

Biorefinery lignins use as antioxidants: radical scavenging properties in packaging and food model matrices



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## Biorefinery lignins use as antioxidants: radical scavenging properties in packaging and food model matrices.

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Lignins are multifunctional compounds that could advantageously substitute oil-based products in cosmetic, pharmaceutic, packaging or food materials. Among the various properties related to their phenolic structure, their radical scavenging capacity offers possibility to use these compounds as antioxidant bio-based products for high-value applications. In order to assess this potential and to address the influence of lignin variability and heterogeneity, biorefinery grass lignins recovered from an alkaline industrial process and from different ethanol organosolv pretreatment processes were implemented either in solution or in multiphasic systems. The multiphasic systems consisted of fatty acid aqueous dispersion, as model of food or cosmetic emulsion, and of biodegradable film in contact with ethanol, as model of

packaging material in contact with an hydrophobic phase. Whereas the lignins exhibited similar radical scavenging properties according to the standard radical 2,2'-diphenyl-1-picrylhydrazyl (DPPH°) test carried out in dioxane, differences appeared within the multiphasic systems. These differences reflected the proportion of ethanol extractable oligomers and monomers within the lignin, likely to diffuse within the system and efficiently trap radicals at interfaces. Highly depolymerized organosolv and alkali lignins containing free *p*-hydroxycinnamic acids showed the best performance. This study shows that ethanol extracts obtained from biorefinery grass lignins could compete with commercial antioxidant additives for high-value applications. Moreover, self-assembling polysaccharide-lignin films could be engineered as active hydrogels for controlled release of antioxidant molecules.

