
Screening of Natural Compounds With Antimicrobial Activity Against Biofilm-Forming Bacteria Isolated From Bioethanol Production Plants

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Resumo

Bacterial contamination during the fermentation of sugarcane wort may significantly reduce the sugar-to-ethanol conversion rate. These microorganisms consume sugars that suppose to be converted in ethanol, and produce substances that inhibit the growth of fermenting yeast. Two of the most prevalent contaminant species in Brazil are *Lactobacillus fermentum* and *Leuconostoc mesenteroides*. Both species are able to form biofilm, and therefore, may generate permanent contamination of the wort through their attachment on pipes and fermentation tanks. Antibiotics, such as penicillin, virginiamycin and sodium monensin are currently used to control this bacterial contamination. The objective of this study was to determine the minimum inhibitory concentration (MIC) of natural antimicrobials alone and in combination with sodium dodecyl sulfate against *Lactobacillus fermentum* and *Leuconostoc mesenteroides*. The MIC of the natural antimicrobials (ricin oil, cinnamaldehyde, carvacrol, geraniol and allyl isothiocyanate) and sodium dodecyl sulfate (SDS) was determined in tubes containing supplemented sugarcane broth (CSN). Tubes received a 10^6 CFU/mL inoculum of either *L. fermentum* or *L. mesenteroides* at mid-exponential phase, and were treated with different doses of the antimicrobials. Tubes were incubated at 200 rpm, 37°C for 24 h. The MIC was considered as the lowest dose of the antimicrobial where there was no

Referência:

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increment in the broth optical density. The ricin oil presented a MIC of 2000 ppm, carvacrol 1000 ppm, geraniol 500 ppm, cinnamaldehyde 400 ppm, allyl isothiocyanate 60 ppm and SDS 300 ppm. The essential oils with best antimicrobial activity (allyl isothiocyanate and cinnamaldehyde) were evaluated in combination with SDS. Both oils showed synergism with the surfactant, presenting MICs of 15 ppm allyl isothiocyanate + 37,5 ppm SDS and 100 ppm cinnamaldehyde + 37,5 ppm SDS. This study has shown that allyl isothiocyanate and cinnamaldehyde have the potential to be used in combination with SDS to eliminate planktonic cells of *L. mesenteroides* e *L. fermentum*. To our knowledge, this was the first time that the synergism among these substances was described. Further studies will evaluate the use of these compounds in combination against bacterial biofilms.

Palavras-Chave: Natural antimicrobials, Sodium dodecyl sulfate, Biofilm-forming bacteria, Contamination

Agência de Fomento: