TITLE: ANTIBACTERIAL ACTIVITY OF LIGNOCELLULOSIC BIOMASS BIOPROCESSED BY LACTIC ACID BACTERIA (LAB)

AUTHORS: REQUE, P.M.[1]; PINILLA, C.M.B.[1]; DUARTE, V.S.[2]; LANTE, A.[2]; GIACOMINI, A.[2]; BRANDELLI, A.[1]

INSTITUTION: [1]INSTITUTO DE CIÊNCIA E TECNOLOGIA DE ALIMENTOS, UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL, PORTO ALEGRE, BRAZIL. [2]DEPARTMENT OF AGRONOMY FOOD NATURAL RESOURCES ANIMALS AND ENVIRONMENT, UNIVERSITÀ DEGLI STUDI DI PADOVA, LEGNARO, ITALY.

ABSTRACT:
The aim of the present study was to investigate the effect of bioprocessing on wheat middlings, a byproduct of wheat flour production. This lignocellulosic biomass was used as substrate for LAB strains cultivation, in order to evaluate its potential use for the production of compounds with antibacterial properties. The strains used were: *Lactobacillus plantarum* DSM 20174^T (LP), *L. fabifermentans* T30PCM38 (LFA), *L. fermentum* LM7 (LFE) and *Streptococcus thermophilus* TH985 (ST). Bacterial growth in the fermentation trials was determined by the spread plate method, performed on the inoculum and after 24 h growth. Plates were incubated at 37°C for 48 h prior to counting the colonies. Antibacterial activity was evaluated by the agar diffusion technique, against the indicator strains *Staphylococcus aureus* ATCC1901 and *Bacillus cereus* ATCC14575. Plates were incubated at 37°C overnight and the inhibition zone (mm) was measured with a digital caliper. All fermentation and co-fermentation experiments showed LAB growth and pH medium decrease. Samples inoculated with LP, alone or with ST, presented highest growth values (2.84 log CFU/mL for LP). Inhibition zones against *B. cereus* were detected for the 24 h bioprocessed samples, with exception of LFE and LFA, but not for control samples. Largest inhibition halo (8.64 ± 0.23 mm), as well as the lowest minimal inhibitory concentration (MIC) of 50 mg/mL, were produced by STLP sample. Similar results were obtained against *S. aureus*, where LP and STLP samples presented a significantly higher activity (p<0.05), with inhibition halos of 12.89 ± 0.34 and 13.37 ± 0.57 mm, respectively. Lowest MIC (50 mg/mL) was found for STLP sample. Only control sample did not exhibit inhibitory activity against *S. aureus*. The results may indicate that a competition between LP and ST could stimulate the production of metabolic antimicrobial compounds such as bacteriocins and organic acids, which could be related to growth inhibition of the pathogenic bacteria *B. cereus* and *S. aureus*. Organic acids are able to inhibit microbial growth and lactic acid is recognized as the major metabolic product of carbohydrates fermentation by LAB. Such characteristic is widely used in food fermentations since acidification inhibits spoilage microorganisms. Thus, bioprocessing techniques using LAB can be an interesting approach to improve the availability of compounds with biological properties from a lignocellulosic waste material.

Keywords: Antibacterial activity; Bioprocessing, LAB, Lignocellulosic biomass, Wheat middlings.

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