

Engineering Assessment of Oregano Oil as a Natural Antifungal Preservative for Coconut Lumber using ASTM-Based Fungal Resistance and Durability Tests

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Abstract

Coconut lumber is widely used in tropical regions due to its affordability, accessibility, and local availability. However, it is highly susceptible to moisture absorption and fungal degradation, which limits its service life, structural integrity, and long-term reliability. Conventional chemical preservatives can improve durability but may pose environmental hazards and higher costs. This study investigates oregano oil (*Origanum vulgare*) as a sustainable, eco-friendly antifungal preservative, emphasizing durability enhancement using ASTM-based laboratory testing methods for quantitative evaluation. The general objective of this study is to evaluate the effectiveness of oregano oil as a natural antifungal treatment for coconut lumber. Specifically, this will 1. assess fungal resistance using ASTM D2017; 2. measure moisture content with ASTM D4442; 3. compare treated and untreated specimens for durability; and 4. determine feasibility as a cost-effective, sustainable preservative in tropical construction. An experimental study was conducted under laboratory conditions. Coconut lumber samples were treated with oregano oil, while untreated samples served as controls. Fungal resistance was evaluated via ASTM D2017, measuring weight loss and fungal colonization. Moisture content was assessed using ASTM D4442, recording wet and dry weights. Data was analyzed to compare durability performance between treated and untreated samples. The treated samples exhibited significantly lower fungal colonization and reduced moisture absorption compared to controls, indicating improved durability and enhanced resistance to biodeterioration under tropical environmental conditions. The results showed that oregano oil is an effective, eco-friendly, and locally available anti-fungal preservative for coconut lumber. It improves durability and moisture resistance, supporting sustainable construction practices. Further research is recommended to assess long-term performance, fire resistance, and large-scale applications.

Keywords: Civil Engineering, Materials Engineering, Coconut Lumber, Wood Durability, Antifungal Treatment, ASTM D2017, ASTM D4442, Laboratory Testing, Philippines, Tropical Regions