

## **POLLINATION, POLLINATORS AND POLLINIZERS**

**Reuben Hofshi**

Del Rey Avocado, Fallbrook, CA

The viability of many avocado enterprises in California is constrained by low production and the high cost of land, water and labor. With increasing international competition and a likely decrease in prices, the viability of the California industry could be sustained by a significant increase in production.

Avocados are grown in the coastal foothills of Southern California under marginal conditions. The dominant variety 'Hass' is drought sensitive and does not easily tolerate hot and dry weather. 'Hass' leaves readily tip burn when even mildly saline irrigation water is used, especially when grafted to the common clonal rootstocks or Mexican seedlings. Tip burn becomes severe during our hot and windy autumn and when the trees are water-stressed. Tip burn reduces the photosynthetic capacity of the individual leaf and reduces the efficiency of the entire canopy as a result of early leaf drop of the salt damaged leaves. 'Hass' has a tendency to bloom early under normal conditions when day and night temperatures are low and are not optimal for fruit set. It tends to alternate bear with wide swings in productivity. Fruit size, especially of older trees, is considered to be small. The average industry 'Hass' production seldom exceeds 6,000 pounds per acre (about 6,800 Kg per hectare). This average is much lower than the tree potential when grown under optimal conditions and management. Given these drawbacks, and since 'Hass' remains the variety of choice, a grower needs to use all the tools available to improve productivity of the orchard. Effective pollination is one important step on the road to high and consistent production. Cross-pollination is an added insurance, which under conditions of stress gives rise to a better chance of fruit set and fruit retention. Successful pollination and fruit set are dependent on well-lit, healthy trees with strong but not explosive bloom, favorable weather, the availability of ample pollinator insects, and sufficient number of pollinizer trees which bloom in synchrony with the 'Hass' bloom. Trees, which have been under stress, such as drought or root rot, overbloom, defoliate, and produce little commercial crop.

Avocado flowers, particularly in semi arid conditions, require pollinator insects to deposit pollen grains from a male flower on to the receptive stigma of a female flower. Certain minimal thresholds of the number of pollen grains need to be achieved to increase the potential for fertilization and fruit set. Although there are diverse insects in our environment that visit the avocado flowers, additional pollinator insects are needed. Honey bees are the only insects that are commercially available. Honey bees are brought to avocado groves, traditionally free of charge, during mid March to early April after almond pollination. Almond pollination is a necessary source of income to the struggling beekeeping industry. These colonies' strength is dependent on their strength prior to being sent to the almond fields, on sufficient forage other than almond bloom and the weather conditions during almond bloom. The honey bees are not always at optimal strength when they arrive at the avocado orchard. Strong hives are commonly split by the beekeeper during their stay in the avocado orchard. Often, not enough colonies are brought to a location to efficiently visit both the avocado flowers and other attractive bloom in the area. Beekeepers use trucks, pallets and forklifts to distribute the colonies and tend to congregate the hives in easily accessible loca-

tions, and seldom place them strategically particularly if they are not compensated for the service. During warm winters, bloom tends to be advanced and pollination and fruit set opportunities may be missed due to lack of honey bees, which have been moved to almond orchards in early February. In some years bloom is delayed and the beekeeper needs to move on, to other pollination services and to locations that provide better forage for the honey bees.

These comments are made to advise the serious grower that the common arrangement with beekeepers as mentioned above is not optimal and could affect the level of production at least in some years. Growers, who would like to minimize the risk of pollination as a limiting factor to productivity, may wish to contract with a beekeeper for sound placement of sufficient number of colonies, up to 4 colonies per acre in some years, for the entire duration of the bloom season.

Successful pollination results from either self-pollination, within the same cultivar, or from cross-pollination which is the product of the deposition of pollen grain of one cultivar onto the stigma of another, such as 'Bacon' pollen pollinating the 'Hass' female flower. Research has shown that the fruit surviving to harvest are the ones, which are the product of cross-pollination. This is not to say that self-pollination does not produce fruit but that nature has preference for the hybrid over the self-progenies. It is likely that under optimal growing conditions the "competition" for survival between self and cross-pollinated fruit may be negligible. It is under stressful conditions, which is common in our environment, where having a good portion of fruit set result from cross-pollination will pay off. The makeup of the pollinizer varieties planted to provide pollen, their spatial placement within the grove, and the number of trees required to provide adequate pollen are issues the grower needs to consider. It is the author's view and experience that by providing diverse varieties of pollinizers, such as 'Bacon', 'Zutano' and 'Ettinger', for example, planted throughout the grove, preferably in combination of all 3 together, will better overlap the 'Hass' bloom than a single pollinizer variety planted in a row. It has been observed that the 'Bacon' variety bloom, often used as pollinizer, in some years does not synchronize with the 'Hass' bloom.

To summarize, healthy, well-lit trees with pollinizers interplanted among them and plenty of honey bees, well placed throughout the orchard during the entire flowering season, will provide the background for increased production.