

Improving the lifespan of wood products

Natural durability and low-impact preservative treatments

Concerns about human health and the environment have led to gradual restrictions or bans on certain biocides. With a view to extending the lifespan of wood products and wooden buildings, CIRAD is conducting research aimed at ensuring that timbers of the right durability are chosen according to the required service life of a product or building. To this end, it is assessing natural durability, attempting to understand what determines that variability, and developing new wood treatment products and processes with a low environmental impact.



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Test of the natural resistance of mulberry wood to the tropical fungus *Pycnoporus sanguineus*.
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Mode of action of secondary metabolites

Encouraging the use of certain naturally highly durable tropical species means identifying, extracting and analysing chemical compounds found in the wood, particularly secondary metabolites, so as to understand better how they work (biocides, anti-oxidants, etc).

CIRAD is working on the nature, chemical structure and functions of these extractible compounds. Metabolite extraction and characterization methods are being optimized. Studies of several tropical and Mediterranean species—red louro, wapa, teak, juniper, cedar and cypress—have shown that it is possible to use the by-products resulting from the processing of these woods to produce active ingredients for use in wood protection treatments. Other applications may well be found for these extractible compounds: cosmetics, perfumes, nutraceuticals, etc.

There is still a very wide range of naturally durable species yet to be studied in order to determine the potential for making use of the extractible compounds they contain.



Extracting secondary metabolites from wood using Soxhlet apparatus.
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From natural durability to conferred durability

If a wood is not naturally sufficiently durable to ensure the required service life for a given structure, it has to be protected. This is known as conferred durability. Treatments must respect environmental criteria if the wood is to remain an eco-material.

CIRAD has developed a patented treatment process that satisfies those criteria: hot oil treatment. This process, using heated vegetable oils, combines drying and processing of green or damp wood. The oils use penetrate the wood and make it moisture-resistant, which reduces the risks of fungal attacks and makes the material more stable.

Adding eco-additives to the oil improves the durability of the wood, its reaction to fire, and the weather-resistance of the wood finish.

Using borates in association with various compounds—proteins, polymers, oils, etc—looks promising in terms of both the efficacy of the products and their low environmental impact.

Laboratory trials recognized by the French Committee for Accreditation

The durability of woods and the efficacy of treatment products and processes are assessed in standard trials, carried out in CIRAD's wood preservation laboratory, which has had a quality approach for more than ten years now, and has been recognized since 2006 by the French Committee for Accreditation (COFRAC, accreditation no. 1-1686) under standard NF EN ISO/CEI 17025. In 2010, this accreditation covered eight trials of woods and wood-based products, defined as per the following standards:

- EN 113: Wood preservatives - Test method for determining the protective effectiveness against wood destroying basidiomycetes - Determination of the toxic values.
- EN 117: Wood preservatives - Determination of toxic values against Reticulitermes species (European termites) (laboratory method).
- EN 118: Wood preservatives - Determination of preventive action against Reticulitermes species (European termites) (laboratory method).
- EN 73: Wood preservatives. Accelerated ageing of treated wood prior to biological testing. Evaporative ageing procedure.
- EN 84: Wood preservatives. Accelerated ageing of treated wood prior to biological testing. Leaching procedure.
- ENV 12038: Durability of wood and wood-based products. Wood-based panels. Method of test for determining the resistance against wood-destroying basidiomycetes.
- XP X 41-542: Anti termite treatment products for floors, walls, foundations and masonry works. Accelerated ageing test of treated materials prior to biological testing. Percolation test.
- XP X 41-550: Determination of the effectiveness against termites of products and material used as barrier designed for ground and/or wall. Laboratory method.

The fact that CIRAD's wood preservation laboratory is accredited guarantees the traceability and reliability of its results and strengthens its position on the international stage. This accreditation is shortly due to be extended to the development and validation of methods.

Partners

- Laboratoire d'études et de recherches sur le matériau bois, University of Nancy I, École nationale supérieure des technologies et industries du bois, CRITT Bois, France
- Sylvadour, University of Pau and Pays de l'Adour, France
- Laboratoire de physiologie végétale, laboratoire de mécanique et de génie civil, University of Montpellier 2, France
- Institut technologique Forêt Cellulose Bois-construction Ameublement, France
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Termite resistance trial. © N. Leménager, CIRAD