

Effects of Combining Organic Acid and Essential Oil as an Alternative to Replace Potassium Sorbate in Fruit Preparations

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The replacement of synthetic preservatives by natural alternatives is an increasing demand in the food industry, driven by consumer preference for clean-label products. This study investigated the substitution of potassium sorbate (PS) in red fruit preparations using combinations of propionic acid (PA) and lemongrass essential oil (LEO) with antimicrobial potential against fungi, yeasts, and bacteria, while maintaining safety and stability of the product. Six treatments were developed with different combinations of PA and LEO applied in concentrations ranging from minimum inhibitory concentration (MIC)/4 to 2 x MIC against *Lactobacillus plantarum*, *Escherichia coli*; *Candida intermedia*, *Pichia fermentans*, *Aspergillus niger* and *Penicillium glabrum* incorporated in red fruit preparation during 28 days. The systems were kept refrigerated ($4 \pm 2^\circ\text{C}$) and counts were performed for each microorganism every 7 days. Inoculums of 10^5 and 10^2 spores/mL were used for fungi, 10^6 CFU/mL for bacteria and 10^3 CFU/mL for yeast. For all treatments, it was observed that there was no growth of any bacteria or yeast from the 1st day of the study. The 2 x MIC treatment inhibited fungal growth from day 7 onwards, followed by the MIC treatment, which inhibited fungi from day 14 onwards, with results similar to those of PS to *A. niger* (10^5 spores/mL), followed by the MIC/2 treatment which also inhibited *P. glabrum* (10^5 spores/mL) from the 7th day. All treatments completely inhibited the growth of both fungi with 10^2 spores/mL from 1st day (*P. glabrum*) or day 7 (*A. niger*), results similar to those of PS. These findings demonstrate the potential of replacing potassium sorbate with natural antimicrobial systems based on propionic acid and lemongrass essential oil in fruit-based products. Future work will focus on optimizing sensory attributes, assessing shelf-life performance, and evaluating the scalability of these formulations for industrial implementation.

Keywords: organic acids, essential oil, natural antimicrobials, fruit preparations, clean-label