FRUIT QUALITY ISSUES ASSOCIATED WITH DEVELOPMENT OF A COMMERCIAL CATTS TREATMENT

[1]David Obenland* and [2]Lisa Neven
[1]USDA-ARS, San Joaquin Valley Agricultural Sciences Center, Parlier, CA
[2]USDA-ARS, Yakima Agricultural Research Laboratory, Wapato, WA

Forced hot air in combination with controlled atmospheres (CATTS) can effectively provide quarantine control of codling moth and oriental fruit moth (Neven et al., 2006). A considerable amount of research over the past years has been conducted to determine whether this treatment could be used for quarantine treatment of peaches and nectarines, with the major goal being to determine if fruit quality is negatively affected as a result of treatment. Results have shown that although certain aspects of stone fruit metabolism, such as ripening rate, are altered fruit quality is generally maintained following CATTS treatment (Obenland et. al., 2005). During the course of the research certain issues regarding CATTS and stone fruit quality have been recognized that will be important to a successful commercial implementation of this treatment. These issues will be described in detail.

Commercially-harvested and packed fruit was used for much of the fruit quality work that was conducted, with the aim being to treat fruit with CATTS that had been handled and treated in a manner consistent with how the fruit would be if the treatment were implemented by the stone fruit industry. Occasionally, batches of fruit were obtained with some degree of surface injury, typically consisting of small brownish lesions. It was found that CATTS treatment caused this type of injury to worsen, sometimes causing the fruit to become non-marketable following a period of storage. The lesson learned was that fruit undergoing this treatment need to be of the highest quality and relatively free of preexisting surface injury.

Decay rate is another fruit quality factor that can potentially be influenced by CATTS treatment. On the positive side it was found that *Monilinia fructicola* (brown rot) is very heat sensitive and is completely controlled by treatment. However, other decay organisms, such as *Alternaria alternata* and *Geotrichum candidum* (sour rot), are not killed by CATTS and remain capable of causing decay following treatment. Decay rates have occasionally been found to be higher in CATTS-treated fruit, most often in fruit with high baseline (control) decay rates. CATTS may be again be acting to enhance a preexisting problem, such as surface wounding. Another potential contributor is that CATTS fruit require longer to ripen than do non-treated fruit, potentially allowing more time and opportunity for decay to occur. Sanitation to reduce microbial load and effective fungicide

treatment during the packing process, as well as good initial surface quality, will be factors that influence the success of a CATTS treatment.

Ripening is strongly inhibited by CATTS treatment as evidenced by slower softening and lower ethylene evolution rates. This may be beneficial in some circumstances in that fruit that soften slowly have the potential to be stored and/or marketed for longer periods. However, since many aspects of flavor development are also dependent upon ripening it is important to ensure that the slowdown in ripening that occurs due to CATTS does not adversely alter flavor. Prior taste panel work conducted with TreeTop (Selah, WA) indicated that panelists were able to differentiate between the flavor of treated and non-treated fruit but that the described differences were relatively small and likely would be imperceptible to the average consumer. Commercially-harvested fruit may vary somewhat in stage of maturity and degree of ripeness following harvest given that color, the currently-used harvest indicator, is a fairly imprecise measure of maturity. Maturity stage at the time of treatment may be an important consideration in ensuring that flavor quality following CATTS treatment is not negatively affected. This consideration has not been fully evaluated to this point.

Packing and shipping stone fruit in California is a high-throughput operation and it is essential that any quarantine treatment be able to fit into the normal operating practices of the industry for it to be economical. The most advantageous treatment format for the California industry would be one in which fruit are treated within shipping boxes stacked onto a pallet. This format presents difficulties as the stacked boxes offer considerable barriers to airflow and heat transfer into the fruit. Initial attempts at large scale treatments found the heating to be uneven, treatment times excessively long and there to be a resulting loss in fruit quality. Uneven heating may be especially problematic in stone fruit as suboptimal heating has been observed to enhance the development of flesh mealiness in some circumstances. Work is currently underway to develop a large-scale chamber specifically designed for the treatment of boxed fruit that will resolve these problems.

References

Obenland, D. M., P.N. Neipp, B. Mackey, and L. Neven. 2005. Peach and nectarine quality following treatment with high-temperature forced air combined with controlled atmosphere. HortScience 40(5):1425-1430.

Neven, L.G., L. Rehfield-Ray and D. Obenland. 2006. Confirmation and efficacy tests against codling moth and oriental fruit moth in peaches and nectarines using combination heat and controlled atmosphere treatments. J. Econ. Entomol. (In Press).