Ascorbic acid content, pH, and acceptability of home-canned tomatoes

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Abstract. Four varieties of tomatoes were home canned by using raw and hot packs and various levels of citric acid and sugar. After six months' storage, pH values were lowest and titratable acidity highest in samples containing added citric acid. Ascorbic acid content was affected by variety used and was significantly higher (p < 0.001) in tomatoes that had been raw packed. Adding 0.5 g citric acid or 1 g citric acid plus 1 tsp sugar acceptably decreased the pH of tomatoes for home canning without producing deleterious effects on flavor or texture. Both raw-packed tomatoes processed for 35 min and hot-packed tomatoes processed for 10 min in the boiling water bath produced acceptable products.

Introduction

Growing or obtaining produce and preserving it in the home are increasing in popularity because of economic considerations and personal satisfaction. Effectiveness of such preservation practices is reflected by the fact that few incidences of botulism occur in home-preserved products. Nevertheless, controversy has developed regarding the pH of tomatoes used by home canners. Fields et al. [3], Powers [6], and Sapers et al. [8] have reviewed and discussed the relationship of botulism associated with home-canned foods. Many researchers have found that some tomatoes, because of pH levels greater than 4.5, classify as low-acid foods [2–5, 7, 9, 12]. A diversity of information from popular and professional sources has frustrated home canners.

Earlier work conducted at Kansas State University [10, 11] indicated that adding 0.5 g citric acid/pt or 1 g citric acid plus 1 tsp (4.2 g) of sugar/pt (473.2 ml) was acceptable for the home canning of tomatoes. Their products were canned by using exclusively the hot-pack method. We here report the results of canning tomatoes with the previously stated acidification procedures by the hot-pack and raw-pack methods and processed in the boiling water bath. Parameters studied on the canned products include ascorbic acid content, pH, titratable acidity, and sensory qualities.

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Materials and Methods

Materials

Three cultivars of tomatoes — Jet Star, Red Pak, and Show Me Hybrid — were chosen because they are grown extensively in Kansas. Also, we used experimental tomatoes from five lines currently being grown for processing by the Kansas State University Department of Horticulture. Tomatoes were canned at the firm-ripe stage (when first turning bright red, but still firm).

Treating raw tomatoes

The pH of longitudinal section of 20 raw tomatoes of each cultivar was measured with a horizontal digital pH meter after each sample had been blended 30 s in a Waring blender. Total ascorbic acid content of samples from 20 raw tomatoes of each cultivar was determined by the AOAC microfluorometric method [1] modified as follows: 4 g acid-washed Norit were used for each sample; to avoid excessively high blank readings, the pH of the filtrate and boric–sodium acetate solution for the blank was adjusted to pH 7.5–8.0; and fluorescence of the quinoxaline formed by the reaction of dehydroascorbic acid with O-phenylenediamine was measured in a Coleman Model 12C photofluorometer with B-1 and PC-1 filters.

Canning procedure

Tomato samples were washed, then successively immersed in boiling water for 30 s and in cold water for 30 s. Cores and peels were removed manually and tomatoes were quartered. For the raw-pack method, tomatoes were packed in pint-glass Mason jars to within ½ in. (1.27 cm) of the jar top. Additives were placed on tomatoes in the top of each jar before it was closed with a standard two-piece, self-sealing lid. Raw-packed tomatoes were processed in a boiling water bath for 35 min. Tomatoes to be hot-packed were heated to the boiling point, then packed in pint-glass Mason jars and covered with hot juice to within ½ in. (1.27 cm) of the jar top. The same procedure was used for additives, sealing, and processing, except that hot-packed tomatoes were processed for 10 min. All samples were cooled to room temperature immediately after processing. The canned produces were stored at ambient temperature (22°C) for six months prior to analyses.

Treatment variables

The additives used for both raw and hot tomato packs were: 0.5 g USP citric acid or 10 g citric acid + 1 tsp (4.2 g) sucrose. Each pack contained ½ tsp (3 g) canning salt. Each control sample contained ½ tsp (3 g) canning salt with no other additive. Four packs of each cultivar were canned for each type of pack and for each additive treatment.