

## MONITORING UPTAKE AND PENETRATION OF PESTICIDE DURING IMPREGNATION OF AN IMPREGNABLE (*PINUS SYLVESTRIS*) AND A REFRACTORY (*PICEA ABIES*) WOOD SPECIES WITH BIO-BASED EMULSION GEL FORMULATIONS

D. MESSAOUDI<sup>1</sup>, K. RUEL<sup>2</sup>, J.P. JOSELEAU<sup>2</sup>

<sup>1</sup>Adkalis - Berkem Group, Blanquefort, France

<sup>2</sup>Link Conseils, Le Cheylas, France

**Abstract** Wood samples from spruce (*Picea abies*) and pine (*Pinus sylvestris*) even in dry state are susceptible to biological degradation. Preservation against insects, termites in exposed conditions is conventionally achieved by impregnating the wood with pesticides applied in professional processes. Solution penetration in wood is a complex and largely unknown process which involves numerous parameters. Here we focus on the relation between the penetration of wood preservatives, the wood macro- and microstructure, and the physical characteristics of emulsion gel formulations. Due to distinct anatomical characteristics, pine wood is considered as easily impregnable contrary to the more recalcitrant spruce. In the present study, specimens from the two species were treated with commercial bio-based insecticide emulsion formulations. The degrees of penetration and uptake of insecticides were evaluated over the thickness of the specimens. The impact of different modes of application of the pesticide formulations such as surface spraying on penetration and retention of insecticides was analyzed. The levels of impregnation were visually assessed, and qualitative and quantitative analyses of the active agents, cypermethrin, permethrin were analyzed by gas liquid chromatography coupled to mass spectroscopy. Due to the suitable combinations of solvents and surfactants used in the preparation of the bio-based emulsions of pesticide agents, the present aqueous gel formulations exhibited rapid wood penetration and enabled high yields retention. The respective penetration and distribution of the active agents were quantified as a function of depth in the specimen. The difference of susceptibility of pine wood versus spruce wood to the treatment is discussed in relation to the permeability of the two species, and to the connectivity of their conducting cells network, in terms of their anatomical and ultrastructural characteristics. The present data will be useful for estimating the capacity of penetration and retention of bio-based preservative formulations and their potential on wood preservation.

**Key words** Termites, emulsion gel formulations, permethrin, cypermethrin, wood microstructure, biobased