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Paul Dawson
Clemson University

Wesam Al-Jeddawi
Clemson University

James Rieck
Clemson University

The Effect of Different Freezing Temperatures and Long-Term Storage on The Stability of Peaches

*Paul Dawson, *Wesam Al-Jeddawi, **James Rieck
*Department of Food, Nutrition and Packaging Sciences, Clemson University, Clemson, South Carolina
**Department of Mathematical Sciences, Clemson University, Clemson, South Carolina

Abstract

Freezing is a simple method to preserve foods especially fruits. The purpose of this research is to determine the impact of long-term freezing storage on peaches quality (physical and chemical attributes). Peaches *(Prunus persica)* were cut into 8 lengthwise slices and dipped in 2% of ascorbic acid for 2 minutes. The slices were then drained and packaged using Whirl Pak (Nasco). The bags were closed, and tab were folded over three times. Fresh and pre-frozen peaches treatments were placed randomly into freezers at different freezing temperatures (-7°C), (-12°C), (-18°C), (-29°C) and (-77°C) for 360 days. Quality measurements included freeze, thaw and weight loss, lightness, firmness, moisture content, pH, ascorbic acid equivalent antioxidant capacity (AAEAC), hexanal detection using gas chromatography (GC), scanning electron microscopy (SEM) and sensory evaluation. The results showed that -77°C and -29°C kept the quality of peaches samples after freezing. However, all samples enzymatically browned, therefore, frozen peaches are best used for applications where they can be used in the frozen state and before thawing. Freezing at -7°C had a negative impact on peaches quality. Fresh and pre-frozen peaches were no preferred by the sensory panelist's members after 270 and 360 days of frozen storage.

Introduction

Fruits grow only in certain parts of the world under specific temperature, humidity environments and times of the year. Fruits contain approximately 90% water which begin to undergo higher rates of respiration once they are harvested, resulting in moisture loss, quality deterioration and potential microbial spoilage **[1]**. Refrigeration slows down the respiration of fruits and allows for longer shelf lives **[1]**. Fruit for freezing is usually harvested while still firm and then ripened under control. Storage should be at temperatures below 0F if extended shelf life is required. The limiting shelf life factor is the browning **[2]**. Freezing has been successfully employed for the long-term preservation of many foods by lowering temperature to -18 °C or lower **[3]**. Fast freezing leads to insufficient time to remove the water from the cell through osmosis. The cell contents cool then ice forms within the cell. While slow freezing leads to adequate time for water to leave the cell. Therefore, it may be for this reason that drip loss is often more marked in slowly frozen fruits **[2]**. Because of cell wall damage due to freezing process, the water does not return to the cells upon thawing but, rather, becomes drip loss **[2]**. Freezing retards the physical, chemical, and biochemical reactions which induce phytochemical deterioration. Six to 8% of peaches produced are processed as frozen peaches **[4]**. During freezing most liquid water is transformed into ice which reduce microbial and enzymatic and lipid oxidation reactions. Enzymatic reactions are a common concern in the deterioration of frozen fruits, despite being very slow. Enzyme activity has been noted in foods stored at temperatures as low as -73°C. Color loses in frozen vegetables which contain chlorophyll because the pheophytisation which occurs when the magnesium found in the center of chlorophyll's porphyrin ring is removed and replaced with hydrogen. This reaction is caused when pH decreases during frozen storage thus initiating the pheophytisation reaction. Texture is another key factor in fruit quality. The purpose of this research is to determine the effect of long-term freezing storage on peaches quality.

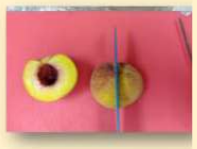
Contact

Wesam Al-Jeddawi
PhD Student

Paul Dawson
Professor

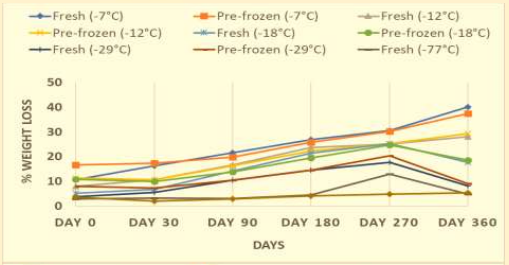
E-mail: Waljedd@g.Clemson.edu
Wal-Jeddawi@DukeFoods.com
E-mail: pdawson@clemson.edu
Phone: 864-625-8413
Phone: 864-656-3397

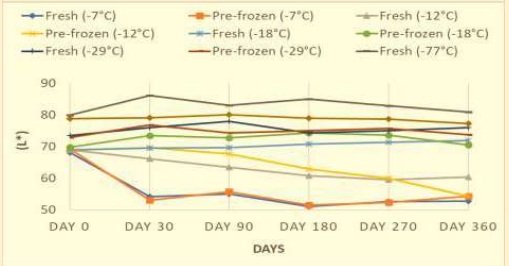
Materials and Methods



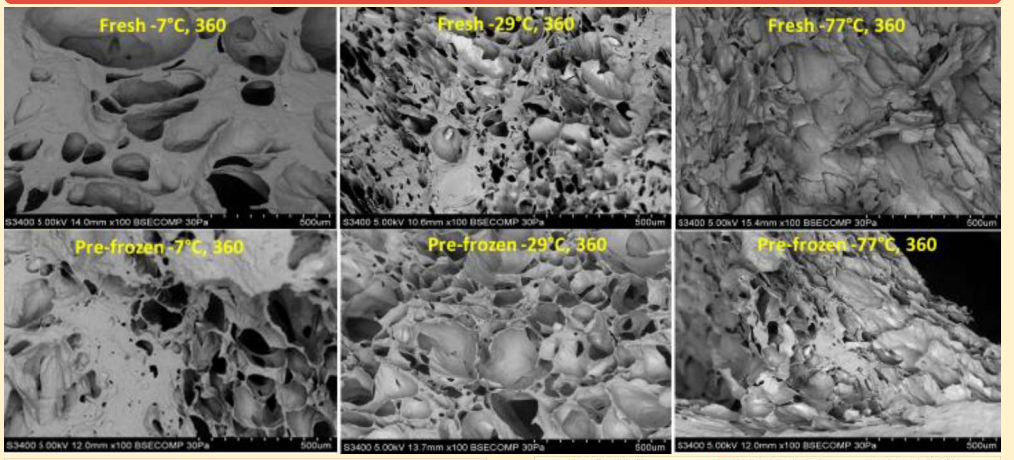
Quality attributes tests were conducted in day 0, 30, 90, 180, 270 and 360

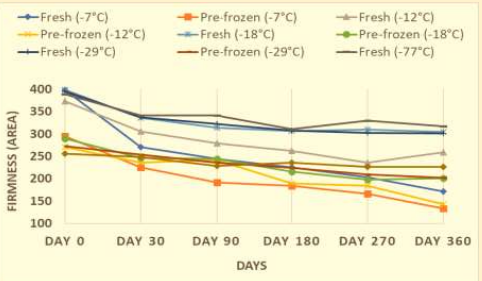
Freeze Loss	Antioxidant Capacity (AAEAC)
Thaw Loss	Pore numbers (SEM)
Weight Loss	Pore Size (SEM)
Lightness	Hexanal (GC)
Firmness	Sensory Evaluation
Moisture Content	

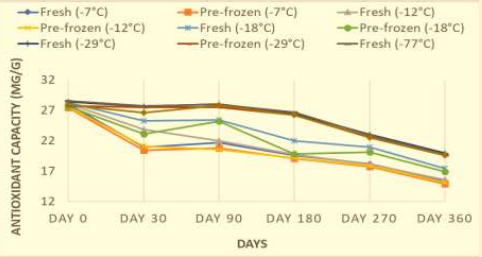


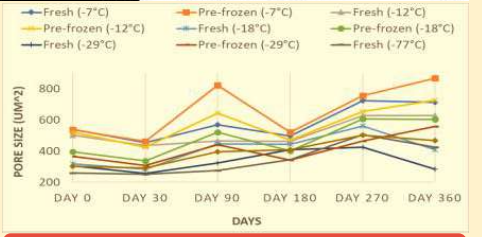


Results









Conclusion

Freezing at -77° C and -29° C kept the quality of peaches samples compared to other freezing temperatures, however, -77° C was significantly lower in weight loss and pores size than other freezing/holding temperatures. No significant difference between freezer -77° C and -29° C was found in antioxidant capacity. Thawing after freezing negatively affected weight loss, PPO enzyme activity, texture deterioration and color for all temperatures.

Acknowledgment

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