Title Effect of various processing methods on fruit and vegetable antioxidants

Author D.M. Barrett

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Abstract

Fruits and vegetables may be preserved by various means, including refrigeration, freezing, freeze-drying, air-drying, thermal processing and non-thermal treatments such as high pressure. Antioxidant activity may be differentially affected by the choice of process. The effects of various processes on ascorbic acid, polyphenolic and carotenoid compounds in fruits and vegetables are reviewed. Refrigeration and freezing have relatively little effect on the level of some antioxidants. However, long term frozen storage may result in loss of cellular integrity and antioxidant activity. Freeze-drying may also result in significant losses of antioxidant activity. In juice production, there are higher concentrations of polyphenolics in the press cake or pomace, rather than the juice produced from the whole fruit or vegetable. The water versus lipid solubility of antioxidant compounds will also affect their extractability. Processes that allow for more exposure to oxygen may incur greater loss of phenolic compounds and ascorbic acid, due to their oxidation by endogenous polyphenol oxidase (PPO) and ascorbic acid oxidase, respectively. Non-thermal methods of preservation, such as high hydrostatic pressure, may have more deleterious effects on oxygen sensitive components due to residual levels of PPO. Canning may result in dramatic decreases in antioxidant compounds, depending on time/temperature conditions utilized. In addition, it has been demonstrated that antioxidant levels may continue to decline during storage. There is evidence that some degree of heat, however, is desirable for inactivation of oxidative enzymes. Indeed, blanching or mild pasteurization treatments focused on enzyme inactivation may result in higher degrees of antioxidant activity. In many cases processing appears to cause an improvement in extractability of antioxidant compounds, perhaps due to disruption of cellular integrity and therefore solubilization. Evidence from tomato carotenoids indicates that thermal processing may cause isomerization of some carotenoids and not others due to differences in cellular location. The effects of various processing methods on antioxidant activity will therefore be reviewed in terms process time/ temperature, oxygen exposure, cellular location of the compound and its extractability from the plant source.