

A STRATEGIC SCREENING PROGRAM FOR IR-4 REGISTRATION OF INSECTICIDES IN GRAPE: 2004 GREAT LAKES EXPO

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In August of 1996 President Clinton signed into law the Food Quality Protection Act (FQPA). This law fundamentally changed the basis by which the EPA registers and regulates pesticides in the USA. One of the results of this new legislation is that the EPA is likely to eliminate or severely restrict many of the conventional pesticides (i.e.; organophosphate and carbamate insecticides) traditionally relied upon for fruit production. In fact, ten of the top 30 most at-risk pesticides listed in MSU's Pesticide Risk Database constitute the primary pest management tools that the Michigan fruit industry presently rely upon for fruit production. In addition, the cost for re-registering existing pesticides and registering new chemistries has become inordinately high, such that many pesticide manufacturers are not able to justify product development for minor-use crops. Because of these circumstances, minor-use crops, like grapes, blueberries, cherries, apples, peaches, and pears, may be left with a significant short-fall in pest management tools for the future.

The USDA IR-4 project serves as the primary avenue that pesticide chemistries, not fully supported by their parent manufacturer, can be registered for minor-use crops. The MSU Trevor Nichols Research Complex (TNRC) is designated as an IR-4 Field Research Center and is one of the few facilities in the state capable of conducting this GLP field residue work, and over the last ten years has carried-out a majority of the IR-4 residue field trails for Michigan fruit pesticides. The demand for registering new pesticides through IR-4 has risen since FQPA, making it increasingly necessary to provide significant evidence of product performance in order to attain the priority rating needed for timely field trial initiation. Because of this a strategic grape-pest chemical screening program has been established at the TNRC to identify promising new insecticide candidates for IR-4.

2004 OBJECTIVES

- 1) To maintain a strong IR-4 field residue program as a major component of the MSU Trevor Nichols Research Complex's research priorities.
- 2) To establish a strategic grape-pest insecticide screening program to identify and evaluate potential new pesticide candidates for IR-4 field residue trials.

Objective 1. IR-4 program involvement and current successes.

Based on results of the screening trials we submitting IR-4 "clearance requests" for two compounds. One was to amend the current label of Acetamiprid, Assail WSP, from it's current maximum rate of 1.1 oz to the 2.2 oz/acre needed to control the grape berry moth. The second was to amend the current label of Imidacloprid, Provado WSP, from it's current maximum rate of 1.1 oz to the 2.28 oz/acre needed to control the Japanese beetle. With the strong performance data from the 2004 screening trials we attended the IR-4 Food Use Workshop (September 04) and were successful in attaining an "A Priority" for Acetamiprid. This assures the initiation of field residue trials in 2005 that will lead to new registrations with the EPA.

Objective 2a. Screening trial to evaluate new candidates for Grape Berry Moth control.

Insecticides were applied to mature (22 year old) 'Concord' grape vines (Vineyard 1) at the Trevor Nichols Research Complex near Fennville, MI with an FMC 1029 airblast sprayer calibrated

to deliver 50 gpa at 2.5 mph. Regular fungicide applications of Nova and Dithane were applied separately to all treatments, and herbicide applications included Glyphomax Plus, Sinbar, and Gramaxone Extra. Plots consisted of single 42 foot-long rows of vines arranged in a randomized complete block design with four replications. Vine spacing was 6 x 10 ft, with a buffer row separating all plots. In addition to using buffers to minimize drift, a cardboard ‘donut’ was placed over the fan on the airblast to reduce airflow. As the canopy in the vineyard increased, the hole in the center of the ‘donut’ was enlarged to ensure spray penetration. Applications of test materials were made on 21 Jun (1st generation GBM egg hatch), 28 Jul (2nd generation GBM egg hatch), 16 Aug (3rd generation GBM egg hatch), and 3 Sep, as indicated in the following tables. GBM evaluations were made on 12 Aug, 31 Aug and 22 Sep by examining 25 clusters per replicate for injury. Damage severity ratings were taken on 12 Aug and 22 Sep by counting the number of damaged berries on each plot. GBM incidence and severity ratings were analyzed using ANOVA and means separation by Duncan’s New MRT at P = 0.05.

All treatment compounds provided good control of first generation grape berry moth (Figure 1). Control of the second and third generations tends to be more difficult as GBM populations build over time. In the 31 Aug evaluation Intrepid and Danitol + Intrepid were the only treatments to provide 100% cluster protection. All treatment compounds provided good control of the third generation GBM, although only Intrepid, Capture and Venom had significantly lower severity ratings for berry damage. These data suggest that Calypso, Rimon (previously called Diamond), and Clutch are worthwhile candidates for future IR-4 minor use crop field residue trials and EPA registration. All other compounds in this trial are either already labeled for use in grapes or are currently in the registration process.

Objective 2a. Determine the effectiveness of soil-applied imidacloprid (Admire) and foliar-applied imidacloprid (Provado) against potato leafhoppers on grape leaves.

Two different formulations of the insecticide imidacloprid were tested for their effectiveness against potato leafhopper nymphs, *Empoasca fabae* (Harris). Both a soil-applied formulation (Admire) and a foliar-applied formulation (Provado) were tested on grape vines. Trials were set up by taking one year old potted Chardonnay grape vines and applying either Admire 2F (48 oz per acre rate), Provado 75WP (1 oz per acre rate), or applying no insecticides. Admire was applied evenly in the pots as a soil drench while Provado was applied with a hand held spray mister until all foliage was thoroughly covered. A third treatment consisted of the same vines without any insecticide applied. Six replicates of each treatment were set up on 12-July-2004 on grape vines that had been planted in sandy soil earlier that spring in plastic pots (height: 28 cm, diameter: 28 cm). At five different times (24 hours, 7 days, 14 days, 21 days, 27 days) after insecticide treatments were applied, potato leafhopper nymphs were placed on grape leaves and held in place using clip cages. Nymphs were collected from untreated alfalfa fields in southwest Michigan using sweep nets. The alfalfa was swept with the net and any nymphs on the net were aspirated into a vial containing a sprig of alfalfa. About 10 to 20 nymphs were collected in each vial before they were stored in a cooler until they could be placed in clip cages later in the day.

For each time period, two clip cages were affixed to one shoot on each grape vine. One of these clip cages was placed on a mature leaf that was fully expanded when the insecticide treatments were made. The other clip cage was affixed to the smallest fully-expanded leaf that was not fully expanded when the insecticides were applied. At each time after treatment, five potato leafhopper nymphs were placed in each clip cage. Clip cages were placed in the center of the grape leaf and left on the leaf for 24 hours. At the 24 hour point the cages were taken off and nymph mortality was assessed. Nymphs were classified as either “alive”, “dead”, or “dying”.

Results from these experiments show significant differences between the insecticide treatments and the untreated controls. The percent of leafhopper nymphs surviving was significantly lower in the Provado and Admire treatments than in the untreated controls. This was the case for nymphs placed on mature leaves as well as nymphs placed on immature leaves, and the result was consistent when all living nymphs (including “dying” ones) were analyzed or when only “alive” nymphs were analyzed. The only departure from this trend was at the 24 hour after treatment time period where Admire treatments were similar to untreated controls. On mature leaves (those present at the time of application) survival of leafhopper nymphs (including “dying” ones) on mature leaves was significantly higher in the untreated controls than on either the Provado or Admire treated leaves for all time periods except the 24 hour time period (Fig. 2.). For the 24 hour time period, the Admire and untreated controls were very similar and both had significantly higher nymph survival than the Provado treatments (Fig. 2.). On immature leaves (those emerged after application), survival of leafhopper nymphs (including “dying” ones) also showed significant differences among the treatments (Fig. 3.). For the 24 hour time period, the Provado treatment nymph survival was again significantly lower than the Admire and untreated treatments (Fig. 3.). In addition, at the 14 day time period all three treatments were significantly different from each other with Admire treatments having the lowest nymph survival and Provado and untreated treatments having progressively higher survival (Fig. 3.). At the 21 day time period the Admire treatments had significantly lower nymph survival than both the Provado and untreated treatments (Fig. 3.). The increases in nymph survival over time in the Provado treatments disappear when the “dying” nymphs are taken out of the analyses. When looking at the survival of “alive” nymphs, Provado treatments maintained lower survival similar to Admire treatments during the later time periods. These results are similar to those seen with those from mature leaves seen in Figure 2. A comparison of nymph survival on mature and immature leaves at each time period shows one significant difference. Overall, nymph survival in Provado treatments was significantly higher on immature leaves than on mature leaves (Figs 2 and 3.). No other significant differences were seen between mature and immature leaves for any treatment at any other time period (Figs 2 and 3.). These data suggest that even though the foliar formulation of Imidacloprid, Provado, provides the most immediate control of PLH, that the soil applied formulation, Admire, shows promise for having the longest activity (27+ days) in terms of foliage protection from PLH.

Industry Impact and Communication of Findings

Because of the continued loss of critical grape insecticides resulting from the FQPA, there is considerable urgency for developing replacement tools for Michigan's grape/wine production systems. Our ability to identify, develop and register effective alternatives will significantly enhance the chances that the Michigan grape/wine industry will successfully make this difficult transition. Since all of these new chemistries are either strong candidates for or have already received an EPA reduced-risk status, they will likely secure a fast-track avenue for registration, relative to other chemistries already in the pipeline. The findings of these trials have and will be communicated to growers at a variety of forums, such as the 2004 Great Lakes Fruit and Vegetable Expo, and regional MSU Extension meeting in the winter/spring of 2005.

Figure 1. Percent grape clusters damaged by grape berry moth larvae at first, second, and third generation evaluations.

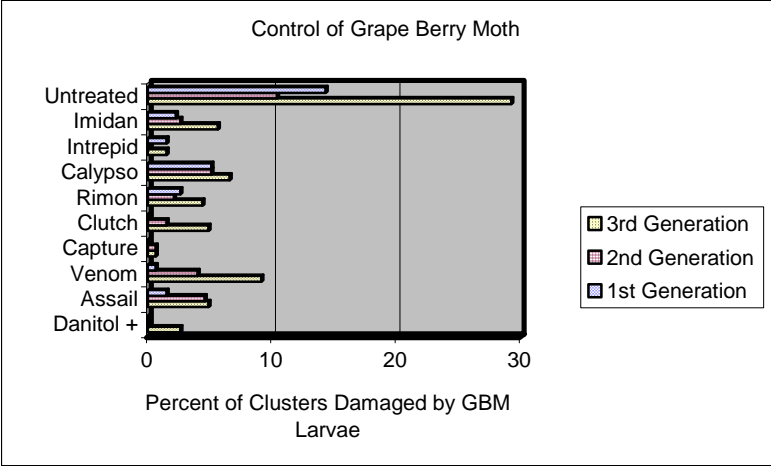


Figure 2. Percent of potato leafhopper nymphs, including dying nymphs, surviving on mature treated grape leaves.

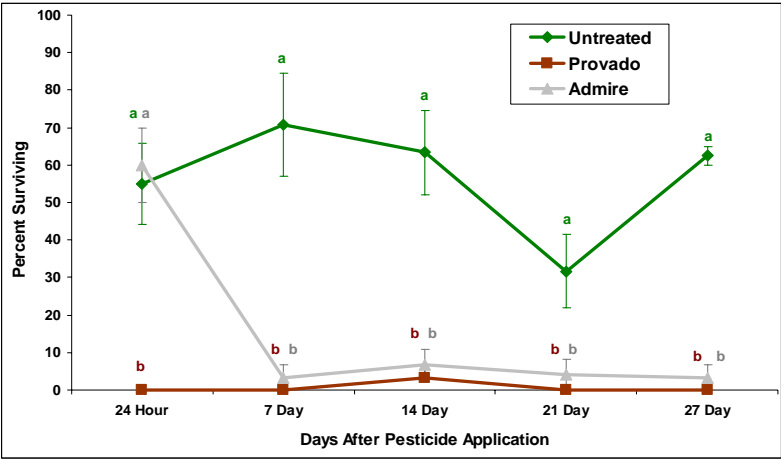


Figure 3. Percent of potato leafhopper nymphs, including dying nymphs, surviving on immature treated grape leaves.

