

2008 Grape Root Borer Research Update

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Larval response to root extracts. At the 2007 VVA meeting, I reported our finding that newly hatched grape root borer larvae were attracted to small filter paper discs treated with alcohol extracts of roots from a range of different grape species and rootstocks presented in “no-choice” laboratory bioassays, in which larvae were presented simultaneously with an extract-treated disc and a disc treated with solvent alone. Larvae exhibited a statistically significant response to extracts of 3309, ‘Norton’, 420-A, *V. riparia* ‘Gloire’, 101-14 and *V. cordifolia*. In “choice” test bioassays, pairs of discs treated with extracts from different root sources were presented simultaneously, revealing that the response of larvae was significantly and consistently much stronger to extracts from 420-A and *Vitis riparia* ‘Gloire’ roots than to 3309 or others. In 2007, with support from the Virginia Wine Board and in collaboration with a USDA chemist from Beltsville MD, we made extracts of 420-A roots, then concentrated and fractionated them into 3 parts; the acid fraction, the base fraction and the neutral fraction. Each of these fractions was then tested repeatedly in “no-choice” bioassays conducted between August 22 and October 2.

Figure 1. The response of grape root borer larvae to filter paper discs treated with fractions from extracts of 420-A roots.

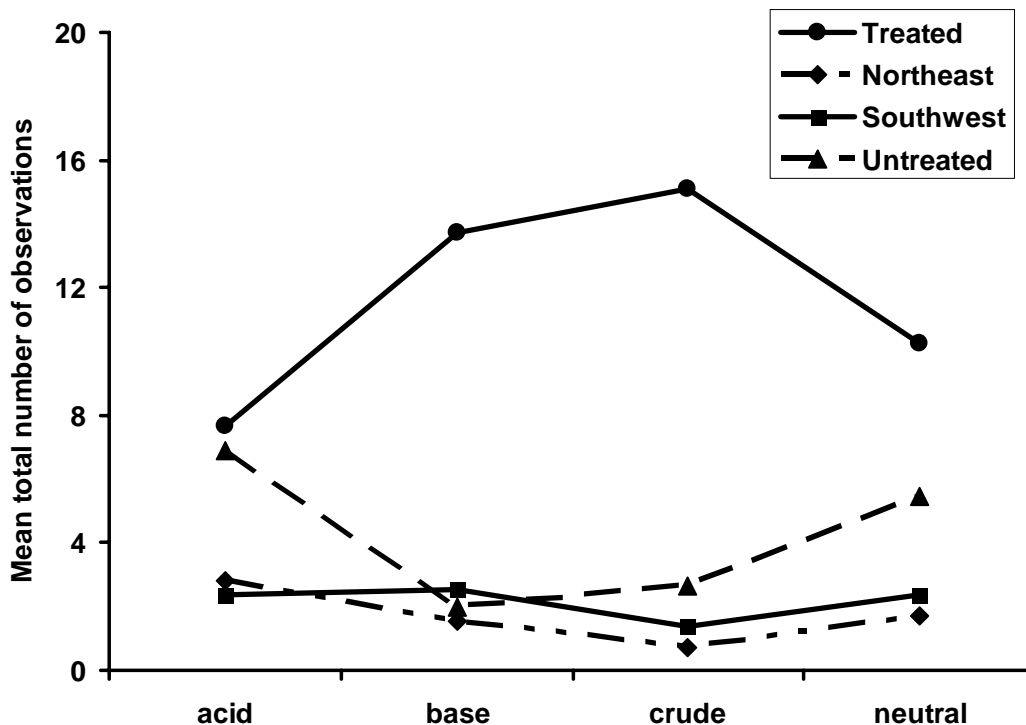


Figure 1 shows the results from this work. To interpret this graph, note the distance between the “treated” line (circles) and the “untreated” line (triangles) for each fraction and the crude extract. The largest distance occurs for the crude (unfractionated) extract. The distance for the base fraction is nearly the same as for the crude extract. The distance between these two lines is very small for the acid fraction while the distance for the neutral fraction is intermediate. These

results indicate that the behaviorally active compounds to which the larvae are responding reside primarily within the base fraction, with no activity in the acid fraction and an indication that there may be some small degree of activity in the neutral fraction. We intend to use increasingly sophisticated fractionation methods on the base fraction to further isolate, and ultimately, to identify the behaviorally active compounds. Our long-term goals are to, 1) evaluate the potential for using these compounds in grape root borer management tactics based on disrupting the ability of larvae to successfully orient to grape roots and 2) to compare the chemical profile of the most active fractions from a range of native and commercially important *Vitis* species and rootstocks, possibly providing clues about differences among hosts in pest susceptibility.

Trapping studies in 2007. Some grape growers in Virginia have expressed interest in the possibility of managing grape root borer via mass trapping (i.e. removal of large numbers of males from the “breeding” population using pheromone traps). Re-usable plastic “bucket” traps have been considered optimal for this purpose, since they do not become quickly “saturated” with moths, as sticky traps can, and a green version of this trap has been commercially marketed for specifically for this purpose. Consequently, in 2007 we addressed several questions about the relative effectiveness of different trap styles and the effects of trap placement on captures of grape root borer males. Three or four different trap types were compared in three vineyards in northern Virginia. Traps were deployed in mid-July and monitored twice weekly through mid-August (for details, contact cbergh@vt.edu). Contrary to published reports from other investigators, we found that the Delta style sticky trap captured significantly or numerically more male grape root borers than either of the bucket traps at all sites (Table 1). Captures in Wing style traps were intermediate, but not significantly lower than in Delta traps and there was not a difference between green and yellow bucket traps. The total number of moths captured during the sample period was, Vineyard 1: 369, Vineyard 2: 641, Vineyard 3: 597.

Table 1. The effect of trap type on the capture of male grape root borer moths

Trap type	# traps	Average total number of moths per trap (\pm SEM)		
		Vineyard 1	Vineyard 2	Vineyard 3
Delta	4	46.25 \pm 8.2a	79.0 \pm 8.3a	61.25 \pm 18.4a
Wing	4	31.5 \pm 5.5ab	55.25 \pm 23.1a	34.0 \pm 14.1ab
Green bucket	4	14.5 \pm 3.3b	11.5 \pm 3.5b	30.75 \pm 8.5b
Yellow bucket	4	-	14.5 \pm 6.2b	23.25 \pm 6.6ab

The effect of trap elevation was examined using green bucket traps at two vineyards in which traps were deployed suspended from trellis wires at ~2.5, 4.5 and 6.5 ft above the ground and monitored weekly from mid-July through mid-August. While there was not a significant effect of trap elevation on the capture of moths, there was a consistent trend for increasing captures with increasing trap elevation at both vineyards (Table 2). The total number of moths captured during the sample period was, Vineyard 1: 364, Vineyard 2: 134. The numbers of moths captured in these vineyard blocks was likely influenced by the fact that the green bucket traps were used.

Table 2. The effect of trap elevation on the capture of male grape root borer moths

Trap elevation	# traps	Average total number of moths per trap (\pm SEM)	
		Vineyard 1	Vineyard 2
2.5 ft	4	21.8 \pm 4.5a	8.3 \pm 1.7a
4.5 ft	4	32.8 \pm 5.0a	11.8 \pm 3.0a
6.5 ft	4	36.5 \pm 11.2a	13.5 \pm 4.3a

The effect of trap location was examined at six vineyards in which one green bucket trap was deployed in a border row and one in the center of the vineyard, suspended from the trellis wire at about mid-canopy. Traps were monitored weekly from about mid-July until about mid-August. The mean number of moths captured per trap per week did not differ significantly between traps placed on border rows (3.1 ± 0.8) versus in the center of the block (5.5 ± 1.7) although there appeared to be a small numerical advantage to placing traps in the block interior.

The use of mass trapping to manage grape root borer infestations may well have merit. Unlike many other moth pests of agricultural crops, with populations of hundreds of thousands or more in a production area, grape root borer populations are typically much lower. So, diligent and consistent removal of males over time (i.e. consecutive years) may indeed impact the frequency of mating, egg-laying and consequently, larval populations on roots. However, before embarking on such an effort, growers must realize that this tactic has not been systematically tested or rigorously evaluated in different vineyards over time. Although the non-saturating green plastic bucket traps are reusable and most easily serviced, our data suggest that this trap may not be the most effective, despite the fact that it has been marketed for that use. It may be that other styles of plastic bucket traps are more effective for removing borer males and we intend to examine that question in 2008. Furthermore, there are no data on the number of traps per acre of vineyard that would be required to impact grape root borer populations or on where they should be deployed. Our data do suggest, however, that placement of traps at the top of the vine canopy and in the interior of vineyard blocks should result in the highest captures.