Bioproducts from different Brazilian plants with antimicrobial activities against sulfate-reducing bacteria (SRB)

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The sulfate-reducing bacteria (SRB) represent a problem for the oil industry. The presence of SRB in pipelines, reservoirs and oil wells is associated with the formation of biofilms, biocorrosion and acidification (production of H_2S), and may result in the closing of the wells. Strategies for the control of SRB make use of high concentrations of biocides, which may induce bacterial resistance and, indirectly, lead to environmental impacts. Different bioproducts produced by plants show the ability to inhibit the growth of different microorganisms, being a possible alternative for the control of SRB. Therefore, the aim of this study was to evaluate the antimicrobial activity of bioproducts from Brazilian flora against the strain NCIMB 13491 of *Desulfovibrio alaskensis*. For this purpose, essential oils (EO) from the plant species *Croton cajucara* Benth (white and red "sacaca"), *Croton sacaquinha* ("sacaquinha"), *Aristolochia cymbifera* ("milhomem") and its major EO component (sulcatyl acetate) were tested against the SRB strain. In addition, the plant extracts (PE) from the species *Platycyamus regnelii* ("pau pereira") and *Quassia amara* (bitter-wood) were also used in the tests.To evaluate the antimicrobial activity, a volume of 100 µL of each bioproduct was tested in 9 mL of Postgate C medium inoculated with 1 mL of the SRB strain. The use of EO from *C. sacaquinha* and the sulcatyl acetate resulted in the complete growth inhibition of the NCIMB 13491 strain when compared to the control without the EO. The same results were observed when PE from *P. regnelii* and *Q. amara* were tested in the same conditions. An amount of 1 mL, taken from the experiment described above, was re-inoculated in a new Postgate C without the addition of bioproducts. No growth was observed considering the addition of EO from *C. sacaquinha* and sulcatyl acetate and PE from *P. regnelii* and *Q. amara*, suggesting a bactericidal activity. Furthermore, the agar diffusion method was performed with the bioproducts from sulcatyl acetate, *P. regnelii* and *Q. amara* in Postgate C plates inoculated with the SRB strain. The OE of *A. cymbifera* showed a total inhibition of the SRB strain growth in agar plates, probably due to the OE volatility. The PE of *P. regnelii* and *Q. amara* showed an inhibition halo against the SRB strain of 1 cm. When serial dilutions of all bioproducts were done to determine the Minimal Inhibitory Concentration (MIC) against the SRB strain, the PE showed the best results when compared to the OE. The PE of *P. regnelii* and *Q. amara* inhibited the SRB strains in concentrations of 31.25 µg mL^{-1} for MIC, and 78 µg mL^{-1} for Minimal Bactericidal Concentration (MBC).

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