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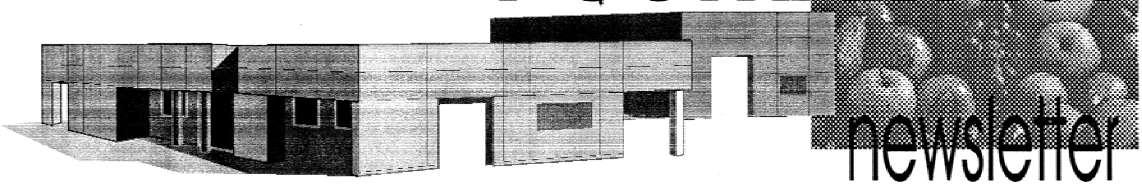
Central Valley POSTHARVEST newsletter



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STRATEGIES FOR POSTHARVEST DECAY MANAGEMENT OF SWEET CHERRIES IN 2003

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Major postharvest decays of sweet cherry in California include brown rot caused by *Monilinia fructicola*, gray mold caused by *Botrytis cinerea*, and Rhizopus rot caused by *Rhizopus stolonifer*. Other decays that infrequently occur include Penicillium decays that mainly develop on senescent fruit and decays caused by *Cladosporium* and *Alternaria* species that primarily are found on fruit with injuries such as rain cracks and spur outgrowths. Postharvest decays are most successfully managed with an integrated strategy that includes preharvest disease management in the field and extends through postharvest handling, packaging, storage, transportation, and marketing until the product reaches the consumer. Postharvest handling practices should focus on maintaining a healthy physiology of the crop by reducing the rate of senescence and on minimizing fruit injuries.

Thus, storage at low temperatures and in modified atmospheres, as well as sanitation of equipment, fruit surfaces, and wash water are important integral parts of postharvest decay control that need to be monitored on a daily basis. Some markets do not allow postharvest fungicide treatments and thus, effective preharvest disease management, sanitation, and temperature management practices are essential in reducing crop losses from decay. Still, especially in years conducive to disease, postharvest decays can occur. Postharvest fungicide treatments are necessary under these conditions and thus, are another component of the integrated strategy to reduce decay. The heightened awareness regarding worker and consumer safety has emphasized the development of safe products such as 'reduced-risk' pesticides as defined by the US-EPA. Biological materials are also registered for use on sweet cherry (e.g. Bio-Save). These treatments, however, generally lack good efficacy and are inconsistent. The following discusses the use of pre- and postharvest fungicides that are available and can provide effective disease management with very low residues on the crop.

Preharvest fungicide applications for postharvest decay management

An important strategy for postharvest decay management is the use of preharvest fungicide applications within two weeks of harvest. Currently, only the DMI fungicides such as Elite 45WP, Orbit 3.6EC, and Indar 75WSP provide some postharvest decay control after postharvest hydrocooling when applied preharvest. Other fungicide classes currently registered for preharvest use have been shown not to perform this way. In Fig. 1, preharvest fungicide applications of Elite 45WP (8 oz/A) applied at a 14 and 7 day preharvest interval (PHI) for brown rot or 7 and 1 day PHI for gray mold provided significant reductions in postharvest decay incidence even after fruit were hydrocooled in chlorinated water for 7 min. For brown rot, both wounded and non-wounded fruit had less than 1% decay (Fig. 1). Gray mold had a much higher incidence because the fungicide is less active on *Botrytis cinerea* than on *Monilinia* spp.

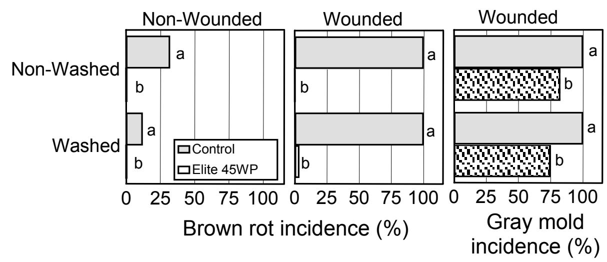


Fig. 1. Efficacy of preharvest applications with Elite 45WP for postharvest decay control of brown rot and gray mold after postharvest washes in a commercial hydrocooler in wound and non-wound inoculation studies.

Postharvest fungicides for decay management

With the long-awaited full registration of Scholar 50WP (fludioxonil) for the 2003 season, growers and packers have reason to be optimistic about the potential for decay-free pack-outs and 'claim-free' market deliveries. In numerous laboratory and packingline tests this new 'reduced risk' fungicide was found to be superior to all previously registered postharvest fungicides. It is a highly effective wound-protection treatment against the major postharvest decays, including brown rot, gray mold, and Rhizopus rot in addition to other decays such as those caused by *Mucor* and *Gilbertella* species. The registration of Scholar, however, is just the beginning of a new era of postharvest treatments. Additional very effective and safe fungicides are on the EPA's waiting list and will be registered in the near future.

The registered application rate for Scholar is 8-16 oz of product in 100 gal of water or diluted (1-5%) commercial fruit coating per 25,000 lb of fruit. The fungicide is stable at pH values between 5 and 9 and at a wide range of temperatures and is compatible with the commonly used fruit coatings for sweet cherry. Residues of 1.5 to 2 ppm should be targeted to obtain excellent decay control and the residue tolerance or maximum residue limit (MRL) is 5 ppm.

The cost for previously and other currently registered postharvest fungicides has been lower than for Scholar because the former fungicides have also been registered for preharvest use. In addition, they have a limited spectrum of activity against the array of decays that may occur on sweet cherry. Scholar has been developed specifically as a postharvest fungicide. Furthermore, no other fungicide has the wide spectrum of activity against the decay fungi on sweet cherry. To reduce costs, applications should only be done on marketable grades of fruit. Furthermore, the use of Scholar will require efficient application systems that prevent run-off. One approach to accomplish these objectives is to use re-circulating, flooder application systems. If fungicide application is done just before packaging or boxing, fruit will be sanitized, clean, and sorted. This will allow for efficient use and keep contamination of the fungicide solution to a minimum. Because Scholar is also stable in diluted chlorine (hypochlorous acid) solutions, chlorine can be added if contamination does occur.

Alternatively, when brown rot is the main postharvest decay concern, application of the more cost-effective Elite instead of Scholar could be considered. Elite has served the industry well over the last four years. Like Scholar, it is also a very effective postharvest fungicide that not only inhibits wound-infections, but also has excellent residual activity against infections that occur after fruit have been treated. Elite is very active against brown rot and it suppresses gray mold and Rhizopus rot at the labeled use rate of 8 oz of product per 25,000 lb of fruit. The residue tolerance for Elite is 4 ppm and, as for Scholar, residues of 1.5 to 2.0 ppm should be obtained for excellent decay control. A comparison of selected characteristics of Scholar and Elite is presented in Table 1. Properly calibrated treatment equipment is essential for good fruit coverage and subsequently is the basis for obtaining effective residues that are within the established tolerances.

Fruit coatings for sweet cherry include vegetable oil, carnauba wax, or derivatives of mineral oil products. These coatings reduce the rate of water loss of fruit (Fig. 2) and stems while allowing gas exchange and respiration to occur. They also can enhance the appearance by adding shine to the fruit and by keeping stems green and succulent during storage and transportation. Any time harvested fruit are exposed to ambient or cold storage with low relative humidity, desiccation may occur and fruit coatings may be necessary. Not all fruit coatings are considered food grade in different international markets. Thus, the proper coating must be selected for the intended market. Application of the fruit coating could be done with the postharvest fungicide as a high-volume system that includes T-jet or flooding systems. Still, some international markets like Japan do not allow postharvest fungicide applications or fruit coatings, whereas most other markets accept these treatments.

Table 1. Comparison of postharvest fungicides registered on sweet cherry in California.

	Fungicide	
Characteristic	**Scholar 50WP**	**Elite 45WP**
Activity against brown rot	Excellent	Excellent
Activity against gray mold	Excellent	Good
Activity against Rhizopus rot	Excellent	Very good
Safety	'Reduced-risk'	Not 'reduced-risk'
Compatibility with fruit coatings*	Excellent	Excellent
Application rate	8-16 oz	8 oz
Residue tolerance	5 ppm	4 ppm
Cost	High	Low

* - Ratings are for vegetable oil- and mineral oil-based fruit coatings.

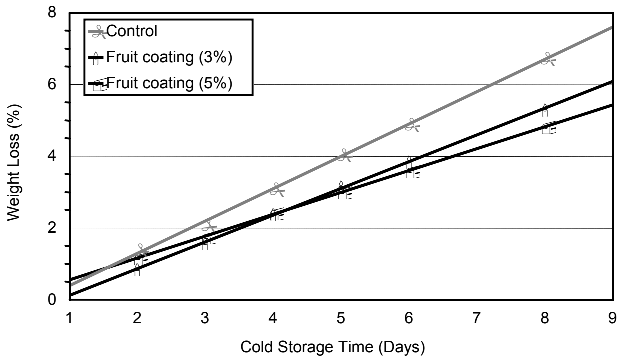


Fig. 2. Effect of a mineral oil-based postharvest fruit coating on weight loss of Bing cherries in cold storage. Fruit were commercially treated and stored for 8 days at 2-4 C.

Resistance management

The risk for resistance development in fungal pathogen populations against fungicides depends in part on the frequency of applications. Thus, fungicides that are registered for both pre- and postharvest use are at higher risk because a selection process potentially can occur. With multiple treatments at bloom, preharvest, and postharvest, 2 to 4 applications of a fungicide could be applied to the same fruit. Having a postharvest fungicide such as Scholar that belongs to a unique class from preharvest registered fungicides reduces the potential for resistance dramatically. The treatment is applied only once to the fruit and, in the case of sweet cherry and other stone fruit crops, all of the treated fruit are shipped without prolonged storage and decay developing in the packinghouse. Thus, if the fungicide Elite is used for both pre- and postharvest decay control, a greater chance for failure of postharvest crop protection exists. With proper fungicide stewardship, fungicides of different classes are used for pre- and postharvest applications to maintain the activity of the treatments. General examples of preharvest rotational practices for growers to use when their contracted packinghouse is using either Elite or Scholar as a postharvest treatment are shown in Table 2.

Table 2. Possible preharvest fungicide rotations based on postharvest fungicide used in the packinghouse for sweet cherry in California.

Program	Preharvest 1	Preharvest 2	Postharvest
1	Elite	Elevate	Elite
2	Orbit	Elevate	Elite
3	Elite/Elevate	Elite/Elevate	Scholar
4	Elevate	Elite	Scholar

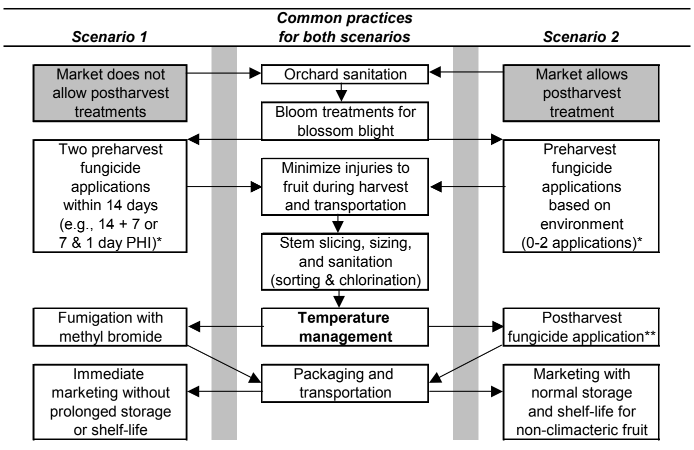
* - Preharvest 1 and 2 refer to fungicide applications prior to harvest (e.g., 14 & 7 day PHI).

The availability of several highly effective postharvest treatments allows the design of resistance management strategies that includes fungicide rotation programs and fungicide mixtures. Additionally, current guidelines recommend the use of labeled rates and using fungicides as postharvest treatments that were not used as preharvest treatments.

Market-dependent, decay management strategies using fungicides

Minimizing postharvest decays in sweet cherry using fungicides is market dependent. Some markets allow the use of postharvest fungicides with pre-determined maximum residue limits (MRLs) or tolerances as described above. Some markets, however, do not allow the use of postharvest fungicide applications to fruit. Thus, strategies have been developed to minimize decay using fungicides for both markets. In Fig. 3, two scenarios are shown for managing postharvest decays using fungicides for markets that allow (right side of diagram) and do not allow (left side of diagram) postharvest fungicide application. Common practices for both scenarios are shown in the middle portion of the diagram. For markets that do not allow postharvest fungicides, key strategies include two preharvest fungicide applications with a DMI fungicide (e.g., Elite 45WP, Orbit 3.6 EC, and other demethylation inhibiting fungicides) as shown in Fig. 1 regardless of environmental conditions and immediate marketing without prolonged storage or display time at markets (i.e., shelf-life). Domestic and most international markets including Japan allow preharvest fungicide usage and have established MRLs or tolerances for many preharvest fungicides registered in the United States including the ones just described. For markets that do allow postharvest fungicides, the number of preharvest applications is based on environmental conditions prior to harvest (Fig. 3). Both scenarios integrate orchard sanitation, fungicide bloom applications, and fruit handling procedures that minimize wounds, as well as sanitation and temperature management practices.

Fig. 3. Minimizing postharvest decay in sweet cherry production based on market requirements



* - Preharvest fungicides allowed in most markets include Elite 45WP, Orbit 3.6EC, or other demethylation-inhibiting (DMI) fungicides.
** - Postharvest fungicides registered in the United State include Elite 45WP and Scholar 50WP.

CONSUMER ACCEPTANCE OF 'BROOKS' AND 'BING' CHERRIES IS MAINLY DEPENDENT ON FRUIT SSC AND VISUAL SKIN COLOR

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During two seasons, 'in-store' consumer acceptance tests were performed to determine the relationship between soluble solids concentration (SSC), titratable acidity (TA) and visual skin color on 'Brooks' and 'Bing' cherry consumer acceptance. For this, approximately 600 consumers were presented cherry samples at targeted skin colors with SSC in the range of ca. 13.0-20.0% and TA in the range of ca. 0.50-1.00%. For each cherry sample, one half of the whole cherry was tasted and the other half was used to determine SSC and TA. TA > 0.60% reduced consumer acceptance on 'Brooks' cherries with <16.0% SSC compared to cherries with ≤0.60% TA, while in 'Bing' the same situation only occurred on cherries with <13.0% SSC. High consumer acceptance was determined on 'Brooks' and 'Bing' cherries when SSC were > 16.0% without regard to TA. For both cultivars, the highest percentage of American consumers would buy cherries based on dark skin color without regard to ethnic group (Caucasian, Asian American, Hispanic, or Black) or gender. However, consumer age was related to making the "buy" or "not to buy" decision based on cherry skin color. Consumers under 18 years old were less biased to buy cherries based on visual skin color. Thus, this work demonstrated that for 'Brooks' and 'Bing' cherries, a full bright red or dark mahogany skin color should be reached, respectively, in addition to a minimum SSC of 16.0% to satisfy the majority of American consumers.

EVALUATION OF DIFFERENT BOX LINERS FOR THE CALIFORNIA 'BING' CHERRY INDUSTRY

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Market life potential of 'Bing' cherries packed with different modified atmosphere packaging (MAP) box liners was compared with solid (commercial) and perforated box liners after

15, 30 and 45 days of storage at 34°F followed by a four-day simulated shelf life period at 68°F. Three high CO_2/O_2 ratios were reached with the use of MAP box liners such as LifeSpan (8% CO_2/5% O_2), Fresh Fruit Cherry Bag 011 (10% CO_2/5% O_2) and Fresh Fruit Cherry Bag 012 (8% CO_2/10% O_2) than with the solid (4% CO_2/16% O_2) or perforated box liner (0% CO_2/20% O_2). Ethylene levels within the box were very low (approximately 150 ppb) during all the storage period. The incidence of decay was significantly lower with any of the MAP box liners, even the solid box liner, compared with fruit packed in perforated box liners at any evaluation time. In a short-term shipment (within 15 days), cherries packed in the Fresh Fruit Cherry Bag 011 had the lowest decay (4.9%), followed by cherries packed using the solid (10.8%) and LifeSpan (7.5%) box liners. However, the use of the solid box liner protected cherries from stem browning, skin color darkness, and firmness losses as well as any of the MAP treatments. In a long-term shipment, the use of solid box liners did not protect cherries from decay development and other deterioration factors as well as any of the MAP treatments. MAP delayed 'Bing' cherry deterioration such as decay, stem browning, skin color darkness, firmness losses and TA degradation. Most of these beneficial effects were also carried over during the warming period at 68°F that simulated shelf life.

Introduction

Extending storage/overseas shipping life and assuring good arrival is an essential requirement for the California cherry industry. This will allow our industry to access long distance markets with high quality fruit and low transportation costs. In addition to good temperature management practices, new technology is needed to maintain green stems, and to avoid skin color darkness and decay. The use of controlled atmosphere (CA) technology during storage and shipment is being used successfully by the cherry industry. High (20-25%) CO_2 and ambient O_2 in combination with 32ºF storage was developed by Patterson and Melstad (1977) for 'Bing' cherries. Recently, a combination of (3-10%) O_2 with (10-12%) CO_2 has been recommended by Kader (1997). He also suggested a critical value of less than 1% for O_2 to avoid 'Bing' skin pitting and "off flavor". CO_2 equal to or higher than 30% has been related with brown skin discoloration and "off flavor" (Zoffoli et al., 1988). Modified atmosphere packaging (MAP) is an alternative technology for CA storage/shipment where the final O_2 and CO_2 concentrations are generated by the use of equipment. In a MAP system, the new atmosphere is attained by the respiration of the fruit, box liner permeability, and fruit temperature. At a given temperature, the two gases reach steady concentrations (plateau) when the rate of gas permeation through the package film equals the rate of respiration. The beneficial effect of high CO_2 while maintaining a high level of O_2 (3-10%) to avoid injury is the target for MAP on cherries. 'Bing' cherries packed using Xtend MAP film stored well up to two months at 32°F but quality rapidly deteriorated during the third month of storage (Lurie and Aharoni, 1997). Previous work with Chilean 'Bing' cherries showed that there were no significant differences in cherry market life by using Viewfresh, Freshold, Fresh Fruit Cherry Bag 011 (FF 011) and Fresh Fruit Cherry Bag 012 (FF 012) box liners (Zoffoli et al, 1988). Also, during that work, it was clear that MAP box liner benefits could be obtained by using a manual hermetic sealing system.

The commercial use of MAP on cherry has been developed rapidly in the Pacific Northwest (USA) to deliver high quality cherries to long distance markets such as Hong Kong and Taiwan. In the last few years different box liners have become available to the cherry industry; however, to our knowledge few evaluations have been done comparing them in similar conditions. In our California industry the use of solid box liners is becoming fashionable to keep green stems. In some cases, MAP box liners are being used upon customer demand.

The objectives of this research were to evaluate the effectiveness of MAP box liners on cherry storage/shipping potential, and to evaluate the solid box liner performance.

Materials and Methods

'Bing' cherries were packed in 17.6 pound corrugated cartons using different box liners. In this test, solid and perforated box liners were compared with three alternative MAP box liners (LifeSpan, FF 011, and FF 012). The three MAP box liners were hermetically sealed by hand. After packaging and cooling, boxes were transported in an non-refrigerated truck to the F. Gordon Mitchell Postharvest Laboratory at the Kearney Agricultural Center. Cherries were stored for 45 days at 34°F for quality evaluations. Quality evaluations were carried out every 15 days within the 45 day period immediately after storage and followed by 4 days at 68°F.

Quality Evaluations: Quality attributes measured included soluble solids concentration (SSC), firmness (F), titratable acidity (TA), pH, skin color, and decay incidence. SSC, pH, and TA were measured on juice extracted with a food press and filtered through cheesecloth. SSC was measured with a temperature compensated handheld refractometer previously calibrated with distilled water. TA was measured by adding 5 g of sample juice to 50 mL of distilled water and titrating with 0.1 N sodium hydroxide (NaOH) to an end point of pH 8.2. TA is expressed as percent of malic acid, which is the predominant acid in this species. Average color was evaluated according to the *Commission Internationale de l'Eclairage* (CIE), with a Minolta colorimeter (Minolta, CR-200, Japan). Cherry skin color is expressed as hue angle (h^o). The hue angle is expressed in degrees and is a measure of color that, for example, from 0^o to 90^o spans from red (dark mahogany) to orange to yellow. Darkening of cherries is an expression of fruit deterioration. Firmness was measured using a U.C. firmness tester with a 3 mm tip. Skin from opposite cheeks of each fruit was removed and firmness calculated as the average of two measurements per fruit expressed as grams.

Stem browning, pitting, and decay incidence were also evaluated after 15, 30 and 45 days storage at 34°F followed by a 4 day warming period at 68°F. A total of 30 cherries was used to characterize individual fruit firmness and stem browning. Stem browning incidence was expressed as a percentage of stems showing visible browning. Cherries were segregated as pitted when pitting damaged areas were $\geq$ 7 mm diameter. After the four days warming at 68°F, 15 pounds of fruit per replication were used to determine the decay incidence expressed as percent by weight.

A completely randomized design with ten (boxes) replicates was used to evaluate quality attributes. Thus, ten boxes per each replicate were examined on each evaluation date. Data were subjected to analysis of variance and correlation analysis. Means were separated using LSD means separation at the 5% or 1% level using the SAS statistical software (SAS Institute, Cary, NC).

Results

The LifeSpan, FF 012, and FF 011 altered the CO_2 and O_2 concentrations around the fruit inside the boxes. The O_2 concentration inside the FF 012 box liner was 15.0%, 9.6% and 8.6% after 15, 30 and 45 days of storage, respectively (Fig. 1). By 15 days of cold storage, the highest CO_2 concentration was obtained on cherries packed using the LifeSpan and FF 011 box liners. The CO_2 concentration increased to 8-10% by the first 15 days reaching a plateau for the rest of the storage period. The oxygen concentration (3-5%) was also similar on cherries packed in these two types of box liners. Cherries packed using the

FF 012 reached a CO_2 concentration similar to the other two MAP box liners but after 30 days storage. CO_2 concentration inside the solid box liner increased to 3.5% by 15 days of storage, reaching a plateau of 4% CO_2 until the end of 45 days of storage. During this 45 day storage period, O_2 concentrations inside this solid box liner varied from 21% to 15%. CO_2 and O_2 concentrations inside boxes packed using the perforated box liners were not modified during this 45 days cold storage.

Decay was not observed immediately after 30 days of cold storage; however, after 45 days of cold storage decay became visible immediately upon removal. By 45 days of cold storage, cherries packed using the FF 011, FF 012 and LifeSpan had 0.2%, 1.1% and 1.5% decay while cherries packed with the solid box liner had 7.7% and in the perforated box liners had 20.6%. By 15 days of cold storage followed by 4 days at 68°F, decay incidence of 4.9%, 7.5%, 10.8%, 11.3%, and 29.4% was detected in cherries packed using the FF 011, LifeSpan, solid box liner, FF 012, and perforated box liner, respectively. By 30 days of cold storage followed by 4 days at 68°F, decay incidence of 23.5%, 25.3%, 25.8%, 31.1%, and 40.4% was detected in cherries packed using the FF 011, FF 012, LifeSpan, solid and perforated box liners, respectively. By 45 days of cold storage followed by 4 days at 68°F, decay incidence of 22.6%, 27.5%, 28.7%, 28.6%, and 40.1% was detected in cherries packed using the FF 011, LifeSpan, FF 012, solid and perforated box liners, respectively (Fig. 2A). In all of the evaluations after the display period, decay incidence was significantly lower in the fruit packed with MAP than fruit packed with solid or perforated box liners.

MAP effectiveness on decay control was related to the concentration of CO_2 and O_2 reaching the steady state (plateau). LifeSpan and FF 011 box liners attained the highest CO_2 and the lowest O_2 concentrations. The CO_2/O_2 relationship for LifeSpan was 8%/5% and 10%/5% in the case of FF 011 box liners.

Stem Browning: Stem condition was not affected after 45 days of cold storage. However, stem quality losses began to be observed after 30 days cold storage during the warming period at 68°F. Cherry stem browning development after cold storage and the 68°F warming period was significantly delayed with all of the MAP box liners although there were no significant differences in stem browning condition between the three MAP treatments. The high CO_2 and low O_2 attained by the MAP box liners did not influence stem browning within this 45 day period followed by 4 days at 68ºF. By 30 days followed by 4 days at 68ºF, the severity of stem browning was 45% for fruit packed in solid and perforated box liners and only 30% for the fruit stored with MAP box liners. By 45 days followed by 4 days at 68ºF, the severity of stem browning was 66% for the fruit packed in solid and perforated box liners and only 40% for the fruit stored with MAP box liners (Fig. 2B).

Cherry firmness decreased from 238 g to approximately 193 g by 45 days of cold storage. During the 45 day storage period, fruit packed using the FF 012 had the highest firmness value (approximately 223 g). By 45 days of cold storage, cherries packed using the FF 011 or FF 012 had the highest firmness. The firmness of fruit packed with these box liners was 210 g and 223 g respectively compared with 190 g for fruit packed in perforated or solid box liners.

Cherry pitting was visible early during cold storage in all of the treatments. Pitting incidence was very high in all of the treatments. However, its development was delayed by the MAP treatments. After 30 days pitting incidence was the same in all of the treatments.

Mahogany color 'Bing' cherries packed using the solid and perforated box liners darkened faster than mahogany color 'Bing' cherries packed using any of the MAP box liners. Hue measurements of 'Bing' cherries stored in solid box liners increased from 32° at harvest to 50°

during the 45 day storage period, while cherries packed in any of the three MAP treatments ended with a hue of 45° after the 45 day cold storage. Cherries packed in the perforated box liner treatment had the darkest mahogany fruit color with a 53° hue value.

'Bing' cherry titratable acidity (TA) was lost during storage at 34°F. By 45 days of cold storage, TA decreased from 0.97% at harvest to 0.67% in cherries packed in the perforated box liner. Cherries packed in the solid box liner had 0.63% while cherries packed in any of the MAP box liners ended with 0.70% after 45 days cold storage (Fig. 3).

Conclusions

The use of solid and perforated box liners did not protect cherries from deterioration as well as the MAP box liners. Cherries packed in perforated box liners had the fastest deterioration rate, thus, the shortest market life.

In a short-term shipment (within 15 days cold storage), cherries packed in the FF 011 had the lowest decay (4.9%), followed by cherries packed using the solid (10.8%) and LifeSpan (7.5%) box liners. However, the use of the solid box liner protected cherries from stem browning, skin color darkness, and firmness losses as well as any of the MAP treatments.

In a long-term shipment (longer than 15 days cold storage), the use of solid box liners did not protect cherries from decay development and other deterioration factors as well as any of the MAP treatments. MAP treatments delayed causes of 'Bing' cherry deterioration such as decay, stem browning, skin color darkness, firmness losses and TA degradation during storage (simulated shipment). Most of these beneficial effects were also carried over during the warming period at 68°F (simulated shelf life).

Market life extension was accomplished best using either FF 011 or LifeSpan box liners. Skin color darkening and stem browning were equally reduced by any of the three MAP treatments (LifeSpan, FF 011 or FF 012). FF 011 and LifeSpan reduced decay during cold storage and the effectiveness remained during shelf life. There were no differences in quality protection between these two MAP box liners.

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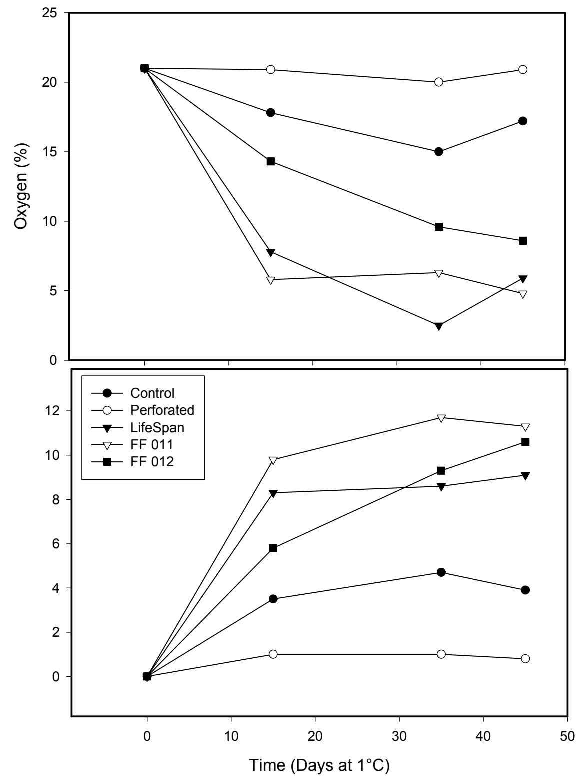

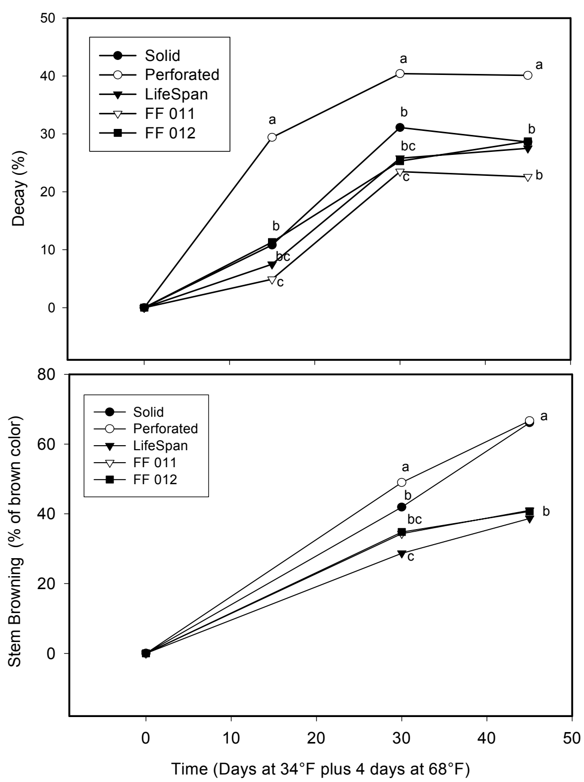

Fig. 2. Decay and stem browning of 'Bing' cherries packed with different box liners stored for 45 days at 34°F plus 4 days at 68°F.

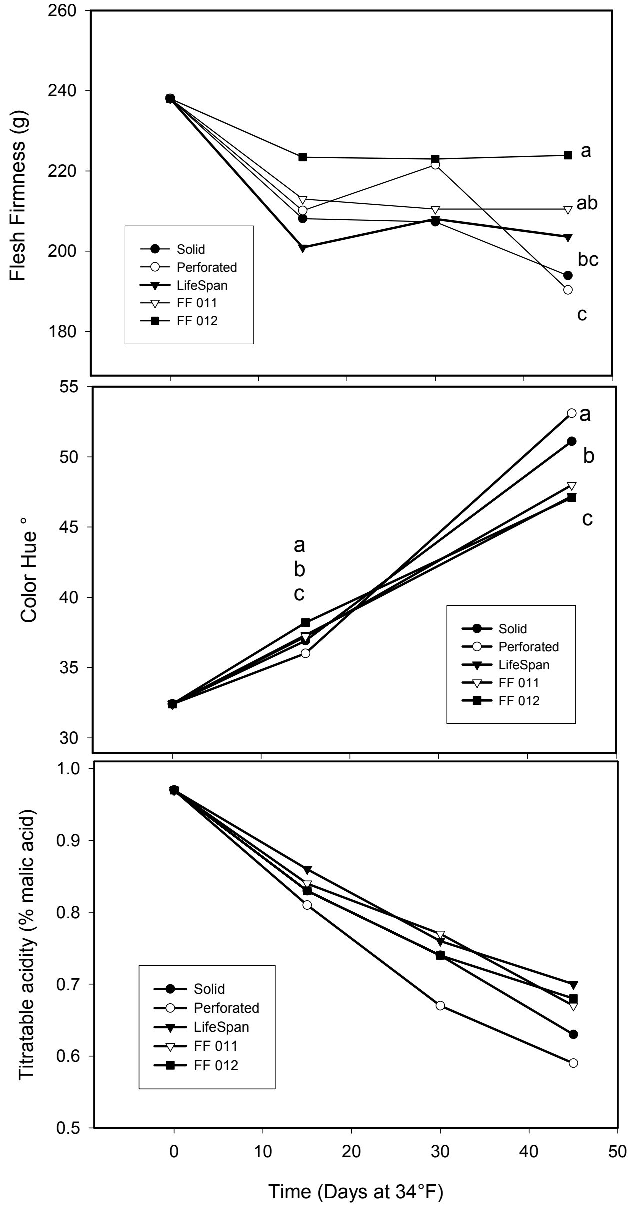

Fig. 3. Firmness, color and titratable acidity of 'Bing' cherries packed with different box liners and stored for 45 days at 34°F.

TESTING THE RELIABILITY OF SKIN COLOR AS AN INDICATOR OF QUALITY FOR EARLY SEASON 'BROOKS' (*PRUNUS AVIUM* L.) CHERRY

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Indian River Research and Education Center,
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During the 1997-1999 seasons, we investigated the relationship between 'Brooks' cherry skin color at harvest (full light red, 50% bright red, full bright red and full dark red) and consumer acceptance using fruit grown in different geographic locations in the San Joaquin Valley (SJV). Soluble solids concentration (SSC) increased, but titratable acidity (TA) levels did not decrease as cherries matured from the full light red to full dark red skin color. The perception of sweetness, sourness and cherry flavor intensity by a trained taste panel was highly correlated to skin color, SSC and SSC:TA at harvest. There were no differences in the level of correlation between SSC or SSC:TA and the perception of sweetness, sourness or cherry flavor by trained judges. In-store consumer tests indicated that 'Brooks' cherries with SSC $\geq$ 16.1% had the highest consumer acceptance (ca. 80-90%) and cherries with SSC $\leq$16.0%, the lowest (ca. 48%). Gender and ethnicity (Caucasian, Asian American, Hispanic, or African American) did not affect American consumer acceptance of 'Brooks' cherries.

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