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## Citrus Nursery Operations: When Psyllid and HLB Rule

*Mani Skaria*

Huanglongbing (HLB, also known as the greening disease) is beginning to change the way the citrus industry has been operating for decades. Nurseries are not excluded, in fact, they are being severely impacted in a very negative way that could pave the way for a collapse of the U.S. citrus industry. As we know, the state of Florida, in an effort to protect the citrus industry now regulates the citrus nursery business. After detecting the Asian citrus psyllid in Southern California, several citrus nurseries are already taking steps to produce trees under psyllid-resistant structures. Both Florida and California are big players in the U.S. citrus industry and they have to do whatever is required of them to stay ahead of the problems in order to survive. The Arizona citrus industry normally follows California's lead. Texas, with only 27,000 acres of citrus, is under imminent HLB threat.

HLB-infected citrus trees become unproductive in a very few years. This means that in a relatively short period of time, these trees will provide no fruit to send to the packinghouses. That will eventually translate into business and employment losses to many in the Lower Rio Grande Valley. Under this scenario, consumers in Texas and beyond would be deprived of the fine grapefruit produced in the rich soils and sunshine of deep South Texas.

In a January 2009 meeting attended by 32 citrus industry people – regulators, nursery persons, growers, packers and scientists in Weslaco – we discovered that the nursery industry is not in a position to switch to production of trees in psyllid-resistant screens. The reasons are:

1. Too costly and no guaranteed returns
2. Field grown trees are healthier
3. The trees are destined to the field, so why bother
4. A nursery inspection and verification for psyllid may be sufficient
5. Traditional open-air nurseries traditionally spray against insects
6. The fear of no returns on HLB preventive measures
7. Florida and California have larger industries and their nurseries have a greater likelihood of a return on such investments, but Texas is a much smaller player and the nursery industry may not see the potential of financial returns.

These are some interesting arguments and rationalizations for resistance to change on behalf of the average nursery person. However, one has to compare these arguments against the biology of the HLB, its dormancy (often called latency of HLB) of HLB symptom development in trees infected for a few years, the ability to detect HLB accurately, and the pathogen-psyllid relations.

HLB is too complex a pathogen for routine detection procedures – even for highly trained professionals with the latest technologies available to them. HLB is one of the most destructive pathogen of citrus with a long latency period. We have known some citrus viruses such as the psorosis virus that takes years to show symptoms. However, the destructive force of HLB surpasses any other citrus pathogens.

The Texas citrus industry cannot afford to submit to the above arguments and risk the viability and future of the commercial citrus industry. The experience of the Florida citrus industry with HLB and its huge negative economic impact is an open book from which we can learn valuable lessons. It would benefit Texas immensely to learn from the missteps Florida committed as it dealt with HLB immediately after it was detected. The smaller size of the Texas citrus industry, the uncertainty of nursery persons on the return of investment, and the fears about the unfortunate state of the national economy

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place the Texas citrus industry in a very challenging situation. The Texas citrus nursery industry is in a difficult situation but it is being forced to accept the costly changes that will help them survive. Unfortunately, major changes in the way the citrus industry does business are inevitable to stay a step above HLB and survive. Texas has to find ways to grow citrus nursery trees under psyllid-resistant structures. Texas has only a limited number of citrus nursery operations. Their futures are going to be based on their personal experiences, their long-term commitment to the nursery business, their financial liquidity and profitability. The Texas citrus industry as a whole must come forward with either financial resources to help the nurseries cope, or at least offer tangible hope to the nursery business that it can be economically viable to invest in setting up psyllid-resistant structures.

Nurseries currently accustomed to producing healthy, large field-grown citrus trees should evaluate the HLB situation from a wider and more positive perspective. Costly yet profitable changes to the nursery industry are not without precedent. When the industry was faced with the threat of *Phytophthora* and citrus nematode distribution in field-grown nurseries, mostly FL and CA growers realized those problems could be managed very well by switching to container-grown trees. Originally, there was a resistance and a reluctance to make the extra investments, much as we're hearing now about dealing with HLB. But the problem was overcome and the industry remained viable and profitable. Unfortunately, many Texas nurseries did not follow this step.

I am sure the owner of a 3 year-old, five acre Rio Red grapefruit block in the mid Valley with approximately 28% of trees with visible *Phytophthora* symptoms would have been happy to have his trees from a *Phytophthora*-free nursery source. The picture below shows severe gumming from *Phytophthora* infection. Twenty trees were already dead, 132 show symptoms, (as of April, 2009) some are as severe as you see in the picture below. The severe gumming on the stem and branch are *Phytophthora*-induced.

# Horticultural Spray Oils in Citrus Pest Management

***Mamoudou Sétamou***

Horticultural spray oils (HSOs) have been used for centuries to control insect and mite pests affecting our crops. In fact, the primary reasons these oils were developed was because of their high efficacy on difficult to control pests on fruit trees. Today, HSOs constitute an important tool for pest management in citrus orchards. They can be used as stand-alone or as adjuvant in tank-mixes with other pesticides in insect, mite and disease control.

Oils can affect insect and mite pests in different ways. However, the most important ones are their suffocating and entangling effects on these pests. By blocking the spiracles of insects and mites (air holes through which these pests breathe), oils cause their death from asphyxiation. Oils also wet the hard cuticle covering insect body and legs, thus preventing the insect from anchoring itself on plant surface for feeding. In some cases, oils can also interact with insect and mite metabolism and may disrupt the feeding behavior of many insect and mite pests. Some studies have shown that HSOs may have repellent effects on some pests.

Despite their high effectiveness on many insect and mite pests, HSOs pose very few risks to most of the natural enemies used in biocontrol, thus allowing their integration in Integrated Pest Management (IPM) programs. Only a few problems have been reported with pest flare-ups in mite populations in grape. In addition, compared to synthetic pesticides, oils have minimal toxicity to humans as they dissipate quickly leaving little or no residues. No special equipment beyond the ones used for traditional spray programs are also required for their applications.

In citrus orchards, oils can control a wide range of pests including aphids, mites, thrips, scales, whiteflies, mealybugs and psyllids. Table 1 presents a summary of the efficacy against many citrus insect and mite pests. It is important to note that these oils have much shorter residual control of pests, mainly because of their rapid evaporation from plant foliage. Oils are also useful in the control of fungal diseases. Mixed with small amount of baking soda, HSOs are particularly effective at controlling powdery mildew.

Overall, HSOs are a good tool for pest management in citrus orchards, but because of their sensitivity to extreme high temperatures (above 100 °F) and extreme low temperatures (below freezing), their use

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is not recommended at those extreme temperatures. Sensitivity of citrus trees to HSO under high temperature primarily depends on their drought-stress status. ***Trees under water stress may be damaged by spray oils when ambient temperature exceeds 85 °F, but trees not water-stressed are less likely to be damaged by HSO. Under freezing conditions, the use of oils causes uneven spray coverage.*** Like with temperature, the use of HSO under high relative humidity (above 90 %) may cause plant injury because this condition inhibits oil evaporation. ***Thus, it is important to avoid spraying oil when leaves are wet or when rain is likely. Inversely, low humidity reduces the risks of phytotoxicity. Also, because oils are able to interact with sulfur to form phytotoxic compounds, avoid combining oils with sulfur or sulfur-containing pesticides. Generally, oils should not be sprayed within 30 days of a sulfur application.***

Three different categories of oils are used as HSO. Petroleum spray oils, also known as mineral oils, have a long history in pest control and are also the most used. They are obtained from refining petroleum products. To date, mineral oils are highly refined and are known as narrow range oils. The narrow range oils have lighter weight, lower impurities and contained sun-screens, thus allowing them to be used during summer months with low risks of phytotoxicity. Two of these oils (JSM Stylet oil and PureSpray Green oil) are approved by the Organic Materials Review Institute (OMRI) for use as organic products.

The second group of oils is plant oils that are derived from plant seeds (e.g. neem oil, soybean oil, cottonseed oil, canola oil, sesame oil, jojoba oil, clove oil, garlic oil, citrus oil). In addition to having the same pest control properties as mineral oils, some plant oils contain some compounds that have insecticidal or fungicidal activity (e.g. azadirachtin present in neem oil).

The third category of oils available comprises mixtures of essential plant oils that are pressed from leaves, stems and flowers of plants rather than seeds (e.g. clove and rosemary oils).

Most of the vegetable oils (i.e., plant and essential plant oils) are allowed by OMRI.

Another category of oils include fish oils that are classified as lipids containing long-chain hydrocarbons.

Because of their effectiveness, HSO are now one the most widely used miticides and scalicides in the U.S.

**Table 1.** Efficacy of Horticultrua; Spray Oils Against Major Pest in Citrus

| Efficacy Category | Pests |
|---|---|
| Good | Leafminer<br>Aphids<br>Mites such as<br>Citrus rust mite<br>Scale<br>Mealybugs |
| Fair | Caterpillars<br>Some mites<br>Citrus psyllids<br>Some scales<br>Citrus thrips |
| Poor | Beetles & weevils<br>Various bugs<br>Various flies<br>Some caterpillars<br>Some mites<br>Few armored scales |

## Awards Ceremonies

The Dick and Mary Lewis Kleberg College of Agriculture, Natural Resources and Human Sciences held its annual awards ceremony in Kingsville in April. **Dr Shad Nelson,** the head of the Agronomy and Resource Sciences Department and Citrus Center scientist, received the Senior Research Award, and **Dr Mamoudou Sétamou**, entomologist at the Citrus Center, received the Junior Research Award. One of Dr Sétamou's graduate students, **Danielle Sekula**, received the Center's graduate student award. Congratulations to all.

Also, the University held its annual Service Awards luncheon in April, and several Citrus Center personnel were recognized. Jose Medrano (35 years service), Marilynn Ambos (25 years), Elias Hernandez (20 years), Cira Cortez (10 years), Miguel Guerrero (10 years) and John da Graca (10 years) received their certificates of service.

# Can Indigenous Citrus Relatives Serve as Hosts for Asian Citrus Psyllids and Greening?

***John da Graça and Mamoudou Sétamou***

Citrus and 20 other species in the same family that citrus belongs to, the Rutaceae, are hosts for the Asian citrus psyllid. The psyllid is known to prefer some of the plants to others, and appears to feed on some, without completing its life cycle. The psyllid is the vector for citrus greening disease, so it is important to know the host range of both the psyllid and the bacterium. This knowledge can be incorporated into management practices, and even an understanding of why some plants are poor or non-hosts of psyllid may give ideas on how to repel the insect, or introduce the responsible genes into citrus.

All citrus species, and other close relatives of commercial use (kumquat, trifoliate orange) are hosts of both. Other psyllid hosts which have been identified as Asian greening hosts are orange jasmine (*Murraya* spp.), Chinese box orange (*Atalantia/ Severinia buxifolia*), Wampee (*Clausena lansium*) and Wood apple (*Limonia acidissma*), while two common wild rutaceous trees in Africa are also hosts of the African greening pathogen. Some rutaceous species of North America have been recorded in Florida as poor hosts or non-hosts of the psyllid, but many more have not been investigated. It is not known if any are potential hosts of the disease.

Dr Ron Brlansky of the Citrus Research & Education Center in Lake Alfred, FL, obtained a grant from the Florida Citrus Production Research Advisory Council to conduct a host range study, and is collaborating with the Citrus Center. Here in Texas we have established a collection of eight species so far, and a graduate student, Jose Sandoval, will be conducting psyllid host range studies on them. The species are two *Amyris* species (torchwoods), *Zanthoxylum fagara* (lime pricklyash), *Helietta parvifolia* (baretta), *Esenbeckia berlandieri* (jopoy), *Casimiroa tetrameria* (yellow sapote) and two *Choisya* spp. (Mexican orange). Hop tree (*Ptelea trifoliata*) plants are on order.

Figure 1 Mexican Amyris or Torchwood (*Amyris madrensis*), a fairly rare species found in Hidalgo, Cameron and Willacy counties.

Figure 2 Baretta (*Helietta parvifolia*), found in Starr County.

Photographs reproduced with permission from "Trees, Shrubs & Cacti of South Texas" by J. Everett, D.L. Drawe & R. Lonard.

## Undergraduate Research Continues in Citrus Biotechnology

*Eliezer Louzada*

The biotechnology laboratory at Texas A&M University-Kingsville Citrus Center has for the last eight years been providing hands-on research experiences for undergraduate students in cooperation with the University of Texas Pan-American (UTPA). The main objective is to channel Hispanic students to science careers in agricultural biotechnology. So far over 60 students have been through the program and close to 50% entered graduate education, including 11 at the doctorate level. Two students are about to conclude their Ph.Ds; both are Hispanics and first generation college graduates. After all these years, we continue to train local students in high tech molecular techniques, and attract them to science careers. During the first semester of 2009 we began training four new UTPA students, Beverly Briones, Omar Vazquez, Amanda Garcia, and Cynthia Carolina Parra. We hope that some of them will continue their education through graduate school. However, even if they chose not to, the training these students get prepares them for highly skilled jobs.

The new students learning research skills in the biotechnology laboratory.

## The Center Loses One Of Its Own

On February 7, 2009, the Center lost one of its retirees, Juan (Johnny) Davila. Johnny worked as a Farm Worker from 1970 until 1990. During his retirement, he lived at his home in Harlingen, and stayed in close contact with the center. He never missed a Christmas lunch, including the most recent. He will be missed by both those who he worked with and those who came to know him in later years. Our deepest condolences go to his family, especially his wife, Eloisa, who always accompanied him on his visits.

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