YEASTS AND MOLDS

COMBINATIONS OF ANTIMYCOTICS TO INHIBIT THE GROWTH OF MOLDS CAPABLE OF PRODUCING 1,3-PENTADIENE

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Raw and pasteurized foods and beverages as well as products subjected to more rigorous thermal processes, e.g., hot-fill beverages, can contain a wide range of molds. These molds may grow during the expected shelf life of these products to cause visual spoilage or result in the production of volatile compounds that are offensive to the consumer. Some of the molds known to grow in the presence of potassium sorbate or survive thermal processes commercially applied to foods and beverages can also produce mycotoxins, thereby posing a public health concern. Degradation of sorbate through decarboxylation by some strains of penicillia can result in the accumulation of 1,3-pentadiene, a volatile compound having an odor described as being similar to that of kerosene, acrylic paint, or petroleum products. Other molds that may also degrade sorbate include *Aspergillus*, *Fusarium*, *Mucor*, *Geotrichum*, and *Trichoderma* species. Strains of yeasts belonging to *Zygosaccharomyces rouxii* and *Debaryomyces hansenii* are also capable of spoiling sorbate-containing high-sugar foods by producing 1,3-pentadiene. While the control of sorbate-resistant molds and yeasts in some types of foods and beverages may be achievable through the addition of high concentrations of the preservative, the adverse effect of off aromas and off flavors that may result make this approach impractical. Instead, the use of antimycotics other than sorbate, e.g., natamycin, ethylenediaminetetracetic acid, and propionate, or a low concentration of sorbate in combination with other antimycotics may be an alternative to prevent or retard the growth of 1,3-pentadiene-producing molds. We did a study to evaluate potassium sorbate, sodium benzoate, calcium propionate, disodium ethylenediaminetetraacetic acid (EDTA), and natamycin, alone and in combination, for their effectiveness in preventing the growth of five molds isolated from Parmesan cheese and a lemon-flavored drink subjectively judged to contain 1,3-pentadiene. Growth of *Penicillium brevicompactum*, *Penicillium roqueforti*, *Paecilomyces variotii*, *Aspergillus niger*, and *Cephaloascus fragrans* on model agar media containing Parmesan cheese (PRM agar) (pH 5.5) and lemon-flavored drink (LD agar) (pH 2.6) supplemented with antimycotics was studied. All molds grew well at 21ºC on PRM agar containing potassium sorbate (3,500 µg/ml), calcium propionate (3,000 µg/ml), or natamycin (20 µg/ml). Combinations of potassium sorbate (250 - 1,000 µg/ml), calcium propionate (250 - 1,000 µg/ml), and/or natamycin (10 - 18 µg/ml) greatly inhibited or prevented growth of molds on PRM agar, indicating their potential as preservative systems at pH values resulting in large percentages of the acids in dissociated forms. Three of the five molds grew on LD agar containing potassium sorbate or sodium benzoate at a concentration of 200 µg/ml. Growth did not occur within 70 days on LD agar containing EDTA (30 µg/ml) in combination with potassium sorbate and sodium benzoate at 50 and 175 µg/ml, respectively, or 175 and 50 µg/ml, respectively. Results of this study show that preservative systems containing a reduced concentration of potassium sorbate, in combination with other antimycotics, particularly natamycin, have potential for controlling the growth of molds thought to be capable of producing 1,3-pentadiene.