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ANTIBACTERIAL ACTIVITIES OF NANO-CRYSTALLINE CAO, MGO AND ZNO ON LACTIC BACTERIA

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ABSTRACT The antibacterial activities of nano-crystalline metallic oxides (CaO, MgO and ZnO), prepared by sonication-thermal decomposition method, and micrometric metal oxides were evaluated on three strains of lactic bacteria, *Lactobacillus plantarum*, *Lactobacillus helviticus and Leuconostoc mesenteroides*, and on spores of *Alicyclobacillus acidoterresris* involved in fruit juice spoilage. The effects of particle size, pH, concentration and exposure time on the viability were examined in physiological solution as well as culture broth. The tests were performed by adding the bacterial or spore suspensions in flasks containing metal oxides. The results showed that CaO nanoparticle was the most effective in killing all the three strains of lactic bacteria exposed for 24 h at 100 ppm, but its antibacterial activity is attributable in part to its pH effect. MgO was lethal against *L. helveticus*, but exhibited little effect against either *L. mesenteroides* or *L. plantarum*. The nanoparticular ZnO clearly showed a bactericidal effect on all lactic bacteria tested, but less so against *L. helveticus*, and it was also more effective in inhibiting their growth compared with alkaline metal oxides. No antibacterial effect of the metal oxides was observed against the spores of *A. acidoterrestris*. This investigation showed that, in general, higher concentration, longer exposure and smaller particles size of metal oxides tend to increase their antibacterial effect. However, the aggregation of nanoparticles at high concentrations of metal oxides in the slurry tends to lower the antimicrobial action. It was also evident that the antibacterial activity of metal oxides depends on the type of metal oxide (alkaline or amphoteric) and on the morphological and physiological characteristics of the bacteria.

Keywords: nano-crystalline metallic oxide, antibacterial activities, lactic bacteria, spores, fruit juice spoilage