CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE
GLASSY-WINGED SHARPSHOOTER/PIERCE'S DISEASE TASK FORCE

-- Members --

Larry G. Bezark, Chair
California Department of Food & Agriculture
Plant Health and Pest Prevention Services
Integrated Pest Control Program
Sacramento, California

Ben Drake
Drake Enterprises
Temecula, California

Ray Gill
California Department of Food and Agriculture
Plant Health and Pest Prevention Services
Plant Pest Diagnostics Branch
Sacramento, California

Patrick Gleeson
American Vineyard Foundation
Oakville, California

Andrew Johnson
Beringer Wine Estates
St. Helena, California

Dr. Bruce Kirkpatrick
University of California
Department of Plant Pathology
Davis, California

Dr. Conrad Krass
California Department of Food and Agriculture
Plant Health and Pest Prevention Services
Sacramento, California

Dr. Michael Oraze
National Biological Control Institute
USDA, APHIS, PPQ, CPHST
Riverdale, Maryland

Vincent Petrucci
California State University
Viticulture & Enology Research Center
Fresno, California

Dr. Alexander H. Purcell
University of California
Division of Insect Biology
Berkeley, California

Dr. Richard Redak
University of California
Department of Entomology
Riverside, California

James O. Wallace
Riverside County Agricultural Department
Riverside, California

Craig C. Weaver
Callaway Vineyards
Temecula, California

David Whitmer
Napa County Agricultural Department
Napa, California

Glassy-Winged Sharpshooter/Pierce's Disease Task Force Report November 1999

Report for Secretary Lyons
from the California Department of Food and Agriculture
Glassy-Winged Sharpshooter/Pierce's Disease Task Force

Research Categories and Objectives for Glassy-Winged Sharpshooter/Pierce's Disease

The California Department of Food and Agriculture Glassy-Winged Sharpshooter/Pierce's Disease Task Force has met twice and we have focused our efforts towards the development of a list of research priorities to address the disease and insect problem.

The following is a series of categories containing research objectives. Each objective was rigorously analyzed. The Task Force members concluded that all of the information that would be developed by pursuing these categories and objectives is important. Therefore, the order of the categories does not necessarily indicate their priority. Within each category of research, the high priority objectives that are expected to yield results in the short-term (one to two years) are listed first. Long-term results are expected to take three to five years to achieve. The Glassy-Winged Sharpshooter is referred to as GWSS and Pierce's Disease as PD.

While all of the objectives in the list compiled by the Task Force are sound and will address the Pierce's Disease and sharpshooter problem, additional objectives may be brought forward when research proposals are submitted for funding. Any new objectives will need to be fully scrutinized to be certain that we have considered the full range of possible solutions to this important problem.

In addition to the research objectives, short-term goals recommended by the Temecula Winegrape Growers Association include: immediate approval for Section 18 registration for the soil-applied insecticide Admire (imidacloprid) on citrus, and obtaining additional funding for purchase and application of Admire which would prevent additional spread of PD in Temecula

Respectfully submitted by,

Larry G. Bezark, Chairman
Glassy-Winged Sharpshooter/Pierce's Disease Task Force
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MONITORING AND DATABASE MANAGEMENT

High Priority – Short-Term Results

Determine the temporal and spatial distribution, and relative abundance of the GWSS.

Determine the distribution and relative abundance of the GWSS egg parasitoid, *Gonatocerus ashmeadi*.

Develop and optimize methods to screen large numbers of plant and insect samples for the presence of PD using sensitive assays (such as polymerase chain reactions).

High Priority – Short-to Long-Term Results

Determine the occurrence and severity of PD in new 'hot spots' in grapes including the Temecula Valley of Southern California.

Compile and incorporate statewide geographic information system (GIS) information to accurately represent the distribution of GWSS and PD; determine areas that could become affected by both the disease and vector.

Medium Priority – Short-to Long-Term Results

Improve vector monitoring methods; develop alternative trapping methods.

BIOLOGY AND ECOLOGY OF THE ORGANISMS

High Priority – Short-to Long-Term Results

Characterize the dispersal and movement abilities of GWSS.

High Priority – Long-Term Results

Determine the seasonal patterns of host plant use and host plant preferences of GWSS.

Medium Priority – Short-to Long-Term Results

Characterize the dispersal and movement abilities of potential egg parasitoids.

Low Priority – Short-Term Results

Determine a phenological degree day model for development of GWSS.

Determine a phenological degree day model for development of parasitoids.

Low Priority – Long-Term Results

Synthesize current GWSS nutritional information into a practical protocol for screening host plants for their acceptability to obviate the need for plant chemistry analyses.

Determine the relationship of host plant xylem chemistry, leaf surface chemistry and morphology on host selection, feeding, and oviposition of GWSS. Assess: 1) host plant acceptance and subsequent feeding rate; 2) host selection and acceptance for oviposition; and 3) survival and performance of the nymph as a function of host plant species.

BIOLOGICAL CONTROL OF GWSS

High Priority – Short-to Long-Term Results

Determine the viability of both parasitized and unparasitized eggs after various periods of long-term storage various temperatures and humidities.

Develop rearing methodologies for the mass rearing and release of wasp parasitoids for the biological control of GWSS.

Conduct exploration for other parasitoids.

Determine the oviposition rate for the GWSS on a variety of host plants (required for egg parasitoid mass rearing).

Medium Priority – Short-to Long-Term Results

Conduct preliminary field inoculative and inundative release studies and evaluate parasitoid longevity, reproduction, field persistence, dispersal, and impact on field populations of the GWSS in both citrus and grapes.

Low Priority – Short-Term Results

Survey, identify, culture and evaluate the *Hirsutella/Entomophthora* spp. pathogens attacking adult leafhoppers in Florida and elsewhere.

Low Priority – Long-Term Results

Determine the relationships of leafhopper egg density, host plant xylem chemistry, leaf chemistry and leaf morphology to the behavior and biology of the GWSS egg parasite, *Gonatocerus ashmeadi* and other parasite species as they become available.

USE OF PESTICIDES TO CONTROL GWSS AND LIMIT SPREAD OF DISEASE

High Priority – Short-Term Results

Determine the degree to which imidacloprid affects transmission of the PD organism to grapevine by pathogen-carrying GWSS through time after plants are treated.

Determine the optimal deployment of imidacloprid on grapevines to reduce vector pressure and disrupt transmission of the PD organism.

Screen insecticides to determine dosage-mortality responses of GWSS on grape at various times after application.

Screen insecticides to determine effects of sublethal dosages (low as well as no mortality) on plant to plant movements (avoidance), flight propensity/ability, and transmission of PD.

Examine materials known to have antifeedant properties in insects. Continue working on new foliar applied insecticides and chemical repellents that disrupt the feeding habits of the GWSS and Blue-Green Sharpshooters.

BARRIERS AND TRAP CROPS

High Priority – Long-Term Results

Determine the efficacy of utilizing trap crops to attract GWSS out of grapes and/or citrus and thus prevent GWSS movement into grape and/or citrus fields.

Low Priority – Short-Term Results

Determine the efficacy of utilizing insecticide-treated trap/barrier crops to attract GWSS out of grapes and/or citrus and thus reducing GWSS movement into grape and/or citrus fields (Including vine netting).

Determine the efficacy of large screen barrier traps to reduce GWSS immigration to grapes from citrus.

Low Priority – Short-to Long-Term results

Identify plant species with resistance to PD and to use these plant species to reduce GWSS infectivity in areas currently colonized or in danger of being colonized by GWSS.

CHEMOTHERAPY FOR PD IN GRAPE
USING ANTIBIOTICS AND OTHER TREATMENTS

High Priority – Short-Term Results

Study conductive tissue and track movement of PD.

Test efficacy of plant micronutrients, such as zinc, copper, manganese and iron, as well as antibiotics for controlling PD, and develop methods to introduce these materials into grapevine xylem tissues.

High Priority – Long-Term Results

Determine whether bactericides can be used prophylactically to prevent infection of healthy grapevines.

Low Priority – Short-Term Results

Conduct fertilization trials including soil mineral balancing, soil microbial enhancement and foliar sprays.

BIOLOGICAL CONTROL OF PD

Medium Priority – Short-to Long-Term Results

Discover bacteriophages of PD and test their protective or curative potential in grape.

Medium Priority – Long-Term Results

Identify endophytic bacteria that are antagonistic to PD - identify xylem inhabiting, nonpathogenic bacteria, and test their potential for reducing populations or movement of PD.

Genetically-engineer endophytic bacteria to deliver polypeptides that are inhibitory to PD.

EPIDEMIOLOGY OF PD

High Priority – Short-Term Results

Determine incidence of PD strains in alternative host plants other than grape in Temecula.

High Priority – Long-Term Results

Epidemiology of PD in Temecula – Does vine to vine transmission occur?

Determine spatial patterns of PD spread in vineyards; determine the effect of date of inoculation on disease persistence in Southern California conditions; determine the effect of GWSS inoculation as a function of feeding sites within the vine (i.e., can winter inoculations of dormant canes or basal portions of green canes result in persistent infections?); and analyze infectivity patterns in GWSS: how they are affected by habitat and season.

Medium Priority – Short-to Long-Term Results

Determine the effects of temperature on growth and spread of PD in grape and other key plants.

Medium Priority – Long-Term Results

Determine the plant factors influencing transmission and inoculation efficiency of PD by GWSS on different host plants.

Low to Medium Priority – Short-Term Results

Study the relationship of rootstocks and their ability to slow the spread of PD on the grafted scion wood.

MOVEMENT/SPREAD/MONITORING METHODS AND PATHOLOGY OF PD IN PLANTS

High Priority – Long-Term Results

Understand how PD moves in systemic (grape, blackberry) and non-systemic (willow) plant hosts using microscopy.

Medium Priority – Long-Term Results

Develop transformation/transposon mutagenesis systems for PD using existing or novel bacterial transformation vectors. Use PD mutants to identify bacterial genes that mediate plant pathogenicity, movement, or insect attachment.

CULTIVARS OF GRAPE RESISTANT TO PIERCE'S DISEASE

High Priority – Long-Term Results

Develop a genetic map to PD resistance using *Vitis vinifera* X (*V. rupestris* X *M. rotundifolia*) seedling populations and Amplification Fragment Length Polymorphism (AFLP).

Utilize DNA markers for resistance to rapidly introgress PD resistance into several *V. vinifera* wine grapes.

Determine the resistance of 10 grape genotypes (10 scions grafted on two rootstocks) to PD after mechanical inoculation and natural infection with PD.

Determine the resistance of common host plants (willow, resistant; blackberry, susceptible) to PD and how the bacterium responds to specific profiles of xylem chemistry.

ECONOMIC ANALYSIS

Medium Priority – Short Term Results

Conduct a micro-economic analysis of PD damage, to allow growers to assess the economics of replacing diseased vines.

Conduct a macro-economic analysis of long-range effects of losing various segments of crops and the effect of damage in the region.