Extending Shelf Life of Tomatoes Using Microbial Antagonists

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The current methods used to extend the shelf life of tomatoes are expensive and toxic, thus inexpensive and nontoxic methods are required to extend their shelf life. Objective of this study was to extend the shelf life of tomatoes using fruit peel extracts. Peel extracts were prepared from sweet orange (*Citrus sinensis*), lime (*Citrus aurantiifolia*) and sour orange (*Citrus aurantium*) peel using a rotary evaporator. From the extracts 2.5 mg mL^{-1}, 1.25 mg mL^{-1} and 0.625 mg mL^{-1} concentration series were prepared. Most abundant microbial species were isolated from rotten tomatoes and tentatively identified as *Bacillus* sp. and *Penicillium* sp. The antimicrobial activities of three peel extracts were tested by using agar well diffusion assay. Positive controls for bacteria and fungi were Amoxicillin and Fluconazole, respectively, and 50% ethanol was the negative control. There were significant differences between Mean Inhibition Zone Diameters (MID) of different concentrations ($P<0.05$). Both concentration and type of extract significantly affected for MID ($P<0.05$). Although the highest MID was resulted from positive controls (2.6±0.3 cm, 3.4±0.4 cm for Amoxicillin and Fluconazole, respectively), sweet orange peel extracts had shown highest MID of 2.5±0.8 cm and 2.1±0.3 cm (at 2.5 mg mL^{-1}) for both bacteria and fungi, respectively, compared to other peel extracts. A solution of sweet orange peel extracts (2.5 mg mL^{-1}) was then prepared and sprayed on a batch of tomatoes (ripen) belonging to same variety and same size, while Amoxicillin and Fluconazole solution and distilled water were sprayed on another three batches of tomatoes. The shelf life of sweet orange peel extract solution sprayed batch was 26 days in average while that of batches sprayed with Amoxicillin, Fluconazole and water were 19, 20 and 5 days in average, respectively. Therefore, sweet orange peel extracts could be used to prepare antimicrobial solutions to extend the shelf life of tomatoes.

Keywords: Tomato, Citrus peel extracts, *Bacillus* sp., *Penicillium* sp., Shelf life