

Improving the antimicrobial activity of bagasse packaging paper using organophosphorus dimers

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Abstrak

The antimicrobial properties of bagasse paper sheets coated with natural polymers (chitosan, different ratios of (gelatin/glycerol) + chitosan, hemicellulose, hemicellulose + glycerol, hemicellulose+chitosan) or synthetic organophosphorus dimer compounds were evaluated in this work. Hemicelluloses showed moderate activity against *Bacillus subtilis* and *Candida albicans*, while chitosan showed weak activity against *B. subtilis*. The condition that offered the highest inhibitory activity of bagasse paper was the one coated with 1,3-diaryl-2,2,2,4,4,4-hexachlorocyclodiphosph(V)azane (where aryl is *p*-chloroaniline or *p*-anisidine). The developed bagasse papers were evaluated against Gram-positive bacteria, Gram-negative bacteria, yeasts, and fungi. The highest inhibitory activity was obtained at a concentration of 200 mg/mL for *p*-chloroaniline with an inhibition zone that varied for different microbes from 6.9 mm to 26 mm. The highest inhibitory activity was obtained at 300-250 mg/mL for *p*-anisidine against most of the pathogenic microorganisms with an inhibition zone that varied for different microbes from 8 mm to 14.75 mm. The observed antimicrobial and antifungal activity properties for bagasse paper coated with 1,3-diaryl 2,2,2,4,4,4-hexachlorocyclodiphosph(V)azane could be attributed to the presence of Cl, P atoms, and the lone pair of electrons on N atoms in the structure of the dimers.