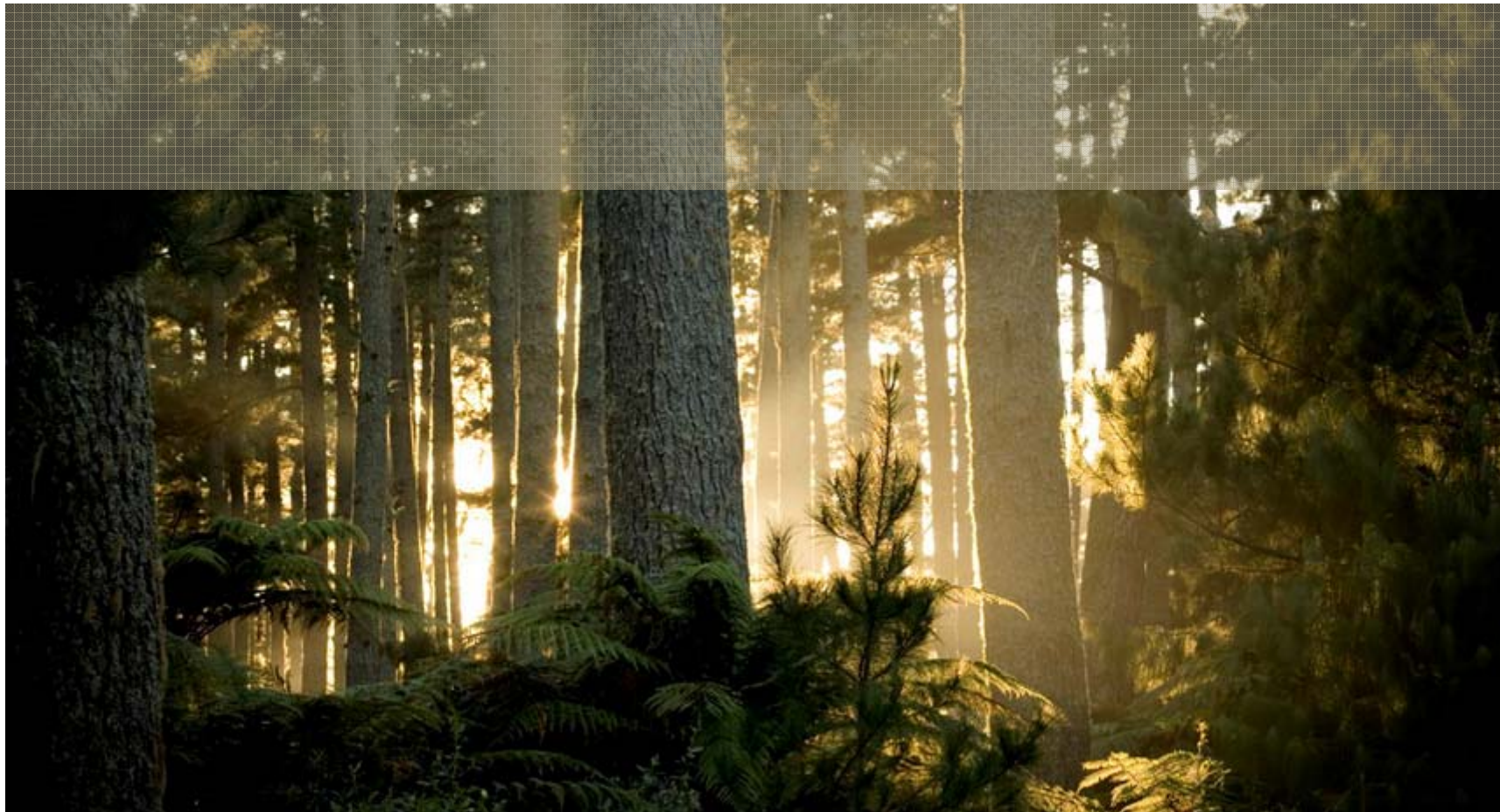


Natural compounds: a review of their use for wood Protection

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Natural compound as wood protectant

- Extending the service life of wood product using natural compounds is an attractive approach from human health and environmental prospective



Natural compound as wood protectant

- Interest in the exploration and use of natural product as biocide is rapidly growing
- However, very few have been implemented by industry



Goal

- An attempt to bring together commonly investigated natural compounds for wood protection and discuss their limitations and especially their possibilities



Aim

- A brief review of the work done on natural products as organic biocides for wood protection
- A tabulated summary of information on natural products, their use as organic biocides and references to studies done
- Possibilities and limitations of using natural compounds as wood protectant.



Review of the work done

- Plant extracts and Essential oils
- Waxes and resins from bark
- Heartwood and heartwood extractives
- Other bioproducts (Miscellaneous)



Table : Natural compounds reported in literature

| Natural product and sources | Uses | Reference to work done |
|---|---|---|
| <ul style="list-style-type: none">●Cinnamon oil ●cinnamaldehyde, Cinnamic acid, cassia oil, wood tar oil | <p>Ponderosa pine (dip treatment on wood)</p> <p>Brown, white rot decay fungi and termites (Pressure treatment in wood)</p> | <p>Li et al. (2008)</p> <p>Kartal et al. (2006)</p> |

Limitations of using natural compound as wood protectant

- A significant amount of research
- Limited Industrial uptake by wood preservation industry
- Reasons
 - ▶ Incompatibility
 - Efficacy on nutrient medium vs. wood
 - Laboratory study vs. field trials
 - ▶ Narrow spectrum activity of some of these compounds
 - ▶ Economics (cost)
 - ▶ Legislation and registrations of new compounds

Legislation and Registration

- In most countries, regulatory act requires that any new compound or formulation be registered prior to manufacturing or sale
 - ▶ Risk assessment
 - Requires costly and exhaustive toxicity studies
- However, the risk assessment is possible without toxicity studies, if the safety of the compound of interest or their decomposition products is already established



Limitations of using natural compound as wood protectant

- Retention of organic biocide within impregnated wood tissues is one of the biggest challenge!!



Progress...

- *In-situ* enzymatic polymerization of biocide to render them water insoluble
 - ▶ Enzymatic polymerization with laccase
- Fixation of organic biocide using cross linker agent
 - ▶ Condensation polymerization of chitosan-melamine co-polymer
- Addition of an oxidant/radical scavenger
 - ▶ Use of methal chelaor, EDTA in combination with 2-HPNO

Potential..

- Some natural compounds well tested with wide antimicrobial activity and eco-friendly
- Some are cost-effective. For others, genetic engineering approach can be employed for economic production
 - ▶ For eg. Gene transfer into fast growing plant can facilitate production of specific active compounds in large quantities



Potential..

- Genome mining for discovering novel compounds from natural sources
- Using natural compounds, nanotechnology and plasma added technologies potentially could greatly impact wood protection industry



Conclusion

- Consideration of impact that a protection agent may have on human health/environment at of end of service life of the treated product is important for its selection and use
- The major benefit to be gained from the use of natural compound for wood protection is their minimal impact at the end of life stage

