HIGH TEMPERATURE FORCED AIR/CONTROLLED ATMOSPHERE TREATMENT FOR STONE FRUIT

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Forced hot air treatment given in a controlled atmosphere of low oxygen and high carbon dioxide has been shown to be an effective quarantine treatment against codling moth (CM) in apples and pears. The objective of this work was to develop a forced hot air/controlled atmosphere treatment for peaches and nectarines that would achieve quarantine security against CM and oriental fruit moth (OFM) and would maintain excellent fruit quality.

Methods

From previous work by Lisa Neven (ARS, Wapato, WA) it had been determined that 100% mortality of CM was obtained by treatments of 44°C (final temp., heating rate of 12°C/h) for 4 hours or by a higher temperature of 46°C (final temp., heating rate of 12°C/h) for 3 hours. All treatments utilized a controlled atmosphere of 1% O2 and 15% CO2. Since OFM is less thermally tolerant than CM any treatment that would kill CM would be effective against OFM. Even though these treatments had been evaluated using apples and pears it was believed that peaches and nectarines would be heated in a similar manner. Based upon this previous work a series of treatments were designed to determine if stone fruit would be able to withstand these treatments. The treatments were as follows:

Final Temperature	Duration (hours)	Controlled Atmosphere
44°C	2,3,4	+ and -
46°C	1,2,3	+ and -

Following treatment the fruit were stored for 3 to 4 weeks at 0°C, ripened for 2 to 3 days and evaluated for quality. The quality ratings included surface injury, juiciness, internal browning, firmness, soluble solids and titratable acidity.

Stone fruit cultivars to evaluate were selected to give a range of fruit types:

Peaches			Nectarines		
Cultivar	**Season**	**Type**	**Cultivar**	**Season**	**Type**
Elegant Lady	mid	yellow	Summer Fire	mid	yellow
Summer Sweet	mid	white	Fire Pearl	mid	white
Country Sweet	mid	subacid yellow	Fire Sweet	mid	subacid yellow
Ryan Sun	late	yellow			
September Snow	late	white			

Results

Surface injury or blemishes generally were slight and were not significantly enhanced by heat treatment. The exceptions were some combination heat/controlled atmosphere treatments at durations of 3 hours or more at 44 ºC or 2 hours or greater at 46 ºC where increased injury was detectable. Only in the case of Ryan Sun and Fire Sweet, however, was the level of injury increased above "slight", the limit above which fruit were considered to be non-marketable. Since the increases in injury were generally slight it is likely that adjustments, such as decreasing the level of carbon dioxide, can be made to the more injurious treatments so that susceptible cultivars can be treated without increased surface injury.

Percent juice was influenced by heat treatment but was not altered by controlled atmosphere treatment. The most common effect was an increase in the juiciness of the fruit if the heat treatment was of a sufficient duration. Interestingly, as in the case of Elegant Lady, it was observed that heat could initially cause a loss of juiciness that was not apparent if the treatment was continued for a longer duration. September Snow treated at 44 ºC was the only situation in which there was observed a loss of fruit juiciness following an extended heat treatment. It appears that as long as sufficient heat is given that mealiness may not be a problem in the heat treatment of peaches and nectarines.

There were no heat-induced alterations in the rest of the characteristics evaluated that would have been noticeable to a consumer. Browning was not a significant feature in any of the cultivars, treated or untreated. Prior studies have reported a slowing of softening due to heat treatment, however, in this study fruit were ripened to a greater degree due to the need to have uniformly soft fruit with which to run the percent juice tests, thus masking any effect of heat on the softening process. No trends were noted regarding either soluble solids or acidity and the treatments applied.

Conclusions

Initial results look very promising for the development of an acceptable treatment. Currently, in-fruit infestation tests to confirm efficacy are underway as is a second year of fruit quality evaluations.