

Copper Tolerance in Brown-Rot Fungi

The voluntary 2004 withdrawal of wood treated with copper chromated arsenate (CCA) from most residential applications has resulted in increased use of several copper-based wood preservatives that do not contain arsenic. Because the arsenic component of CCA controlled copper-tolerant fungi, there is renewed interest and concern about the capability of this important group of brown-rot fungi to decay wood treated with CCA alternatives.

Background

Copper-based biocides have provided protection against fungal decay and termite damage to wood since the 1930s. For most of the latter half of the 20th century, the wood preservation industry was dominated by CCA. Copper provided broad-based protection against fungi and termites, chromium helped to fix copper and arsenic in the wood, and arsenic provided supplemental protection against copper-tolerant fungi.

Objectives

Evaluating the potential of known copper-tolerant fungi to degrade Southern Pine treated with non-arsenic copper-based preservative formulations may either (1) raise the level of concern about the effectiveness of CCA alternatives or (2) provide evidence that CCA alternatives are effective against copper-tolerant brown-rot fungi.

Approach

Southern Pine sapwood blocks were treated in the laboratory with commercial retention levels of waterborne copper naphthenate, copper triazole, ammoniacal copper quat type D (ACQ-D), or copper borate according to standardized laboratory treatment methods. Treated blocks were exposed to nine representative brown-rot fungi that are known to be copper tolerant to assess their ability to cause weight loss in wood treated with these copper-based preservatives.



Copper-tolerant brown-rot fungus on preservative-treated specimen.

Expected Outcomes

A better understanding of the mechanism of copper tolerance in brown-rot decay fungi is critical for the development of new copper-based preservative systems in order to ensure adequate protection against this group of fungi.

Timeline

Related research—evaluating the relationship of oxalic acid production to the time course and severity of decay by copper-tolerant brown-rot fungi—has been ongoing for the past 5 years:

- Oxalic acid production within the group of brown-rot fungi, *Wolfiporia cocos*, 2000
- Evaluation of copper tolerance in 15 brown-rot fungi against copper citrate, 2001

- Time course of oxalic acid production in copper-tolerant fungi, 2003
- Overproduction of oxalic acid on copper-based preservatives, 2003

We expect to complete this research on tolerance to arsenic-free preservatives in 2007.

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