

Post-Harvest Handling and Characteristics of Blueberries

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Survey

- Before I start, we have a few questions we would like you to answer and pass back to me.
- The results as well as answers on the questions will be posted with Eric and sent to you if you want.
- **THANK YOU**



Factors Affecting Fruit Quality

- Intensity and uniformity of blue color
- Juiciness
- Sweetness
- Flavor
- Sweet/acid balance
- Firmness/crunch
- Size
- Shelf life: handling resistance
- Antioxidant capacity and related properties

Note: These and other factors are important to all but they vary in importance depending on audience. Producers care about variety (early...), handlers and retailers rely on color and shelf life, processors may rely on juiciness, nutritionists may rely on health properties, consumers may rely on sweetness

Quality of Blueberries by Type

- Which Blueberry Type do you like?
 - Highbush
 - Rabbiteye
 - Southern Highbush
 - Lowbush
 - All equal

Note: Most consumers prefer Highbush blueberries. These are the most common and perceived as not as tough as rabbiteyes. However, rabbiteyes are usually hand picked and thus tend to be sweeter (more mature in the market) and handle better than Highbush. Lowbush blueberries are usually used for processing.

True or False

- Rabbiteyes are more “seedy” than Highbush blueberries?
- Rabbiteyes have tougher skin than Highbush blueberries?
- Rabbiteye blueberries get tougher after freezing?

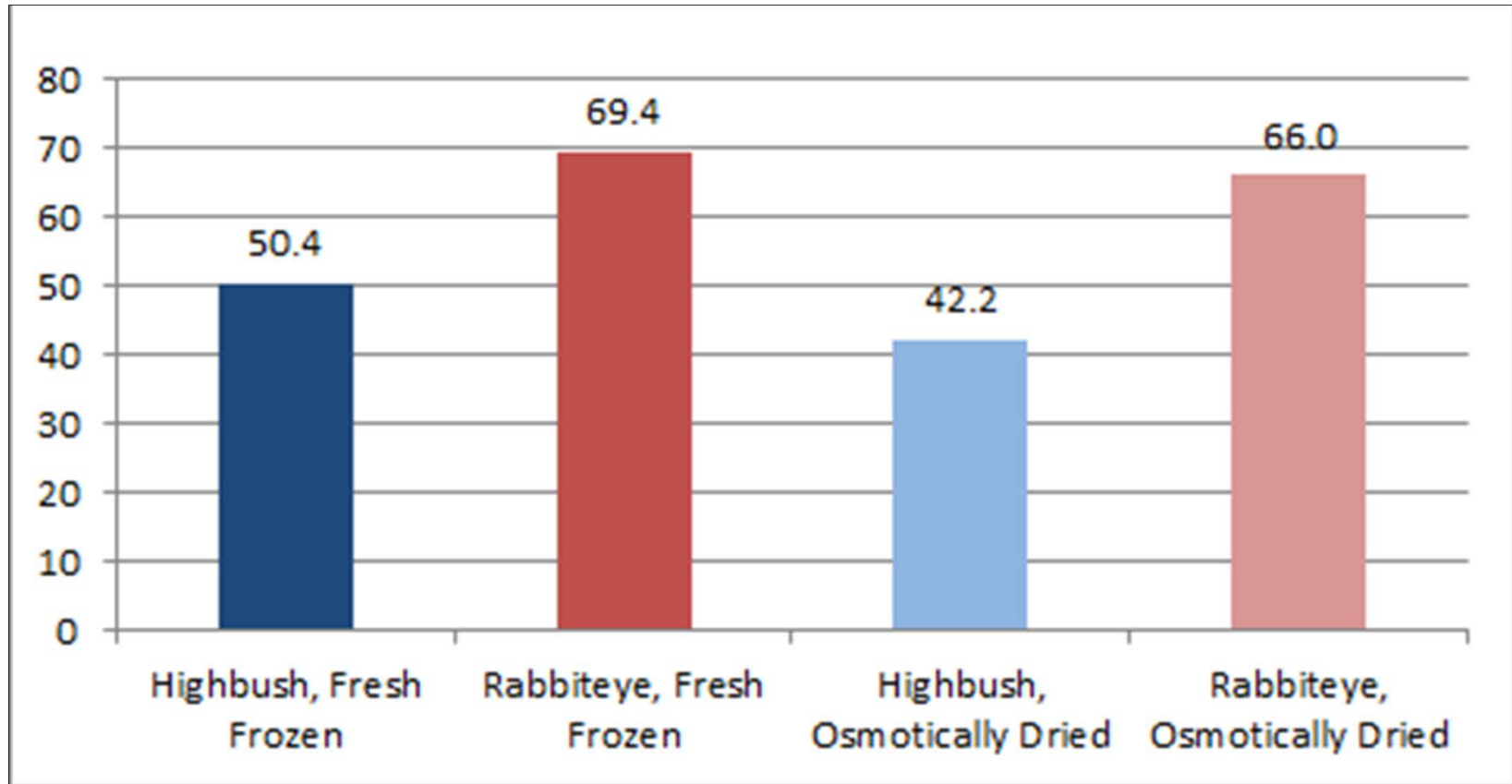
Note: We will answer the first question soon but it appears that seediness is lower in Rabbiteyes than highbush berries. This depends on maturity, berry size, cultivar, etc. Rabbiteyes have a tougher skin than highbush blueberries but in some cases this is not noted by consumers. In general, blueberries do not get tougher upon freezing.

Blueberries and Safety

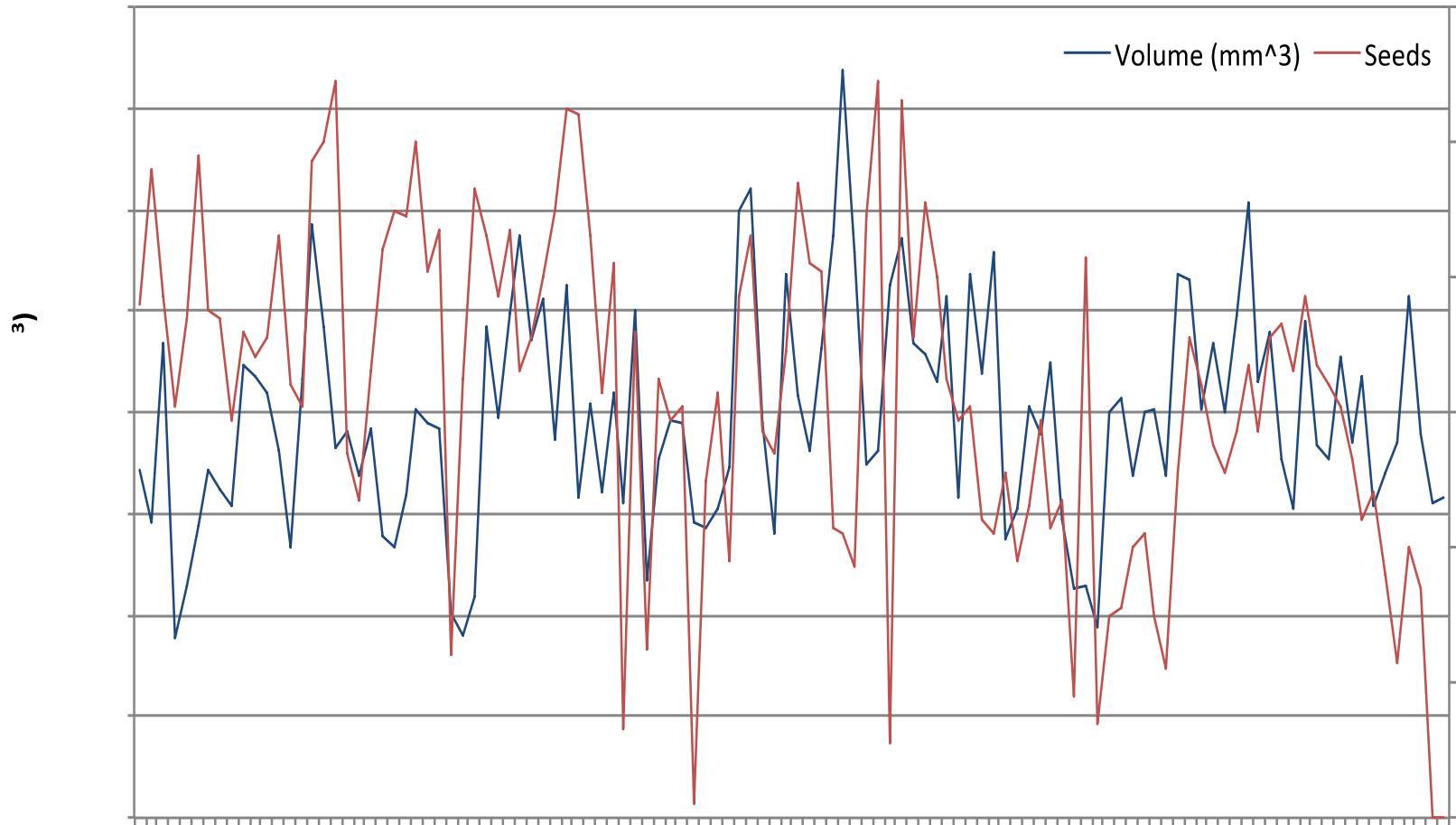
- There have been no documented cases of outbreaks from blueberries
- The cases documented have been from foreign blueberries
- *Salmonella* and *E. coli* 0157:H7 or others cannot survive on acid blueberries
- Hepatitis has not been associated with blueberries
- Parasites like Cyclospora have not been associated with berries/blueberries

Note: There have been at least two Hepatitis outbreaks and one Salmonella outbreak directly linked to blueberries. Other outbreaks implicated blueberries (in berry mix) as one of a mix of possible sources. Outbreaks have been reported with US and foreign berries. Salmonella, *E. coli* O157:H7 and other pathogens can survive in blueberries. Hepatitis has been associated with at least two outbreaks. Parasites have been associated with berries, including blueberries

Skin Thickness (um) of Blueberries



Blueberry Seediness



Rabbiteye Variety



Conventional vs. Organic Production

Production type	Antioxidant capacity, ORAC	Total phenolics	Total anthocyanins
	μmol of Trolox (TE)/g of fresh weight (fwt)	mg/100 g of fwt	mg/100 g of fwt
Organic	46.14	131.2	319.3
Conventional	30.8	82.4	190.3

Wang et al, 2008

Maturity and Hand Harvesting

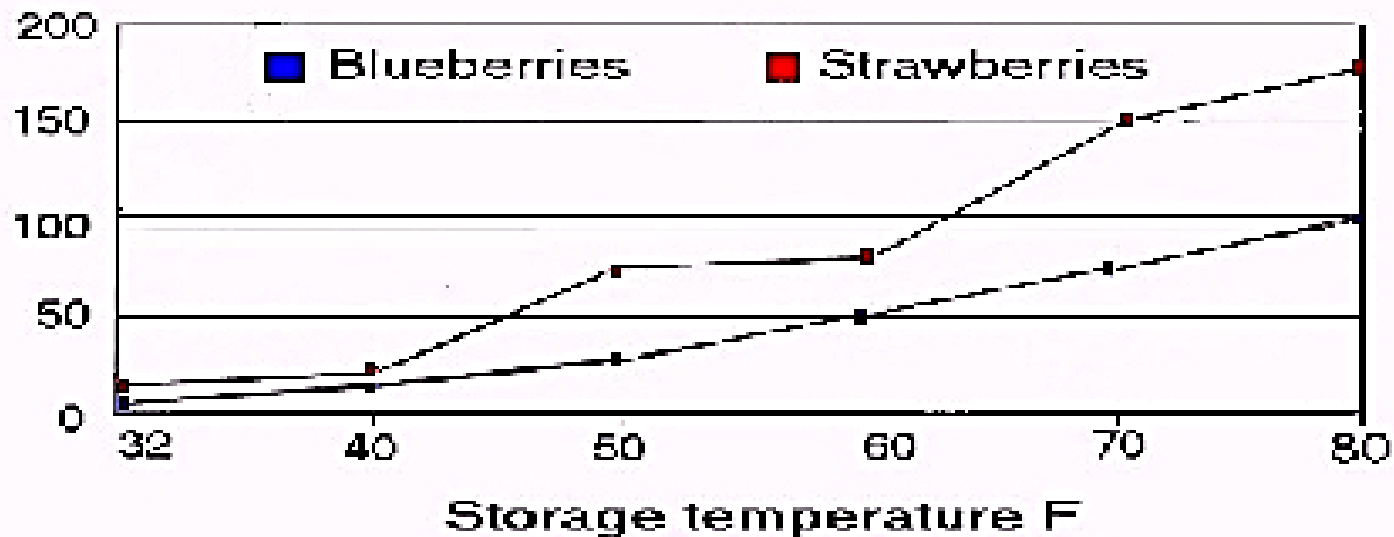
- Hand harvest BBs have higher sugars and sensory acceptance, are more uniform in maturity and quality
- Machine harvest BBs vary in maturity and quality

Harvesting BBs with dew



Rate of Respiration

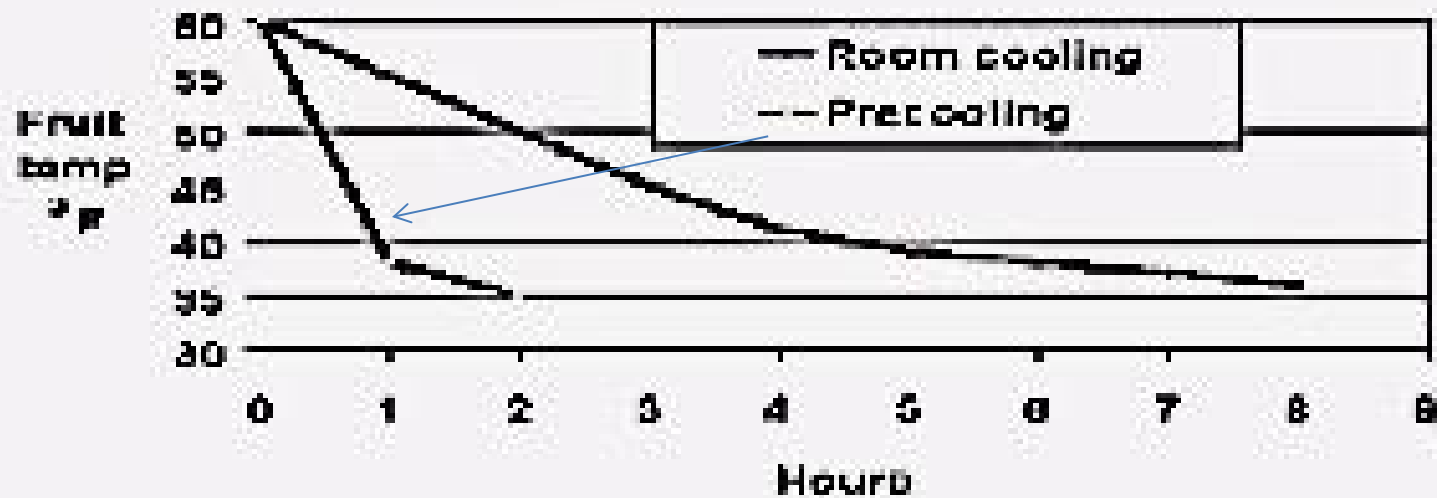
Rate of respiration (mg/Kg/hr)



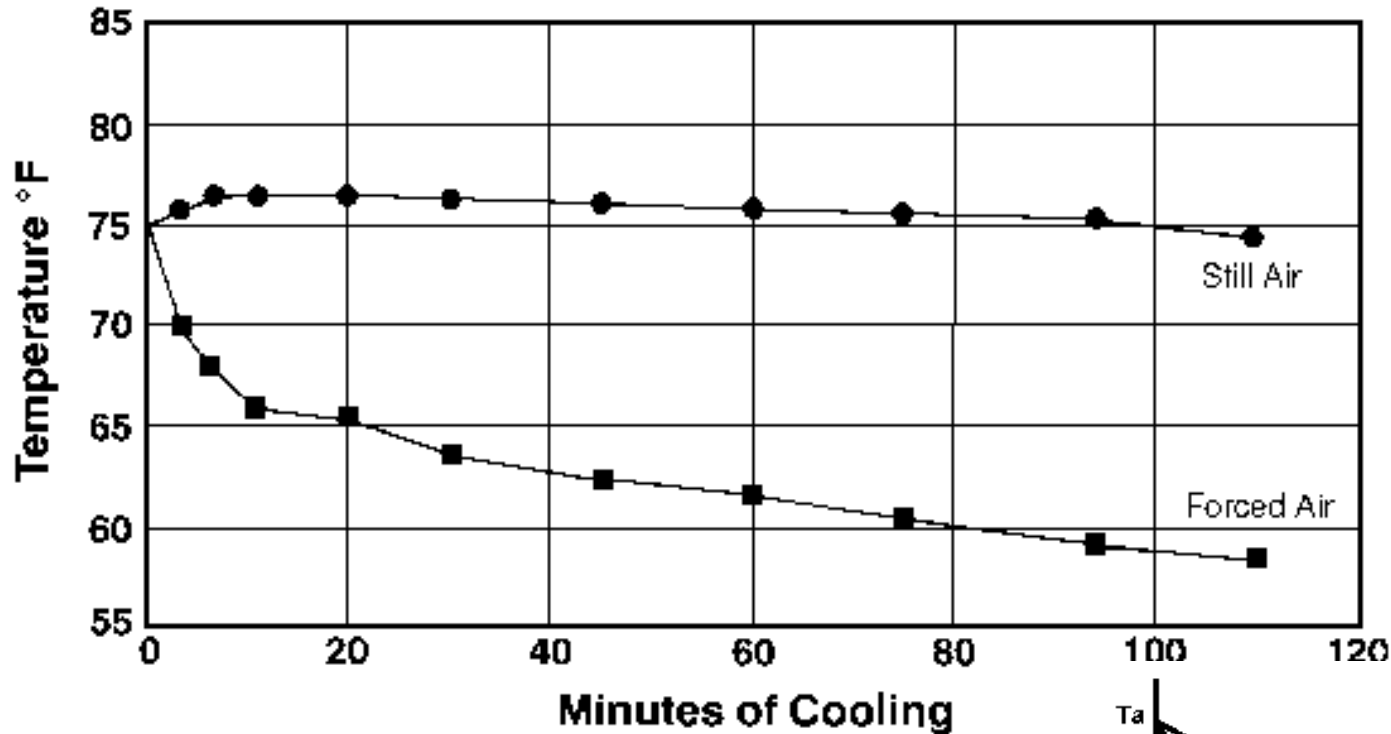
Respiration rates of blueberries and strawberries stored at various temperatures.

Field and Room Cooling

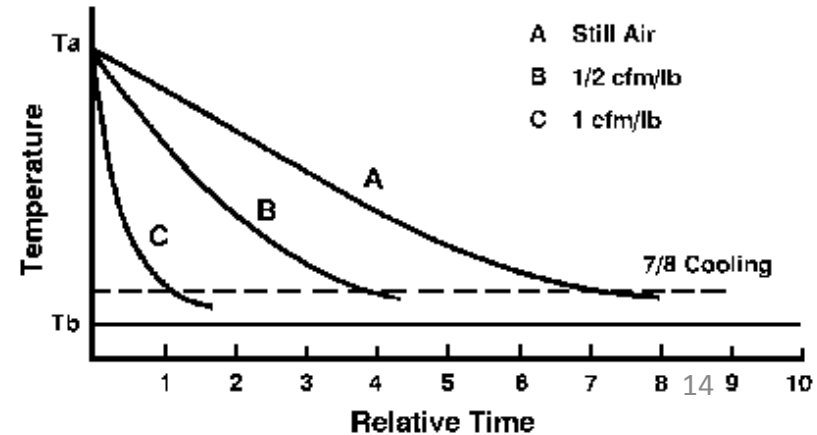
Precooling vs. room cooling



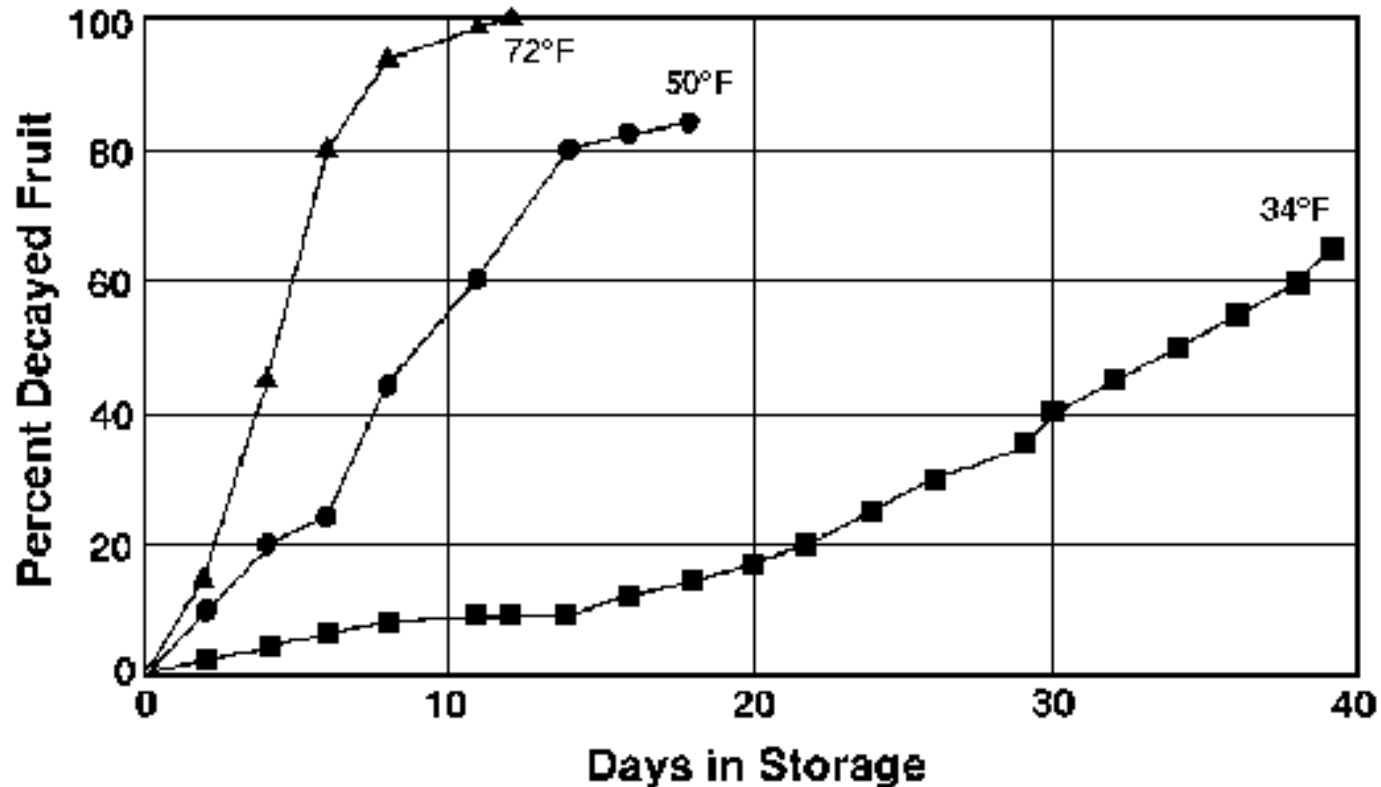
Cooling rates for blueberries in forced air and still air. (Room air temperature of 44 F)



Boyette et al, 1993



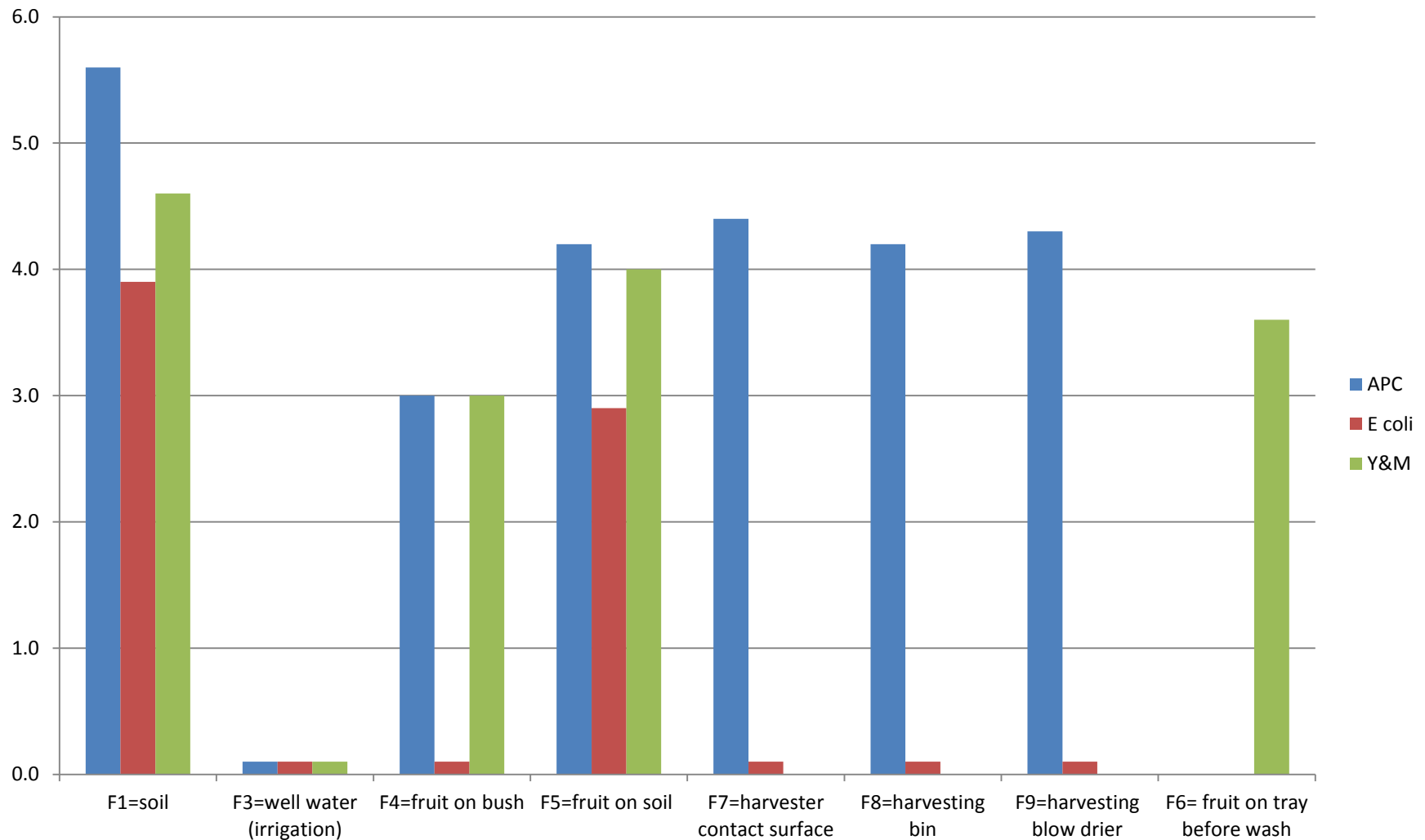
Decay in packaged blueberries stored at various temperatures



Boyette et al, 1993

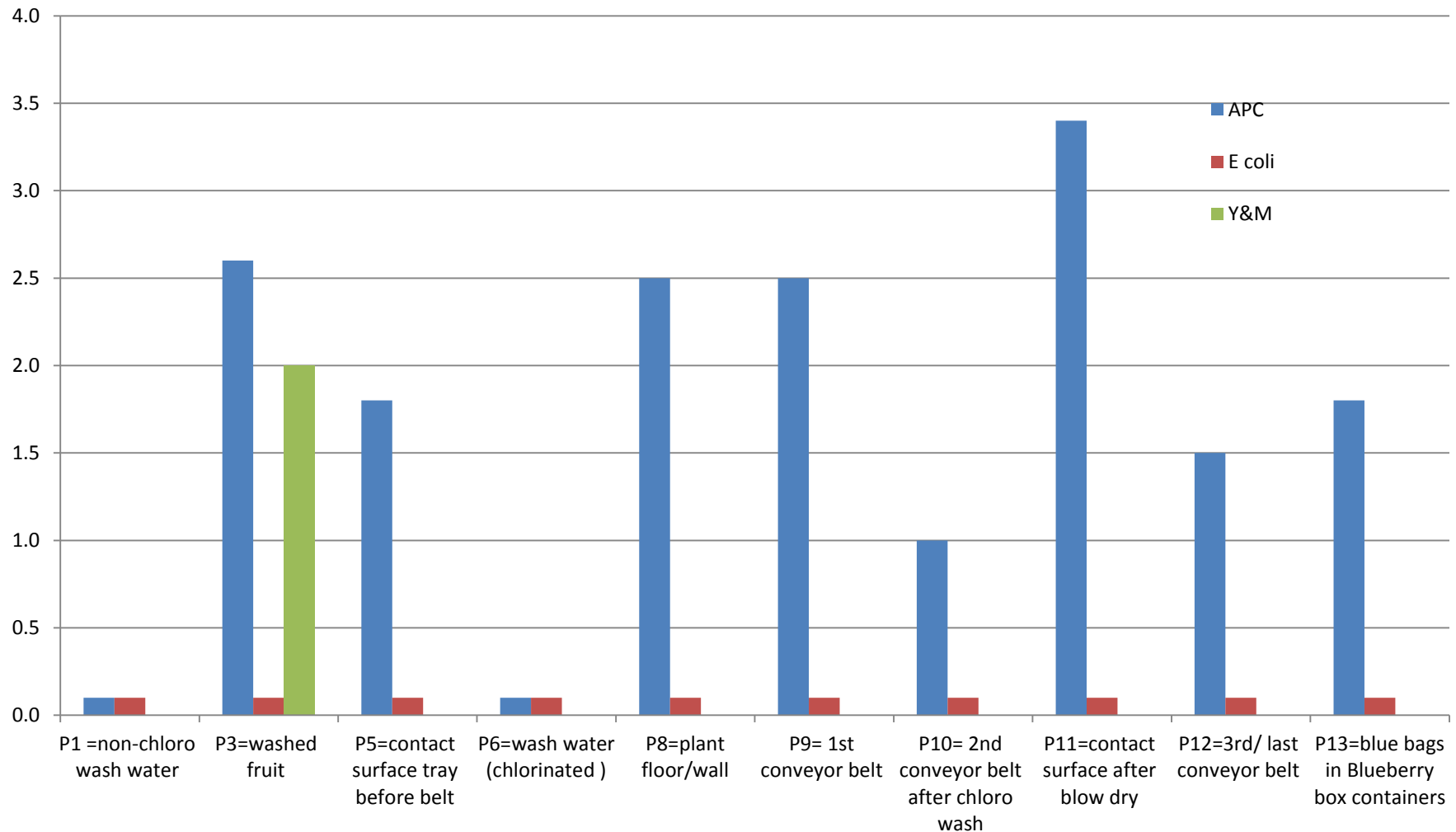


Aerobic (APC), E. coli and Yeast & Mold (Y&M) Counts on Blueberries in Farm





Aerobic (APC), E. coli and Yeast & Mold (Y&M) Counts on Blueberries in Packing Line



Modified and Controlled Atmosphere



- Conventional: 32 F at high RH yields ~ 3 weeks shelf life.
- Shrink-wrapped pint containers -modified atmosphere packaging or MAP): High RH resulted in less shrink but fungal growth
- Placing filled flats in cold storage under conditions of various concentrations of carbon dioxide and oxygen (referred to as controlled atmosphere storage, or CA): 1.8% O₂ & 12% CO₂ at 32F for 46 days



Reveille after 5w cold storage + 3d shelf life



Ozone on Shelf-Life



Ozone

Air



250 or 1000ppb
ozone for 24 or 48 h
Then 4 wks storage



Beth Mitcham &
Andrew Macnish
UCDavis

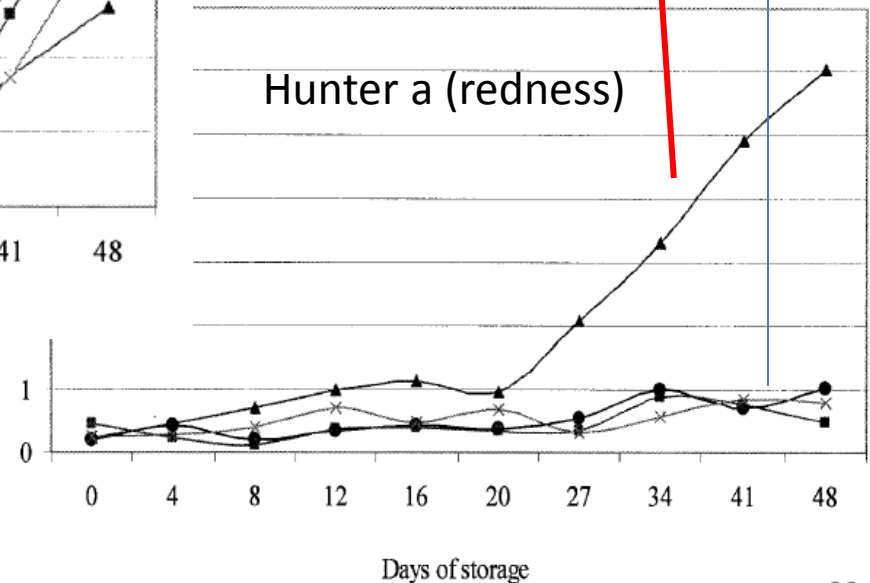
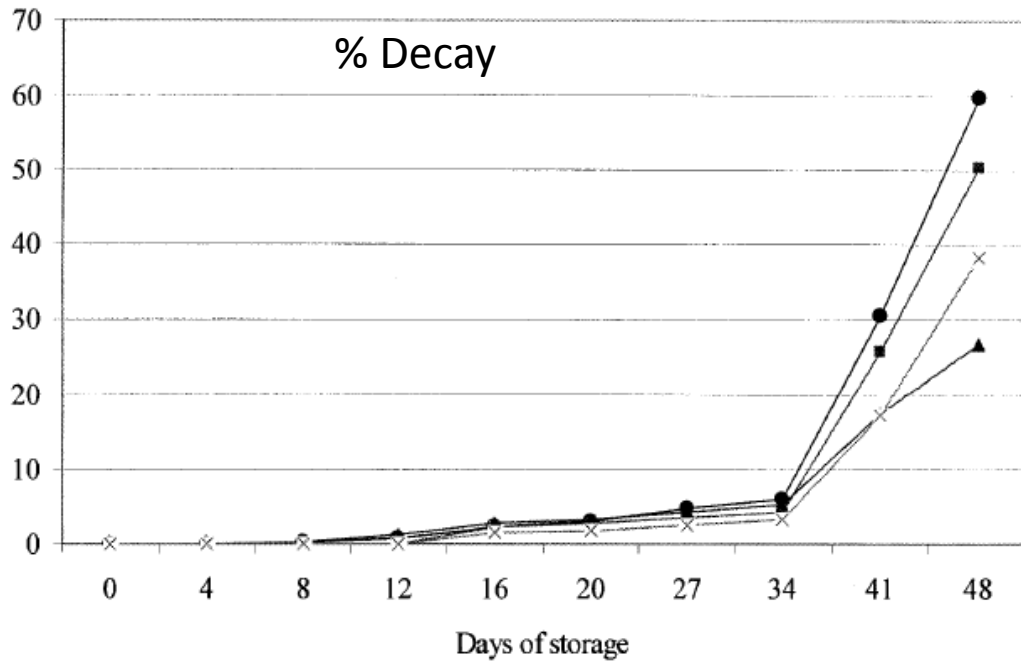


UV-C Radiation



- UV-C radiation on Blueberries (*Vaccinium corymbosum*, cvs. Collins, Bluecrop) prior to storage, can decrease decay caused by ripe rot (*Colletotrichum acutatum*)
- UV-C radiation may enhance antioxidant levels
- Stimulation of antioxidants by UV-C radiation appears to be dependent on cultivar
- Weight loss and firmness was not affected by light treatment.

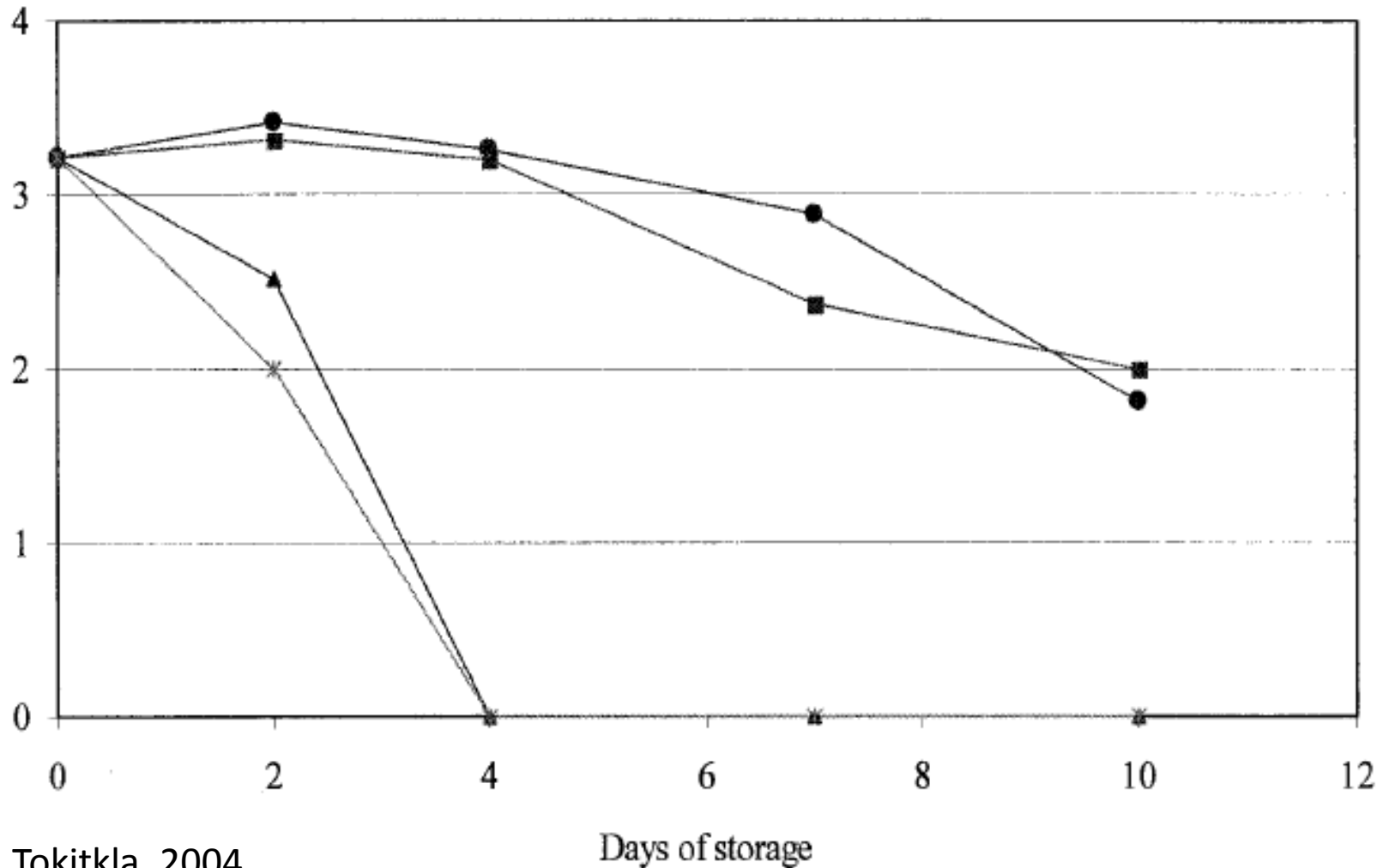
Effect of treatment [control/air (●), 18.8%CO₂ (■), 193 ppm SO₂ (A), and 15.5% ozone (x)] & storage time on decay and redness of 'Tifblue' at 2°C



Risks/Hazards Associated with Blueberries

- Production related hazards
 - *Salmonella* (1 documented outbreak)
 - *Eschericia coli* 0157:H7 or related
- Harvest related hazards
 - Hepatitis A (2 documented outbreaks)
- Post-harvest related hazards
 - *Salmonella*
 - *Listeria monocytogenes*
 - *Others* (Recalls bc of plastic, other contaminants)

Effect of treatment [control (●), CO₂ (■), SO₂ (▲), and O₃ (x)] & storage time on Salmonella (logCFU/g) in 'Tifblue' at 2°C



Tokitkla, 2004

Conclusions

- Quality of BBs depends on market demands and buyer perception (other than Grade)
- Rabbiteyes are just as good or better than other types of blueberries
- Harvest uniform, firm, mature berries (or sort for these) for optimum flavor and Shelf Life (SL)
- Rapid cooling (field preferably) is key to SL
- Controlled atmospheres can double or more SL
- Beware, pathogens can contaminate BBs and affect humans/consumers
- Prevention of pathogen contamination is key, better than control after being contaminated

CONSUMER TASTE TEST

- We would like to have your opinion on a taste test we have conducted as part of our student's thesis and a project on Mississippi/Southern Blueberries.
- Please help Amanda by doing the taste test or thank you if you have already done it.

GRACIAS



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