

Title New developments on the environmentally friendly microbiocidal formulation of components of essential oil of lemon peel

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Abstract

Previously a new environmentally friendly biocidal formulation prepared from peel of citrus fruits was reported. The active ingredients of this formulation comprised components of lemon's essential oil and limonene hydroperoxides. Some of these components were reported recently to have also additional medical benefits if administered to humans. Although these ingredients have potential for phytotoxicity, the formulation does not cause injury due to the use of either high level (up to 25%) of ethanol as a solvent, or a high level (1000 to 2500 ppm) of edible emulsifiers such as Tween 20 or chitosan. Addition of 300 to 1000 ppm of the antioxidant BHA had also reduced the phytotoxicity as well as enhanced the biocidal activity of this formulation. Successful combinations between present day fungicides and the new food grade biocides was achieved so that the amount of the old fungicide such as imazalil was markedly reduced from 1000 to 10 ppm by introducing the new biocide citral in a dosage of 1000 to 2500 ppm. Such a combination has allowed to use the imazalil where its permissible residue was much reduced and to save costs as the citral is much cheaper than imazalil. Limonene hydroperoxides could be obtained in effective concentrations by exposing limonene to sun or to ultraviolet radiation. Several methods of synthesizing limonene hydroperoxides were also developed. Crude extract of 18 h prevented decay development of *Penicillium digitatum*-inoculated citrus fruit. More research is still needed to extend the life of the limonene hydroperoxides. Greater efforts should be exerted to find better interactions between different components of the essential oil in the formulation in order to achieve synergistic relationship between these components in controlling the development of different pathogens.