing assembly; flow tube; 2-channel USB acquisition controller to fit new computer, IDAC-2 2-channel signal recording system optimized for GC-EAD signals; and Syntech EAG and GC-EAD signal recording and analysis program. This will allow us to identify the biologically active odor attributes of blackberry primocanes or floricanes to RNCB adults in May 2011 and to RCB adults in September 2011.

Objective 2

Rednecked cane borer

The efficacy trials were conducted at the University of Arkansas Fruit Research Station in Clarksville, Arkansas. Insecticide applications were timed by weekly inspection of primocane foliage for presence of RNCB adults. Compounds used in this test included synthetic, biopesticides, and microbial formulations (Table 1). In a RCB with 4 replicates, each treatment plot had 10 blackberry plants with a buffer of 2-3 plants in between treatments. On 12 May, most treatment plots had a foliar application of 0.25 gal of solution per treatment plot (50 gal/acre) using a SHURflo® electric backpack sprayer (Cypress, CA) at 40 psi. On 12 May, a single application either of Voliam Flexi was made to the foliage or Admire Pro was soil drenched around the plant base. The biopesticide and microbial formulations were reapplied weekly on 19 and 25 May. Assail 30SG was reapplied only on 25 May. On 17 and 30 of September 2010, the number of galls per plant was recorded. Data were analyzed with ANOVA and treatment means were separated using the Waller-Duncan *k*-ratio *t*-test.

Results from the efficacy testing have shown no significant difference for any of the treatments (Table 1). Although there was a high population of RNCB at the start of application (May 12, 2010), population counts 2 weeks later showed a dramatic drop. This drop in population may have been the result of toxicity of the applied pesticides to the borer. RNCB adults were observed to fly from plant to plant within a row and may have acquired toxic dose from a treatment plot and died before flying to and laying eggs on canes in another treatment plot within that row. The efficacy testing protocol needs to be modified so each treatment application is applied to different rows instead of all treatments as subplots within a row.

Raspberry crown borer

We assumed that the typical blackberry planting has plants spaced 2 ft apart with an 8 ft drive row (2,722 plants/ acre). Most treatments in (Table 2) will be applied in a volume of 200 gal of treatment solution per acre or 9.4 fl oz per blackberry plant (278 ml). On 26 October 2009, we applied a soil drench of each treatment (RCB* in Tables 1 and 2) to four plots each of four blackberry plants in a RCB design at the Fruit Research Station in Clarksville, AR. During RCB egg hatch in October 2009, apply weekly foliar treatments of formulations 6, and 8-14 in Tables 1 and 2. In mid-October 2010 the number of RCB pupal skins at the cane base was recorded. Data were analyzed with ANOVA and treatment means were separated using the Waller-Duncan *k*-ratio *t*-test.

Results from the efficacy testing showed no significant differences in the numbers of pupal skins per plant (Table 2). However, there was a general trend observed that the synthetic chemistries had lower numbers of pupal skins per plant than did the biorational compounds.

Objective 3

Plants of different cultivars were located and those available as tissue culture plants have arrived and growing in pots in a greenhouse located at the Arkansas Agricultural Research and Extension Center (AAREC) in Fayetteville, AR. The other cultivars will be delivered as soon as leaves fall in December. These plants will be grown throughout the winter to ensure usability next year.

Conclusion

The two pests experimented have the potential to greatly reduce yields the following year if effective control measures are not taken. However, with the cancelation of key pesticides to control both pests the need for replacements is crucial. Even though our results didn't demonstrate any significance differences between the different chemistries applied, general trends were observed. Pesticides tested for rednecked cane borer have shown trends that the synthetic chemistries and two organic products (Pyganic and JMS) had lower number of galls caused by the pest. However, for raspberry crown borer the general trend observed was that only synthetic pesticides decreased the number of pupal skins observed.

It is crucial to replicate the efficacy testing to determine alternative pesticides to combat the pests. Also, the completion of objective 1 is crucial in order to possibly develop efficient monitoring and/or trapping techniques. Development of objective 1 will allow for an alternative control strategy and can also decrease the pesticide inputs into the environment.

Table 1. List of pesticides applied to blackberries in 12 May 2010 and applied four weekly sprays of biorationals applied from 12 May on with mean (N = 4) numbers of rednecked cane borer galls per plant in Clarksville, AR.

Treatment or Formulation	**Mean number of galls per plant**
Brigade 2EC	0.06a
Assail 30SG	0.13a
Admire 2F	0.13a
Voliam Flexi	0.19a
Ecotrol	0.13a
JMS Stylet Oil	0.0a
Aza-Direct	0.13a
Pyganic 5EC	0.0a
Azera	0.19a
Botanigard	0.06a
Untreated check	0.13a

Means followed by the same letter(s) are not significantly different, (Waller-Duncan *k*-ratio *t*-test, $P < 0.05$)

Table 2. List of pesticides and biorationals applied to blackberries on 28 October 2009 and mean number of raspberry crown borer pupal skins per plant in October 2010 in Clarksville, AR.

Treatment or Formulation	Mean number of pupal skins per plant
Brigade 2EC	0.0a
Assail 30SG	0.06a
Javelin WG	0.25a
Entrust	0.06a
Barrier Oil	0.83a
Ecotrol	0.38a
JMS Stylet Oil	0.38a
Aza-Direct	0.19a
Pyganic 5EC	0.25a
Azera	0.31a
Nematode	0.31a
Untreated check	0.38a

Means followed by the same letter(s) are not significantly different, (Waller-Duncan *k*-ratio *t*-test, $P < 0.05$)