CRB Project No. 5500-185

CITRUS RESEARCH BOARD

PROJECT PLAN - RESEARCH GRANT PROPOSAL FOR FY2010-2011

Fiscal Year: 2010-11 **Anticipated Duration of Project:** 2 years

This Project is: _____**New or** ___X___ **Ongoing (Year** ___**2**__ **of** ___**2**__**)**

Project Leaders: Beth Grafton-Cardwell, Joseph Morse and Mary Lu Arpaia
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Location: Arpaia: Department of Botany and Plant Sciences, University of California, Riverside CA 93521.

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Cooperating Personnel: _____

Project Title: Evaluating the effects of repeated oil treatments for Asian citrus psyllid on navel orange tree health, fruit production and fruit quality

Keywords: Organic citrus, Asian citrus psyllid, petroleum oil,

Abstract *(limit 200 words):(clearly and succinctly state what your project is about why you are doing it and expected out come and how the industry will use these outcomes)*
The most effective insecticides for Asian citrus psyllid control are synthetic and so are not registered for organic use. If ACP is not adequately suppressed in organic orchards, they will act as a source of continuing infestation of neighboring non-organic orchards, escalating insecticide treatments in those orchards. In Florida, researchers have achieved suppression of ACP with repeated low rate oil applications applied at 14 day intervals. In the Florida environment, there have been no adverse effects on the trees noted. The more arid climate and more extreme winter temperatures of California may result in more adverse effects. The proposed research will evaluate the strategy of repeated, 14 day interval, low rate organic oil treatments on the health, productivity and fruit quality of San Joaquin Valley navel oranges.

Problem and its Significance*: *(include literature review)*
Asian citrus psyllid (ACP) is a vector of the devastating bacterial disease Huanglongbing (HLB). ACP is infesting parts of southern California and is likely to spread to the San Joaquin Valley. HLB is found in Florida, S. Carolina, Georgia, Louisiana and eastern Mexico and its spread threatens California citrus production. The insecticides that are effective in suppressing ACP to the lowest levels include the neonicotinoid imidacloprid, pyrethroids, OPs and carbamates, and a few softer insecticides such as Movento and Delegate. These insecticides, especially when applied in combination, provide ACP suppression for up to 3 months. In contrast, organically approved insecticides that have been tested (Pyganic, Entrust, botanical extracts such as chenopodium and neem, and botanical or petroleum oils), show very short residual efficacy, lasting no more than 10-14 days. In the glassy-winged sharpshooter program in California and in the Florida ACP programs, organic orchards have been a continuing source of sharpshooter or psyllid infestations that spread disease. Thus, it is critical to develop techniques to control vectors in these situations. In Florida, researchers have screened numerous organically approved insecticides and have not found any that are more effective than petroleum oil. These researchers are currently determining the efficacy against ACP of repeated applications of low rate oils (≤0.25%) in 100-

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250 gpa water volume or applied in foggers, spaced 14 days apart. The theory is that the low rate of oil reduces the chances of phytotoxicity and the oil acts as an oviposition deterrent. This technique has been suggested by Australian researchers where it has been shown to be effective for citrus leafminer control. Florida conditions are quite humid, reducing the risk of repeated oil applications causing phytotoxicity to citrus trees. California citrus, especially in the San Joaquin Valley, is at a higher risk for phytotoxic effects due to the dry climate and the more extreme winter temperatures. On the other hand, more highly refined and pure narrow range oils are now available and may make this approach feasible. ACP is most active during periods of flushing, which occur during March-May and Sept-November in California. Oil treatments during these periods may affect development of flowers and fruit set and may increase the risk of oil affecting tree tolerance of cold temperatures. The purpose of the proposed research is to evaluate the effects of repeated low rate oil applications on the production, tree health and fruit quality of California navels.

Objectives*: (*succinctly state each objective and milestone, ie the time expected to successfully complete an achieve each objective)*

1) Determine the effects of 0, 6 and 12 treatments of 0.25% oil applied in 250 gpa with outside coverage on tree health, fruit production and fruit quality of California navels. Yield effects should be seen in the 2010-11 harvest.

Project's Benefit to the Industry*: (*How will the industry utilize your research results or product)*

ACP is present in California and it is only a matter of time before HLB is also found in the state. Organic citrus production will pose a high risk to HLB spread because the current organically approved products have very short residual activity against ACP. In Florida, currently, the most effective method of ACP reduction in organic orchards is low rate oil treatments applied every 14 days. At the moment, there are no organic orchards in California that are infested with ACP, however, that situation could change in the near future, because the majority of organic acreage is in San Diego County. It is critical for the California industry to determine the effects of these treatments on California citrus production and fruit quality before the treatments are needed. The results of this research could determine whether organic production is feasible in the coming era of ACP infestations.

Research Collaboration* (*be specific*):

Dr. Grafton-Cardwell is conducting the studies at Lindcove Research and Extension Center in a block of navel oranges. She has expertise in experimental design, application of insecticides, and evaluations of yield and fruit size in the LREC packline and fruit quality parameters in the fruit quality laboratory. Dr. Morse will assist with experimental design, and when ACP becomes established in the Riverside area, will rear it in the quarantine facility and determine the mode of action of oil treatments on ACP. Dr. Arpaia will determine the experimental design of the fruit quality characteristics to be measured.

Plans and Procedures* *(use this section to describe your experimental design site location(s)and elaborate on objectives and milestones)*

A six acre block of Washington navel oranges at the Lindcove Research and Extension Center was divided into nine replicated plots of approximately 6 rows by 8 trees. Prior to treatment, the fruit were harvested during January 2010 by individual trees and analyzed for fruit number and size. Trees that were excessively high or low producers were eliminated from the analyses. Oil treatments of 0.25% oil in 250 gpa applied at 3 mph are applied using an airblast sprayer with outside coverage. Treatments include 1) untreated control, 2) 12 oil treatments applied every 14 days during March-May and again during Sept-Nov, and 3) 6 oil treatments applied every 2 weeks from March-May. There are 3 replicate plots per treatment. During the season, the amount of leaf and fruit drop is measured on 5 trees per plot (15 trees per treatment) by raking and counting leaves and fruit. Color break will be evaluated during October and November to determine if there is a difference between treatments. Fruit quality analysis (peel thickness, juice content, S/A ratio) will be conducted on 5 similar-sized fruit per tree in each of 5 trees per plot (75 fruit per treatment) prior to harvest. The January following these treatments, individual trees will be harvested and the fruit number, size, and grade will be evaluated on 15 trees per plot x 3 replicates = 45 trees per treatment. The density of foliage was rated in February 2010 and will be evaluated again in February 2011.

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Other Funding Sources for this Project *(current, pending, potential; can this project be used as matching funds for other funding sources)*

Base funding for salaries is provided to Grafton-Cardwell for her entomology staff by the CRB and so no salaries/benefits will be requested for this project.

Technology Transfer* *(include any potential intellectual property issues; steps necessary for grower utilization extension/communication component):*

The results of the research will be reported to the California citrus industry through CRB reports, scientific publications, newsletters and a field day at LREC at the conclusion of the experiment.

Budget Justification:

CRB funding is needed for the LREC station staff to apply the oil applications, maintain the irrigation of the block, manage the harvest, run the fruit on the packline, and pay the fruit quality analysis sample charges. Travel funds will be utilized by Arpaia and Morse to travel to LREC to consult on the project design.

References

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Project Budget

Department Account Number: *(if applicable)*_____

	Year: **2010-2011**	Year: **2011-2012**	Year: **2012-2013**
Salaries and Benefits:			
Postdocs/Research Assistants	$_____	_____	_____
SRA's	_____	_____	_____
Lab/Field Assistance	_____	_____	_____
Benefits	_____	_____	_____
Supplies and Expenses:	$500	_____	_____
Equipment:	_____	_____	_____
Operating Expenses and Travel:	$1,000	_____	_____
Lindcove Recharges:	$2,750	_____	_____
Lindcove Packline:	$2,000	_____	_____
Other: _____	_____	_____	_____
_____	_____	_____	_____
ANNUAL TOTAL:	$6,250	_____	_____

Specifics regarding contract (i.e., "split" funding to more than one PI):
None

Signatures

Project Leader: _____ **Date:** _____
Beth Grafton-Cardwell

_____ **Date:** _____
Joseph Morse

_____ **Date:** _____
MaryLu Arpaia

Dept. Chair: _____ **Date:** _____
Rick Redak

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