FRESH CITRUS JUICE—AN UPDATE

R. M. GOODRICH
University of Florida
Citrus Research and Education Center
Lake Alfred, FL 33850

Abstract. Fresh citrus juice is an important component of road-side fruit shop retail sales, and is synonymous with Florida for many tourists and native Floridians alike. Additionally, a large (30-50%) proportion of citrus fruit packed in Florida is utilized as fresh citrus juice and is produced either at the retail grocery store, at a central commissary serving several stores, or in the home by the consumer. In response to at least two salmonellosis outbreaks associated with fresh orange juice in the last 5 years, the U.S. Food and Drug Administration (FDA) has issued rules and proposals pertaining to fresh citrus juice safety and quality. Researchers are working to develop and validate methods of safely producing fresh citrus juice.

Orange juice is the most popular fruit juice in the United States and accounts for just over 60% of total domestic fruit juice sales. Consumers like orange juice because of its healthfulness, convenience, perceived value and flavor. Two billion gallons of 100% juice were consumed by Americans in 1998; of this amount, about 96% underwent some type of thermal treatment such as pasteurization to inactivate spoilage organisms as well as harmful microorganisms. However, there are consumers that prefer fresh, non-pasteurized citrus juice due to its real and/or perceived flavor superiority and freshness. This segment of the orange juice industry, while small, represents an important and valuable marketing outlet, especially in the state of Florida.

Discussion

On January 25, 1997, the President announced the National Food Safety Initiative. Key components of this program include expansion of the Federal food safety surveillance system, improved coordination between Federal, State, and local authorities, improved risk assessment capabilities, and increased research and consumer education. This initiative includes components for reducing the incidence of foodborne illness from farm-to-table. Relevant to the citrus industry, the FDA has identified imported and domestic fresh and minimally processed fruit and vegetable products as commodities upon which to focus in the next few years. Fresh juice was presented as an example of a product which has incurred food safety problems, has minimal processing, and is potentially in need of stronger regulatory scrutiny. Mandatory juice warning labels were proposed as one means of providing better fresh fruit and vegetable juice safety (Goodrich, 1998).

In the Federal Register of April 24, 1998 (63 FR 20450), the U.S. Food and Drug Administration (FDA) proposed to adopt regulations to ensure the safe and sanitary processing of fruit and vegetable juices through implementation of Hazard Analysis Critical Control Point (HACCP) procedures (the HACCP proposal). Preventative systems (such as HACCP) are viewed as scientifically sounder for the production of safe food than systems that rely solely on product testing. HACCP systems have previously been implemented by the meat, poultry, low-acid canned food, and seafood industries as a means of elevating the food safety of these products. Some fresh and pasteurized citrus juice producers have adopted formal HACCP systems, but there are many who have not and feel that mandated juice HACCP would be a significant burden. University of Florida and Florida Department of Citrus scientists have published guidelines for a model HACCP system for fresh juice operations (Schmidt et al., 1997).

In late 1998, FDA announced it would allow fresh citrus juice producers to market their product without a warning statement if they registered with the FDA and continued to develop and validate systems that provided at least a 5-log reduction in pertinent fruit surface microorganisms. This applied only to citrus juice producers because of the unique character/physiology of the citrus fruit and the means by which it is juiced. Research on safe fresh juice production continued during 1999 and included studies on microbial sanitation of citrus fruit surfaces by waxes (Pao et al., 1999) and hot water immersion and chemical sanitizers (Pao and Davis, 1999).

Current concerns of the FDA involve pathogen internalization and suitability of fruit surface sanitation to achieve safe juice. Studies with tomatoes and apples indicate that surface treatments might not successfully eliminate potential pathogens within the fruit (FDA, 1999; Cherry, 1999). There is some debate regarding potential pathogen internalization in citrus. A meeting among industry, consumer, government and academic representatives was held in Washington, DC, on December 8 and 9, 1999 to address and discuss these issues and to provide information to the National Advisory Committee on Microbiological Criteria for Foods (NACMCF). NACMCF is a committee that provides advice and recommendations to the Secretaries of Agriculture and Health and Human Services concerning microbiologic and epidemiologic aspects of food safety and foodborne disease.

Additionally, by notice in the Federal Register, FDA has re-opened comment period on the HACCP proposal and interested/affected parties are encouraged to submit their comments by January 24, 2000. In an unusual request, FDA asked consumers who prefer fresh juice to submit comments regarding how much they would be willing to pay for this product. FDA also asked fresh juice processors to submit the percent annual profit they realize from fresh juice products.

Summary

There was an enormous amount of scientific and regulatory activity, research and discussion regarding the safe production of fresh citrus juice in 1999; this is expected to continue throughout the 1999-2000 citrus harvesting season. The industry anticipates a proposed final rule (or final rule) regarding HACCP implementation in citrus processing facilities to be announced in the near future. Additionally, there are proposed amendments to the Florida statutes that will more closely regulate sanitary production of citrus juice and the importation of...
fresh juice from locations outside the state of Florida; these proposals will be discussed in early CY 2000. Finally, the FDA is expected to indicate, through research publications, proposed rulemaking, or some other mechanism, the degree of risk they feel is presented by possible internalization of pathogens in citrus fruits and subsequent entry into juice. The outcome of these activities is expected to guide the scientific research of government, academic and industry scientists on fresh juice and fresh juice production for the remainder of the fruit season.

Literature Cited


ETHYLENE LEVELS AND FRUIT QUALITY OF SILVERLEAF WHITEFLY-INFESTED DWARF CHERRY TOMATO

SHAHAB HANIF-KHAN AND JEFFREY K. BRECHT
University of Florida
Horticultural Sciences Dept.
Gainesville, FL 32611

CHARLES A. POWELL AND PETER J. STOFFELLA
University of Florida
Indian River Research and Education Center
2199 South Rock Road
Fort Pierce, FL 34945

Additional index words. Lycopersicon esculentum, cherry tomato, Bemisia argentifolii, silverleaf whitefly, tomato irregular ripening.

Abstract. Tomato (Lycopersicon esculentum Mill.) irregular ripening (TIR) is a disorder of fruit pigmentation induced by the infestation of silverleaf whitefly (SLW), (Bemisia argentifolii Bellows and Peering). Experiments were conducted to differentiate the postharvest characteristics of the SLW-infested and control fruit. Ethylene production by SLW-infested fruit was 2-fold higher than control fruit on day 1 of measurement and declined thereafter. In general, the SLW-infested fruit were slightly lighter in color than the control fruit. The control fruit developed normal red color while the SLW-infested fruit developed blotchy and streaky symptoms and were overall more of an orange-red color. SLW-infested fruit were firmer than control fruit. Total soluble solids contents were not significantly different between the treatments. However, titratable acidity and pH measurements indicated that the SLW-infested fruit were more acidic than control fruit. SLW-infested fruit exhibited a high incidence of TIR symptoms, both externally (i.e., blotches and streaks) and internally (i.e., white tissues), as well as a star formation color pattern at the blossom end of the fruit while control fruit had no TIR symptoms. The ripening process in the SLW-infested fruit appeared slower compared with the control fruit.

There are two distinct symptoms of TIR on the disordered fruit. Externally, TIR symptoms appear as distinct longitudinal red streaks over the septa and/or red, yellow, and green blotches in the intermediate areas. At the full ripe stage, internal white tissue is apparent in the endocarp layer and around each of the locules (inner pericarp). Powell and Stoffella (1995) reported that the external TIR symptoms sometimes disappear and the external fruit area recovers to a complete red color, but almost always retains the internal white tissue during ripening in fresh-market tomatoes. Ethylene treatment, a common practice for mature-green harvested tomatoes, does not appear to have a significant effect on ripening of fruit expressing TIR (Maynard and Cantaliffe, 1989). Abnormal ripening in tomato has also been associated with other factors. According to Picha and Hall (1981, 1982), potassium (K) fertilization significantly reduced the appearance of tomato fruit disorders. Blotchy ripening was more prevalent in the spring season than in the fall season. Titratable acidity increased and pericarp pH decreased (only in the spring season) with increased levels of K. Tomato tissue expressing yellow shoulder (YS), a form of abnormal ripening,