

NATURAL PLANT POLYPHENOL EXTRACTS IN BIO-COMPATIBLE FORMULATIONS AGAINST SUBTERRANEAN TERMITES AND WOOD BORING BEETLES

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INTRODUCTION // // // // //

Termites and woodboring beetles are social insects that degrade wood to feed on cellulose and hemicelluloses. The severe damages they cause in buildings and other woody materials are a serious concern. Worldwide they cause considerable economic losses, estimated in the billions. The conventional techniques to prevent termites to access the buildings mostly rely on synthetic chemical termiticides, toxic for environment and human health. Therefore, there is a need for eco-friendly bio-based formulations of insecticides, less persistent and quickly biodegradable. In view of the damage potential of subterranean termites and woodboring beetles, Groupe Berkem (France) has developed a new generation of polyphenol-containing formulations.

TERMITES USA

Coptotermes formosanus

Method: AWPA E-17 (no choice test – pine sapwood)
Test duration: 28 days



Conc (%)	Mortality (%)	Weight loss (%)	Rating (AWPA E-1)
5	Low	20,8	6
10	Low	26,0	5
20	Medium	4,5	8
30	Medium	3,8	9,5
50	Medium	2,1	10
control	Low	51,2	0

Method: Field trial test SOP 25 (urban and forest sites)

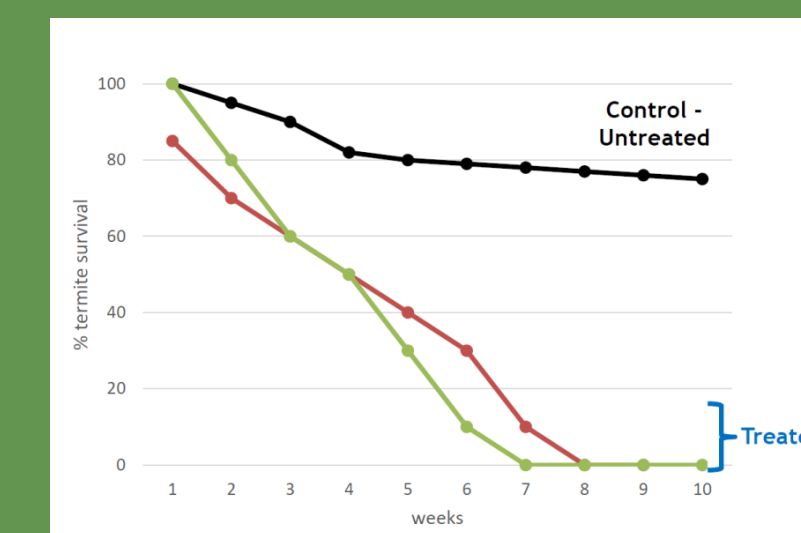


USDA Formosan termite site in New Orleans, Louisiana

TERMITES EUROPE

Reticulitermes flavipes

Method: EN117 adapted (*Pinus sylvestris*)
250 workers + 10 soldiers



PLANT POLYPHENOLIC EXTRACT

FROM BERKEM BIOSOLUTIONS®

XYLOPHAGOUS INSECTS

Hylotrupes bajulus

Method: EN47 (impregnation)
• *Pinus sylvestris*

Duration test	Concentration (%)	Number of larvae	
		dead	alive
After 4 weeks	15,0	6	1
After 12 weeks	6,2	28	0
	9,3	29	0
	12,2	29	0
After 24 weeks	3,1	21	5
Control		0	29

Method: EN1390 (brushing)
• Test duration: 52 weeks
• *Pinus sylvestris*
• Application rate: 270 g/m²
• Mortality (larvae): 98,3%
• No beetle recovered



OTHER INSECTS

Grain pests

- Adult Grain weevil, *Sitophilus granarius*
- Adult Flour beetle, *Tribolium confusum*
- Larvae of Mediterranean flour moth, *Ephesia kuehniella*

Efficacy against grain pests, tested in a direct application test on 100g wheat grains infested

- Introduction of insects onto grains before treatment
- Test duration: 15 days
- Results: 1 day after exposure all test insects showed 100% mortality. Untreated controls were fine and showed on average up 6% mortality at test day 15



Treated grains 15 days after product application

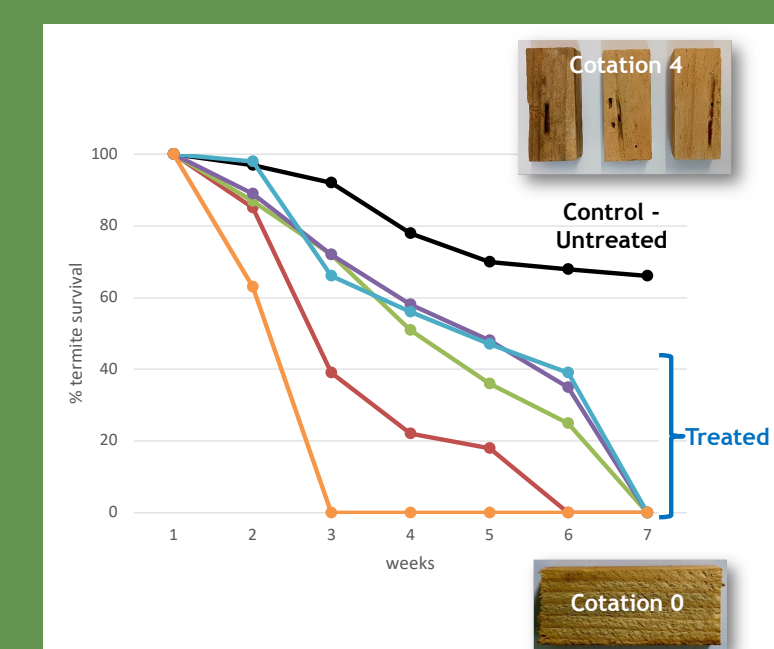


Grain weevil / Flour beetle / Mediterranean flour moth

TERMITES ÎLE DE LA RÉUNION

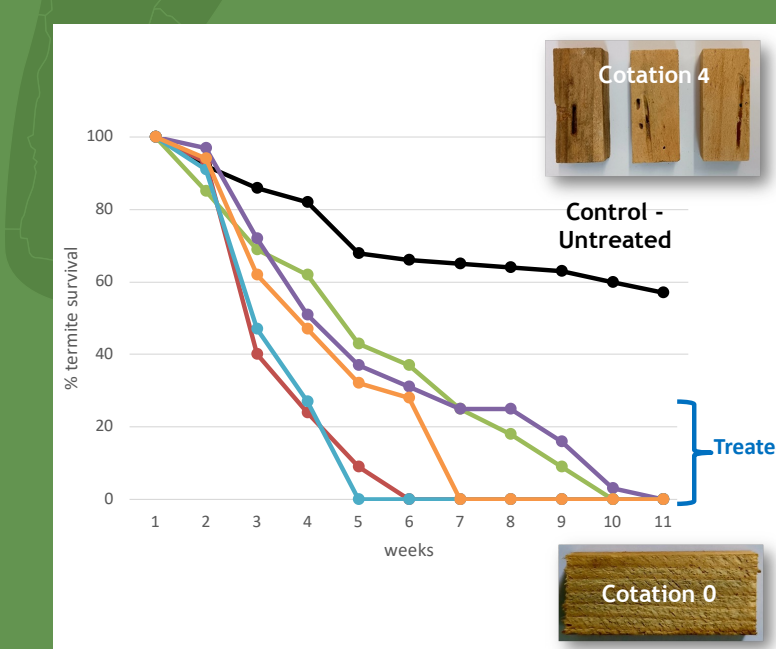
Coptotermes gestroi

Method: LAB-TERM-018 (EN117 adapted – *Pinus sylvestris*)
250 workers + 10 soldiers



Prohinotermes canalifrons

Method: LAB-TERM-018 (EN117 adapted – *Pinus sylvestris*)
250 workers + 10 soldiers

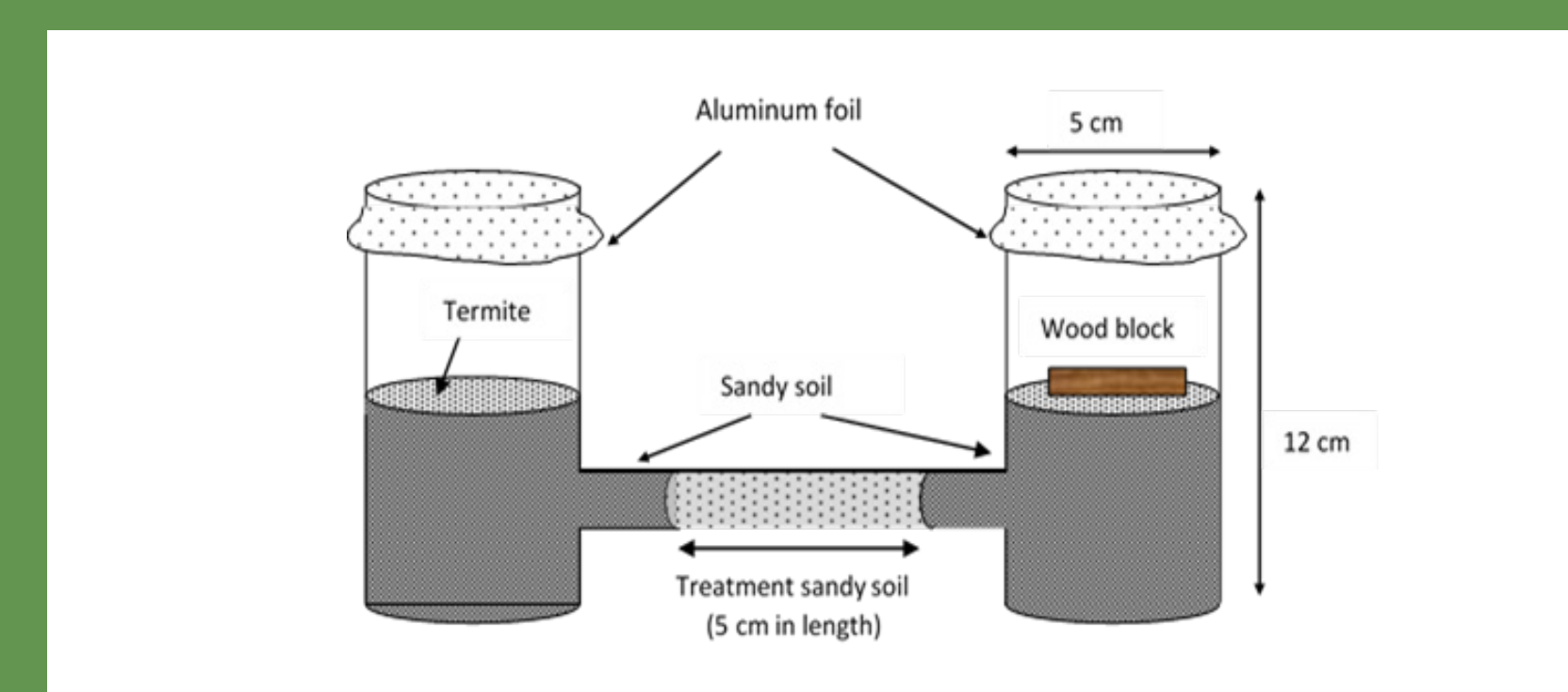


TERMITES PACIFIC – ASIA

Coptotermes gestroi

Method: JWPAS-TS-(1) (soil treatment)

Results: high resistant, 100% termite mortality rate, (control unit: non-resistant, 18% termite mortality rate)



CONCLUSIONS // // // // //

The assays on resinous wood impregnated with plant polyphenolic plant extracts formulations were potent at all concentrations tested, demonstrating a clear termiticidal activity at various concentrations and retentions against *Prohinotermes spp.*, *Coptotermes spp.*, *Reticulitermes spp.*. The same formulations showed similar insecticidal activity against the house woodboring beetle *H. Bajulus* and grain pests. Whether the observed mortality of termites and longhorn beetle's larvae is due to feeding deterrence or digestive toxicity inherent to polyphenols could not be judged in these experiments. However, it is likely that the ability of polyphenolic compounds to chelate metals by complexation and their anti-oxidant activity take part in the observed insecticidal toxicity of the formulations. It can be concluded that Plant Polyphenolic Extracts from Berkem Biosolutions® have great potential for wood preservation, termite protection and other applications to replace toxic chemicals and develop novel formulations with low environmental impact and sustainable principles.

