

Southern Region Small Fruit Consortium – Final Report

Title: A Sensory and Histological Study on the Effects of Frozen Storage Over Time on *Vaccinium ashei*

Grant Code: 2007-06

Research Project

Personnel:

Jennifer Swift
Graduate Student
Department of Horticultural Science
North Carolina State University
Raleigh NC 17695
jeswift@ncsu.edu

Dr. Jim Ballington
Department of Horticultural Science
North Carolina State University
Raleigh NC 17695
Jim_Ballington@ncsu.edu

Objectives:

Growers and processors of blueberries have expressed concerns that rabbiteye blueberries, due to their firmer skins that make them great for machine harvesting and long transport, may over time become unpalatable to consumers when processed or frozen.

In the current study, four rabbiteye varieties, one highbush, and one rabbiteye – highbush hybrid were collected from Castle Hayne, NC, all individually quick frozen and stored at the same temperature (-14° F). Every three months they were comparatively tested by pressure tests and sensory taste panels for the course of one year. Tests are to be replicated for a total of 2 years. Specific objectives include:

- Detecting differing levels of skin toughness between rabbiteye varieties and highbush “standard.”
- Identifying cellular structures that are associated with increased epidermal toughness/firmness through histological examination.
- Detecting any differences in toughness between harvests of a couple weeks.
- Determining whether prolonged frozen storage of berries leads to any changes over time, including an increase in toughness and “grittiness,” can be detected by consumers, and found to be unpalatable.

Materials and methods:

Composition

Soluble solids were read by portable refractometer. pH, and titratable acids were performed according to protocol from the NC Agricultural Research Station at Castle Hayne.

Firmness Testing

All cultivars underwent puncture and compression tests, 20 berries per cultivar were used per test. Both puncture and compression tests were performed using a TA-XT Plus Texture Analyzer.

Histological

Fresh and frozen berries were fixed by formalin-acetic acid alcohol (FAA), and subsequently dyed with aniline blue and looked at with a fluorescing microscope.

Sensory Panels

Every three months consumer sensory panels consisting of 75 untrained participants tasted and judged the berries. The berries were thawed for a measured amount of time, about 35 to 40 minutes. Subjects received trays with 9 small coded sample cups, each containing 3 berries, a plastic spoon, a napkin, and a small cup of water to rinse between samples. Subjects were given an instruction sheet of what cup to start with, and a number of questions to answer about the sample. After tasting each sample, subjects rated their level of liking of flavor, seediness, texture, and skin toughness on a hedonic 9-point scale.

Results:

First year results after 13 months of testing show that no major changes in texture over time were detected by consumers. Mean firmness ratings for each cultivar were stable over time. Significant differences in firmness ratings between cultivars were found. Beaufort, the only highbush cultivar most often ranked lowest in firmness, but also often ranked lowest in firmness desirability. Powderblue consistently rated the highest for firmness, and also rated very low in firmness desirability (i.e. skin toughness), just above Beaufort. Often there was very little to no significant difference between the rating of the other rabbiteye varieties, Premier, Ira, Tifblue, and the hybrid, NC3465 in firmness. These findings tell us that the lack of firmness, as found in the highbush variety Beaufort is potentially more undesirable to consumers than firmness or detected toughness.

Preliminary histological investigations show that lignified cellular structures, known as sclereids, are found in greatest quantity in the epidermis of the Powderblue cultivar. Preliminary puncture tests also show Powderblue as significantly outstanding in firmness, Beaufort as lowest in firmness, and insignificant differences in other cultivars. These findings match consumer ratings.

Consumer ratings for overall liking were consistently highest for Tifblue, with Premier and NC 3465 just below. Both Premier and NC3465 both ranked highest throughout the 13 months for overall texture liking (lack of skin toughness) as well.

Powderblue, Premier and Tifblue each had two harvests to see if differences in texture or liking arose between them. Only Powderblue showed significant differences. The first harvest of Powderblue consistently had higher means for firmness in puncture tests than the second harvest, and consumer rating followed this trend, consistently rating the first harvest as higher in toughness and lower in liking than the second.

Over the 13 months there were no significant differences in soluble solids, pH or titratable acids.

Acknowledgements:

In addition to the financial support provided by the SRSFC, the principal investigators would like to thank the following people for their help in making this study possible: Tim Kelly of Solo Foods, Burgaw NC, Terry Bland of the Castle Hayne Horticultural Crops Research Station, Dr. Leon Boyd in the NCSU Food Science Department, Dr. Shyamalrau Tallury of the NCSU Crop Science Department, and NCSU research technician Kerry Olive.