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FUNGI ISOLATED FROM AVOCADOS WITH STEM-END ROT AFTER "SNAP" OR "CLIP" HARVEST

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In 1998, Arpaia and Hofshi reported that among avocados from San Diego County, California, the incidence of stem-end rot (SER) after storage and ripening among "snap" harvested avocados was 15.0% while that among "clip" harvested avocados was 38.3%. Other workers reported SER incidence was reduced when avocados were "snap" harvested (Johnson and Kotze, 1994).

In 1999, we isolated fungi from 247 avocados with SER, primarily 'Hass', from ripe avocados that had been harvested by the "snap" or "clip" methods from eight groves in southern California in collaboration with M. L. Arpaia and J. R. Sievert. SER lesion size in avocados was classified as 1 (minor), 2 (moderate), or 3 (severe). SER lesions were smaller on "snap" harvested avocados than "clip" harvested fruit. Fungi responsible for SER differed between "clip" and "snap" harvested fruit. *Phomopsis, Dothiorella,* and *Alternaria* spp. were isolated from 30, 41, and 10%, respectively, of the "clip" harvested avocados (n = 116) with SER. *Phomopsis, Dothiorella,* and *Alternaria* spp. were isolated from 10, 12, and 27%, respectively, of the "snap" harvested avocados (n = 131). Aggressive pathogens, capable of making large SER lesions, were isolated from 71% of the "clip" harvested fruit with SER, while they were isolated from only 22% of the "snap" harvested fruit. Most SER lesions on "snap" harvested fruit contained weakly parasitic fungi and saprophytes that do not make large SER lesions.

We propose the reason the distribution of fungi isolated and SER severity differs between "clip" and "snap" harvest is that a large proportion of the aggressive pathogens, such as *Dothiorella* and *Phomopsis*, were eliminated from the fruit that were snapped from the tree during harvest. These fungi are associated with colonization of woody twigs where they can occur as endophytes in stem tissue (Johnson and Kotze, 1994), that are spread by splashing water and not as air-borne spores. They remained associated with the stem left attached to the tree when the avocados are "snap" harvested, while they remained with the fruit when the avocados were "clip" harvested. Although the inoculum of the aggressive pathogens is greatly reduced by "snap" harvest, the relatively unprotected avocado flesh (mesocarp) exposed when fruit are harvested in this fashion is vulnerable to colonization by air-borne spores of weakly parasitic and saprophytic fungi. The limited colonization of the flesh of the stem-end by these fungi causes minor, but still objectionable, SER symptoms. We noted particularly *Alternaria* spp., although only capable of colonizing 2 to 3 mm into soft, ripe avocado flesh, caused vascular bundles throughout the fruit to darken objectionably.

This preliminary work supports the use of "snap" harvest to manage postharvest SER, as was similarly reported by other workers (Johnson and Kotze, 1994). However, a negative

consequence of “snap” harvest they reported was that it delayed ripening, and the delayed ripening was associated with increased postharvest side rot losses by *Colletotrichum*. In a preliminary report, however, California “snap” harvested fruit ripened at the same rate as “clip” harvested fruit (Arpaia and Hofshi, 1998); presumably, side rot incidence in California would not be influenced by harvest method.

This work also shows which fungi are associated with SER under these two harvest methods; this information impacts the disease control methods employed to reduce SER. For example, for “clip” harvested fruit, fungicides or other techniques employed for preharvest or postharvest management of SER should focus on *Phomopsis* and *Dothiorella* control, while on “snap” harvested fruit, control of other fungi, such as *Alternaria,* becomes important. Methods to protect fruit from air-borne spores are presumably very important for “snap” harvested fruit, because the fruit flesh is exposed and vulnerable to attack by air-borne spores of even weak pathogens and saprophytes. The woody stem of “clip” harvested fruit resists postharvest infections from air-borne spores and may not require rigorous protection from contamination, although the stem itself often harbors quiescent SER infections of the very aggressive *Phomopsis* and *Dothiorella* fungi.

References

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