

# Tree Pathogen Survival in Wood Chip Mulch

R.D. KOSKI and W.R. Jacobi

Dept. of Bioagricultural Sciences and Pest Management  
Colorado State University, Fort Collins, CO 80523-1177



Tree debris to be chipped into landscape mulch



Dyed wood chip mulch

## Abstract

Wood chips are commonly used as landscape mulches. Wood chips are derived from trees removed from landscapes and solid wood packing materials. We wanted to know if wood chips could harbor pathogens that cause tree diseases and provide a means for pathogen movement. A study was initiated to determine the longevity of survival of *Thyronectria austroamericana*, the cause of Thyronectria Canker in honeylocust trees, in uncomposted wood chip mulch. Cankered wood pieces produced from inoculated branches of honeylocust trees were placed into mulched areas in an irrigated landscape. Cankered wood pieces were periodically collected and samples placed on agar plates. Recovery of *T. austroamericana* occurred from cankered wood pieces collected after 143 weeks in the mulch. *T. austroamericana* recovered from cankered wood pieces after 98 weeks produced cankers when inoculated into honeylocust branches. Irrigation treatments did not impact recovery of *T. austroamericana*. Since wood chips derived from landscape trees can provide a source of inoculum for pathogenic fungi, additional studies are warranted to investigate the survival of indigenous and/or exotic plant pathogens in chipped solid wood packing materials.

## Materials and Methods

### Production of cankered wood pieces:

An 8 mm diameter cork borer was used to produce wounds at 15 cm intervals along 2–4 cm diameter honeylocust branches. A 6 mm plug of one of two isolates of *Thyronectria austroamericana* was placed in each wound, and wrapped with wax film. After fourteen days, branches were cut into 6.5 cm sections so that each piece contained one-half of an inoculation wound.

### Study area:

The study area, located near Fort Collins CO, consisted of nine irrigated blocks. A typical turf-type irrigation system with pop-up heads was designed with controls that allowed each of the nine blocks to be controlled independently. Three irrigation treatments, based on levels of measured evapotranspiration (ET) for alfalfa, were replicated three times. The irrigation treatments consisted of 'low' (40% of ET), 'medium' (80% of ET), and 'high' (160% ET). Only two 'low' irrigation blocks and two 'high' irrigation blocks were used in this study. Within each block were three-row plots of 'Skyline' honeylocust (*Gleditsia tricanthos inermis* 'Skyline'); and 'Livingston' Kentucky bluegrass (*Poa pratensis* 'Livingston') grew throughout the nine-block study area. Four honeylocust trees in the middle row of each of selected block were utilized in this study. Turfgrass was removed from around the base of the trees and a ring of plastic landscape edging material, 0.75 m in diameter, was placed around the base of each tree. Within each ring, uncomposted cottonwood wood chips (derived from *Populus deltoides*) were placed to a depth of 10 cm. Cottonwood wood chips were used because species of *Populus* are not hosts of *T. austroamericana*.

### Placement of cankered wood pieces in mulch layer:

Cankered wood pieces were attached to landscape staples using acrylic yarn. Half of the wood pieces attached to each landscape staple were positioned 10 cm under the mulch (i.e. buried); the remaining half were positioned so that they rested on top of the mulch (i.e. surface). Three separate yet similar experiments were conducted between 1998 and 2002.

### Analysis of cankered wood pieces:

On each collection date, 32 to 64 cankered wood pieces were collected and assessed for percent moisture and fungal viability. A band saw was used to cut a 2.5 cm portion from each cankered wood piece which was weighed and then oven dried and weighed again to calculate the percent moisture. The remaining 4 cm portion of each cankered wood piece was surface disinfected using a 10% bleach solution; bark was removed, and eight wood chips were cut from each cankered wood piece. These eight wood chips were placed on two petri dishes containing PDA amended with 10 ppm streptomycin. Over a period of fourteen days, each plate was examined periodically for the presence of *Gyrostoma austroamericanum* Seeler, the imperfect state of *T. austroamericana*. When grown on PDA, *G. austroamericanum* produced mycelium that appeared wet and pinkish-orange in color.

### Pathogenicity of recovered isolates:

*Thyronectria austroamericana* isolates recovered from cankered wood pieces after 98 weeks were used to inoculate branches of honeylocust trees. Six honeylocust trees from two 'low' irrigation blocks; six honeylocust trees from two 'medium' irrigation blocks; and six honeylocust trees from two 'high' irrigation blocks were inoculated with the recovered isolates. On a different branch, inoculations were made using the original two fungal isolates. Each inoculation site was wrapped with wax film and allowed to incubate for two weeks, after which the wax film was removed. Cankers typical of those caused by *T. austroamericana* developed at sites inoculated with the recovered and original isolates.



Cankered wood piece on mulch surface



Cankered wood pieces positioned in mulch layer around base of honeylocust tree



Reddish stain of *T. austroamericana* in wood pieces



Pinkish-orange culture of imperfect state of *T. austroamericana* on PDA



Pathogenicity test with recovered isolate

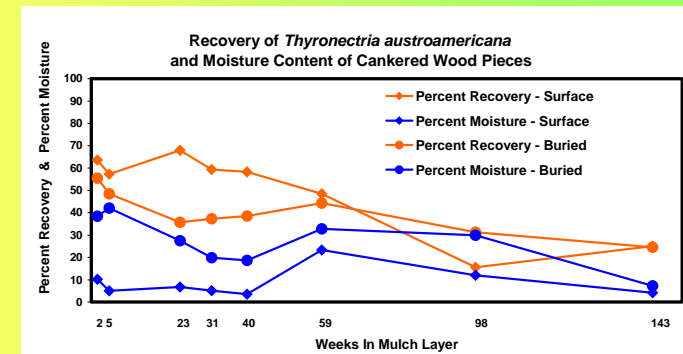
## Results

### Experiments one and two:

- *T. austroamericana* survived in both surface and buried wood pieces for 9 and 10 weeks
- *T. austroamericana* was viable in 17% to 93% of the wood pieces after 9 and 10 weeks
- Recovery of *T. austroamericana* was significantly less in surface vs. buried pieces
- Percent moisture was significantly less for the surface pieces (11%) vs. buried pieces (35%)

### Experiment three:

- *T. austroamericana* survived in both surface and buried wood pieces for over 143 weeks
- Percent moisture was significantly less for the surface (10%) vs. buried pieces (25%)
- Irrigation treatments had little impact on recovery of *T. austroamericana*



## Conclusions

- Recovery of *T. austroamericana* after 143 weeks indicates that the pathogen can survive as an inoculum source
- Recovery of *T. austroamericana* was not affected by the irrigation treatments
- Recovery of *T. austroamericana* decreased over time
- Recovery of *T. austroamericana* during the winter indicates that the pathogen can withstand freezing temperatures
- Even though surface pieces dried out more than buried pieces, recovery of *T. austroamericana* was affected by position in the mulch layer only for a few months
- *T. austroamericana* isolated from cankered wood pieces that had been on or in mulch layers for 98 weeks produced typical Thyronectria Canker lesions
- The results of this study suggest that infested wood chip mulch can be a source of inoculum for plant pathogens; infested mulch may allow fungal pathogens to survive for prolonged periods until environmental conditions and horticultural practices favor host infection
- Further research is needed to determine pathogen survival during the process of chipping trees and/or solid wood packing materials, drying of chips, and storage in mulch piles
- The risk of introducing exotic plant pathogens via the importation of wood-based packing materials into the United States is increased by the use of these materials for landscape mulch
- The findings from this research suggest that the risk of introducing exotic plant pathogens and other pests is real, and may justify stricter regulations on wood packing materials