Project Title: Worm control in grapes with reduced-risk insecticides

Principal Investigators:

David Haviland*, Entomology Farm Advisor, UC Cooperative Extension- Kern Co., 1031 South Mt. Vernon Ave., Bakersfield, CA 93307, (661) 868-6215, dhaviland@ucdavis.edu

Carmen Gispert, Area Viticulture Advisor, UC Cooperative Extension- Riverside and San Bernardino Counties, 82-675 Highway 111, Room 118, Indio, CA 92201, (760) 863-8293, cgispert@ucdavis.edu

* Correspondence related to this project should be directed to Mr. Haviland

Cooperators:

Walt Bentley, IPM Entomologist, UC Cooperative Extension, Kearney Agricultural Center, 9240 South Riverbend Ave., Parlier, CA 93648, (559) 646-6527, walt@uckac.edu

Richard Coviello, Entomology Farm Advisor, UC Cooperative Extension- Fresno Co., 1720 South Maple Ave., Fresno, CA 93702, (559) 456-7549, rlcoviello@ucdavis.edu

Jennifer Hashim, Viticulture Farm Advisor, UC Cooperative Extension- Kern Co., 1031 South Mount Vernon Ave., Bakersfield, CA 93307, (661) 868-6223, jmhashim@ucdavis.edu

Stephen Vasquez, Viticulture Farm Advisor, UC Cooperative Extension- Fresno Co., 1720 South Maple Ave., Fresno, CA 93702, (559) 456-7567, sjvasquez@ucdavis.edu

Objectives

1) Evaluate new, reduced risk insecticides for control of lepidopterous pests in grape
   a) Conduct laboratory bioassay experiments to test insecticides for their effects on western grapeleaf skeletonizer
   b) Test the effects of insecticides for control of western grapeleaf skeletonizer under field conditions
   c) Test insecticides for their effects on grape leaffolder or omnivorous leafroller under field conditions

Justification and Importance

Worm control is essential for the production of high quality table grapes in the Coachella and San Joaquin valleys. Lack of control can affect both the quality, and quantity of marketable grapes. The most serious damage occurs when larvae feed on the rachis, allowing the entry of opportunistic pathogens that can rot the entire cluster. Damage from sunburn can also occur when larvae defoliate large portions of the leaf canopy, leaving clusters exposed to direct sunlight. Complete defoliation can also weaken the vine by affecting carbohydrate reserves going into the dormant season.

During the past few years, worm damage to table grapes has been on the increase. Western grapeleaf skeletonizer, which was once under good biological control from a granulosis virus, has in the last several years reemerged as a pest in Riverside County and throughout the San Joaquin Valley. Severe isolated crop losses have also been attributable to grape leaffolder and omnivorous leafroller. In fact, one grower in Kern County recently reported using 8 applications of *Bacillus thuringiensis* to control omnivorous leafroller, yet his field became 100% defoliated at harvest from grape leaffolder. Once no leaves were left on the vine, worms entered the clusters and rotted over 50% of the entire crop.

Control of all three lepidopterous pests is currently based on the use of two pesticides, Kryocide (Cryolite) and *Bacillus thuringiensis* (various products). Kryocide is a stomach poison that can only be used once per year, and can't be used after fruit formation. *Bacillus thuringiensis* products only provide control of young larvae and have very short residuals. Additional insecticides such as methomyl (Lannate) and carbaryl (Sevin) are also registered, but both are highly toxic to a wide range of organisms and can result in flare-ups of mites and leafhoppers. Limitations on the use of these products necessitate the evaluation of the many new reduced risk larvicides that have become available to grape growers.

Several new insecticides are currently available or are in various stages of the registration process for worm control in grapes. These include Confirm (tebufenozide), Intrepid (methoxyfenozide), Steward (*Bacillus thuringiensis*), Assail (acetamiprid), Avaunt (indoxicarb), and Success (spinosad). These products are all currently registered on at least one crop in California, and have all been proven highly effective against one or multiple lepidopterous pests. These insecticides are all classified as reduced risk by the

EPA, have less detrimental effects on beneficial insects than products like Lannate and Sevin, have long residuals in crops where they have been tested, and will most likely be active on a wider range of life stages than the traditional *Bacillus thuringiensis* products.

Our primary objective in this study will be to evaluate the effectiveness of these new insecticide chemistries as alternatives to current products. Results will hopefully give growers a wider range of treatment options that give them more flexibility and increased control, while not disrupting valuable biological control organisms.

Experimental Procedures

I. Evaluate new, reduced risk insecticides for control of lepidopterous pests in grape

a) *Conduct laboratory bioassay experiments to test insecticides for their effects on western grapeleaf skeletonizer (WGLS)*

Laboratory bioassays will be conducted in a controlled environment to test for differences in the effects of the insecticides on WGLS mortality. Potted green nursery plants will be obtained and seeded with WGLS larvae collected from the field. Plants will be treated with the insecticides, and placed in a controlled greenhouse environment. Larval mortality will be evaluated at 1, 3, 7, and 14 days after treatment. The experiment will be repeated a minimum of 2 times, once using larvae in the 1^{st} and 2^{nd} instar, and the second using 3^{rd} and 4^{th} instar larvae. Data will be analyzed to test for differences in treatment effects among the different insecticides, and for differences in the effects of insecticides on different sized larvae.

b) Test the effects of insecticides for control of western grapeleaf skeletonizer under field conditions

Field trials for WGLS will be conducted in Kern and Riverside counties. Plots at each location will be organized into a randomized complete block design, with approximately 3 vines per plot. Insecticides will be applied to both sides of each vine using a CO_2 powered backpack sprayer. Insect larvae will be counted 1 day prior to application, and at 2, 7, and 14 days after treatments. Data will be converted to percentage mortality, and be evaluated by ANOVA to test for treatment differences at each evaluation date.

c) Test insecticides for their effects on grape leaffolder or omnivorous leafroller under field conditions

We will conduct one field trial in Kern County for either grape leaffolder or omnivorous leafroller. Our choice of pest will depend on the availability of quality field sites for one or the other pest. PCAs in traditional grape leaffolder hotspots will be provided with pheromone traps for omnivorous leafroller (already in widespread use) and for grape leaffolder (obtainable from Dr. Jocelyn Millar at UC Riverside, but not commercially available yet). PCAs will record weekly trap catches, and help to locate a suitable research site for at least one of these pests.

Once a suitable site is found, pheromone trap catches will be used to determine pesticide application timing. Plots will be sprayed at the onset of egg hatch of the current generation of larvae. Plot design and evaluation procedures will be conducted in a fashion similar to those of field trials outlined above for western grapeleaf skeletonizer.

Research Timetable for Project:

Laboratory and field experiments will be conducted between late spring and early fall 2004. Laboratory experiments will begin as soon as larvae become available; most likely during the second generation around mid-July. Field experiments will be conducted as soon as suitable field sites are located in Riverside and in Kern County.

Present Outlook and Estimated Success in Accomplishing Objectives:

We are optimistic that all experiments will be completed during the summer of 2004. The widespread nature of localized outbreaks of western grapeleaf skeletonizer during the past few years suggests that we will be successful at finding insects for the nursery study and field sites for this pest. Field sites for grape leaffolder or omnivorous leafroller will be more difficult to find (due to widespread pesticide use), and for that reason we have only committed to one location for one of the two pests. Ideally we will find sites for both pests and be able to run the extra field experiment.

Extension of results will be accomplished through the CTGC, grower meetings, and farm advisor newsletters. All cooperating researchers have a history of providing quality extension services to the table grape industry, and will undoubtedly continue to do so with the extension of results from these experiments.

Budget Support Summary by Objectives

The entire portion of this request is being submitted solely to the California Table Grape Commission. Since all three tasks under the first objective are closely tied to each other, we do not consider it appropriate to itemize the budget by individual task within this individual objective. The extension objective will be provided by all cooperators at no expense to the CTGC.

Budget Request:

	Request 2004/2005	Projected 2005/2006
Personnel		
Lab assistant III (50% for 3 months)	4,000	same
Benefits (@25%)	1,000	
Laboratory technician (50% for 3 months)	2,500	
Total personnel	7,500	
Supplies and Expenses		
Misc. supplies and greenhouse rental fees	1,000	
Equipment	0	
Travel		
Travel within Riverside County (provided directly to an account for Carmen Gisbert)	500	
Travel in the San Joaquin Valley	1000	
Computer time	0	
Overhead	0	
Indirect Costs	0	
TOTAL REQUEST	10,000	

Approved:

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David Haviland
Entomology Farm Advisor
UCCE Kern County

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Carmen Gispert
Viticulture Farm Advisor
UCCE Riverside and San Bernardino Counties

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Darlene Liesch
County Director
UCCE Kern County

RESEARCH PROPOSAL CHECKLIST

Author/Researcher: David Haviland and Carmen Gispert

Project title: Worm control in table grapes with reduced risk insecticides

Please check the appropriate commodity groups / funding agencies to which you submitted your proposal:

- ☐ The American Vineyard Foundation
- ☐ The California Competitive Grant Program for Research in Viticulture and Enology
- ☐ The California Grape Rootstock Improvement Commission
- ☐ The California Grape Rootstock Research Foundation
- ☐ The California Raisin Marketing Board
- ☒ The California Table Grape Commission
- ☐ The Oregon Wine Advisory Board
- ☐ The Viticulture Consortium Program
- ☐ The Washington Wine Commission's - Wine Advisory Committee

Other_____

(A PROPOSAL CHECKLIST MUST ACCOMPANY EVERY PROPOSAL)