

The Arizona Citrus Newsletter

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A Note from the Editor...

The deadline for earning CEU hours for Custom Applicator, PCA and Certified Private and Commercial Applicators licenses is September 30th. In response to the need for CEU hours, we are organizing two fall citrus meetings to be held on the mornings of September 29th and 30th in Yuma and in Phoenix, respectively. Both will offer at least 3 CEU hours. The Yuma meeting will be held at the Yuma County Health Department Conference Room, and the Phoenix meeting will be located at the Maricopa Cooperative Extension Office. Times and agendas are still under development. Readers of this newsletter will receive a notification shortly.

Please feel free to copy or forward this newsletter to others. I would appreciate receiving the names and e-mails of others who might be interested in receiving the Newsletter. If you have any suggestions, questions or comments, please contact me.

Another Fungus Causing Death of Lemon Tree Branches in Arizona

Michael E. Matheron, Extension Plant Pathologist, University of Arizona, Yuma Agricultural Center.

Dieback of branches on lemon trees is becoming increasingly evident during the summer months within lemon groves in southwestern Arizona. Removal of dead branches usually reveals the presence of decayed wood. In 1992, *Coniophora eremophila* was first reported to be associated with a brown heartwood rot in lemon



Fig. 1a.



Fig. 1b.

Fig. 1a.

Recent Citrus News, Information and Headlines

Citrus industry says hurricane would hurt grapefruit crops

http://www.palmbeachpost.com/business/content/business/epaper/2004/09/02/a9c_citrus_0902.html

Grapefruit juice may contain cancer-fighting compounds

<http://www.foodnavigator.com/news/news-NG.asp?id=54361>

Citrus Fruits - Final Estimates 1997-2002

<http://www.usda.gov/nass/PUBS/TO DAYRPT/citrsb04.txt>

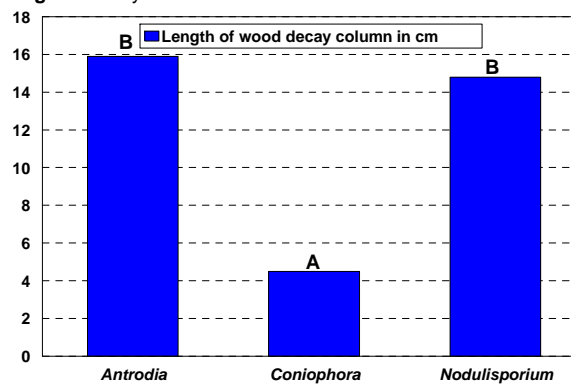
Charley Claims 20 Percent Of Citrus Crop

<http://www.theledger.com/apps/pbcs.dll/article?AID=/20040819/NEWS/408190346/1178>

tree branches. During surveys of mature lemon plantings to determine the incidence of trees infected with *C. eremophila*, a second fungus was isolated in 1997 from symptomatic decayed wood. This fungus, which was also associated with a brown heartwood rot, was identified as *Antrodia sinuosa*. In 1999, a third fungus was recovered from small dead lemon tree branches in the Yuma area (Figure 1a). Unlike the brown wood decay from which *Antrodia* and *Coniophora* were recovered, this fungus was isolated from decayed wood that was white in color (Figure 1b). This third fungus subsequently was identified as a species of *Nodulisporium*. Research studies were initiated to learn more about wood rot development caused by *Nodulisporium*. The results of these studies are summarized below.

The relative rate of wood decay caused by each of these pathogens on lemon trees.

Fig. 2. Decay in lemon branches aft 6 months.

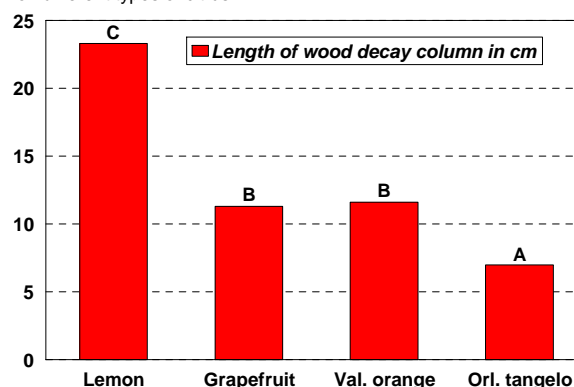


Among the three wood rot pathogens affecting lemon trees, the rate of wood decay development was greatest with *Antrodia* and *Nodulisporium*. Six months after inoculation, the length of resultant wood decay columns on lemon tree branches

inoculated with *Antrodia*, *Coniophora*, and *Nodulisporium* was 16, 4 and 15 cm, respectively (Fig. 2).

The relative rate of wood decay caused by *Nodulisporium* on different types of citrus trees.

Fig. 3. Wood decay caused by *Nodulisporium* sp. on different types of citrus.



Among lemon, grapefruit, orange and tangelo trees, the greatest rate of wood decay was recorded on lemon. Six months after inoculation, the length of wood decay columns on branches of Lisbon lemon, Marsh grapefruit, Valencia orange and Orlando tangelo trees

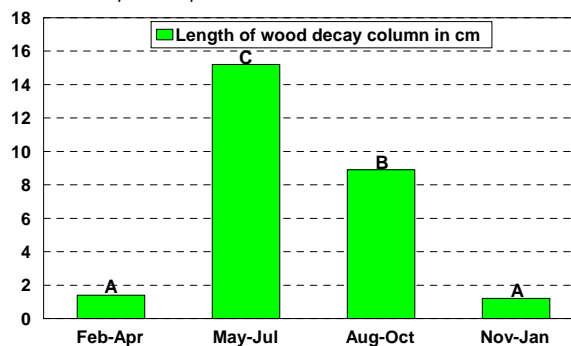
inoculated with *Nodulisporium* was 23, 11, 12 and 7 cm, respectively (Fig. 3).

The relative rate of wood decay caused by *Nodulisporium* during different times of the year. The highest rates of wood decay caused by *Nodulisporium* occurred from May through

Upcoming Citrus Meetings

- September 29th and 30th** – Annual Citrus Workshops in Phoenix and Yuma.
Details: Agenda and locations to be announced soon. Three CEU hours to be offered. For more information, contact the Editor.
- November 3rd** - CRB-UCCE Citrus Growers' Research Educational Seminar
Details: 9:00 A.M. - 1:30 P.M. Topics include: Using compost/mulch (basic background information, pros and cons, local area examples); Glassy-winged sharpshooter impact on citrus and update on Pierce's disease in desert grapes; Info. on lemon varieties for the desert; Using new budget calculator software.
Location: Indian Palms, 48630 Monroe Street, Indio
Contact Info: Phone the CRB office at (559) 738-0246 or e-mail Info@citrusresearch.org
- December 8th** – Desert Crops Workshop
Details: Forthcoming

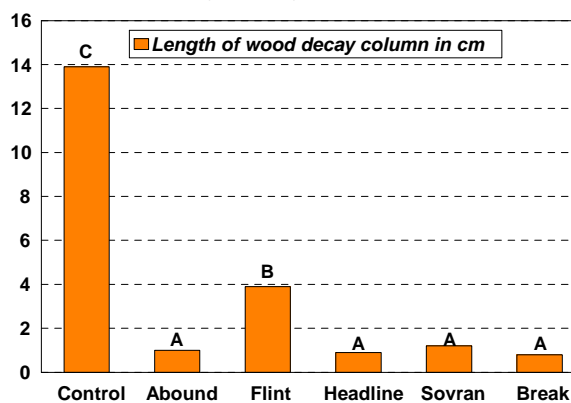
Fig. 4. Effect of season on lemon wood rot development with *Nodulisporium* sp.



3-month inoculation period from November through April was 1 cm and the average air temperature was 17°C (62°F). The high temperatures of late spring, summer and early autumn greatly enhance the development of wood rot compared to the lower temperatures of late autumn, winter and early spring.

The relative rate of wood decay caused by *Nodulisporium* on lemon tree branches treated with selected fungicides.

Fig. 5. Effect of fungicides on lemon wood decay caused by *Nodulisporium* sp. (20 g active ingredient per liter).



were observed with propiconazole (Break), pyraclostrobin (Headline), azoxystrobin (Abound), and kresoxim-methyl (Sovran).

Loss of branches and ultimately trees due to wood rot is a continuing concern for those producing lemons in southwestern Arizona. Since *Nodulisporium*, as well as *Antrodia* and *Coniophora*, appear to primarily colonize lemon trees at branch fracture sites and other non-pruning wounds, minimizing these potential infection sites should significantly reduce new infections. Citrus groves should be inspected frequently and any infected branches should be removed promptly. Research data suggests that preventative treatment of wounds with selected fungicides could reduce subsequent development of wood rot; however, none of the tested fungicides currently are registered for this use. If Arizona citrus growers want one or more of these fungicides to be registered for use on these wood rotting diseases, then they need to contact the respective manufacturer concerning the possibilities of acquiring a label for this use. I will do all that I can

October, when the average length of wood decay columns after a 3-month inoculation period was 12 cm and the average air temperature was 29°C (84°F) (Fig. 4). In comparison, the average length of wood decay columns after a

3-month inoculation period from November through April was 1 cm and the average air temperature was 17°C (62°F). The high temperatures of late spring, summer and early autumn greatly enhance the development of wood rot compared to the lower temperatures of late autumn, winter and early spring.

Compared to non-treated branches, suppression of wood decay caused by *Nodulisporium* in the presence of a tested fungicide ranged from 72 to 94% (Fig. 5). The lowest level of wood rot suppression occurred in the presence of trifloxystrobin (Flint), whereas the highest levels of suppression were observed with propiconazole (Break), pyraclostrobin (Headline), azoxystrobin (Abound), and kresoxim-methyl (Sovran).

Arizona Citrus Resources

- **Arizona Crop Information Site (ACIS)** Click on "Crops", then on "Citrus"
<http://ag.arizona.edu/crops/crops.html>
- **2002 Citrus and Deciduous Fruit and Nut Research Report** (2001 Research)
<http://cals.arizona.edu/pubs/crops/az1303/>
- **Arizona Citrus Research Council and 2003 Citrus and Deciduous Fruit and Nut Research Projects** (2002 Research)
<http://agriculture.state.az.us/CD&P/citrus.htm>
- **Other University of Arizona Citrus Publications online**
Type Citrus in the "Title contains" box, then press "Show Publications"
<http://pubs1.cals.arizona.edu/search/srch.cfm>

Citrus Resources from other States

- **University of California Citrus Publications**
<http://anrcatalog.ucdavis.edu/>
- **University of Florida Citrus Publications**
<http://edis.ifas.ufl.edu/>
- **Ultimate Citrus Newsletter**
A Florida site that contains a great variety of information and links
<http://www.ultimatecitrus.com/>

to support such registration efforts if growers are interested in pursuing registration of one or more of these efficacious fungicides.

For more information click:

<http://ag.arizona.edu/pubs/crops/az1303/az1303-11.pdf>

Some Practical Steps to Manage and Combat Wood Rot in Lemons

Glenn C Wright, Extension Specialist, University of Arizona, Yuma Agricultural Center.

Wood rots are a fact of life in Arizona lemon groves, and become particularly evident at this time of the year when "flags", or browning branches, are evident in the groves.

When considering how to manage and prevent wood rot disease in lemons, a grower should consider both the short- and long-term steps. The first of the short-term steps is to prune out diseased wood. This step is critical, and should be a regular production practice, but should also be done as soon as possible following wind storms, hurricanes or freeze damage. Prune the branch back to a point where there is no longer evidence of the disease on the cut surface of the limb. Saw blades should be sharp so as to produce a smooth cut. Jagged cuts will provide sites for re-infestation of clean wood. Diseased wood should be removed from the grove as soon as possible.

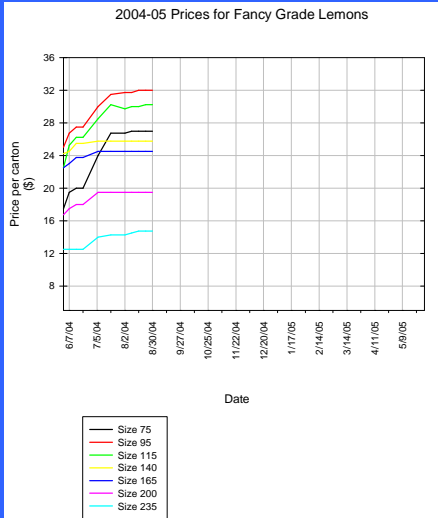
Trees should also be topped, hedged or hand-pruned to remove "whips". Whips are those long, vigorous, upright branches that extend above the canopy and often have fruit growing at their tips. These should be removed before the weight of the fruit causes the branches to break. Annual pruning operations should be scheduled for late winter, before temperatures get high and the wood rot fungi become active. Again, saw blades should be sharp.

Long-term management steps should also include a commitment to avoid damage to groves from implements such as tractors, forklifts, and sprayers. Also, it is important to avoid damage to the tree from picking ladders. When tree damage occurs due to these causes, grove managers should be notified so that the broken limbs can be removed. Finally, new plantings should be planned to avoid limb breakage. Spacing of less than 22 ft between tree rows should be avoided, since close row-to-row spacing will invariably lead to damage when implements are driven down the row. If higher tree densities are desired, consider planting in the hedge-row design, double hedgerow design, or in the diamond design in which trees can be removed when crowding will lead to limb damage.

Extensive wood rot is not a foregone conclusion in any Arizona lemon grove. With diligent management, the onset of the disease can be delayed and productivity maintained.

Citrus Prices

Los Angeles FOB Prices for Fancy Lemons



Los Angeles FOB Prices for Choice Lemons

