

CONSIDERATIONS IN MANAGING POLLINATION OF THE AVOCADO

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While some flowering plant species can achieve adequate pollination by means of wind or water, or are able to reproduce in the absence of pollen vectors entirely, most depend upon animals for efficient transfer of pollen between flowers and subsequent setting of fruit. Indeed, the employment of insects for this purpose and the consequent selective pressures exerted on plants to produce flowers appealing to any of a variety of foragers has been largely responsible for the immense diversity of floral designs generated over the past millions of years. Avocado figures among the multitude of species whose flowers are adapted to insect pollination and whose fruit production is limited by access to pollinators.

In an ideal world, avocado groves would automatically be brimming with foragers hungrily seeking rewards from avocado flowers, and carrying out saturating levels of pollination in the process. However, this is typically not the case, particularly for growers outside of the northern neotropics, who are beyond the range of the native pollinators of avocado, and therefore cannot benefit from a pollination environment like that in which avocado evolved. Moreover, the relatively low abundance of feral bees of any type in most commercial operations makes the introduction of honey bees into groves a beneficial, or even necessary (especially for growers in Mediterranean climates), step for achieving adequate pollination.

Although avocado may not be its forage of choice, the European honey bee (*Apis mellifera*) has proven to be an effective pollinator of avocado, and is an appealing pollen vector for use in commercial operations because its colonies are perennial and easily managed. The Italian race of honey bee is the one traditionally introduced into groves to pollinate avocado, however, recent observations in southern California suggested that another race, Carniolan, might be superior. This observation has been an important advance in the search for a better pollinator of avocado and merits further investigation. As such, a project comparing the efficacy of avocado pollination of the two races will be conducted this coming season through the University of California, Riverside (1999 – 2000).

The possibility that economically important differences exist between races in avocado pollination is supported by the fact that Carniolan bees evolved under the influence of a higher-latitude climate (Austria-Yugoslavia region) than the Italian race, a consequence of which is the Carniolan's ability to forage at colder temperatures. Since avocado flowers are open and receive and dispense pollen for only limited periods during the day, one honey bee race may visit avocado flowers at more opportune windows of time for pollination than the other, leading to more effective pollination.

Another reason for any differences that may exist between honey bee races in the efficacy of avocado pollination may be based on race-specific preferences for forage. Avocado tends to be less attractive to honey bees than competing pasture (such as citrus and wildflowers) which may be found in the area of avocado groves and compete with avocado for pollinator visitation (Ish-Am and Eisikowitch, 1998). If one race of honey bees were to prefer avocado to the other, the result could be more frequent or effective visitation by that pol-

linator, and better yield as a consequence. In support of this possibility, a preliminary experiment has revealed that the presence of perseitol, a rare sugar found in avocado nectar, affects the feeding behavior of Italian and Carniolan honey bees differentially, at certain nectar concentrations. Whereas Italians spend more time feeding at a nectar source lacking perseitol than when it is present, Carniolans exhibit the opposite behavior and spend more time feeding when the nectar contains perseitol. This may indicate that, whereas perseitol deters Italians, it is desirable, or at least, more tolerable, to Carniolans.

The primary objective of the upcoming pollination research to be conducted through the University of California, Riverside is to compare components of avocado pollination by Italian and Carniolan races of honey bees to determine whether race-specific differences in their effectiveness as pollinators, leading to differences in resulting yield, are detected. If race differences in pollinator effectiveness can be identified experimentally and shown to correspond to improvement in yield, recommendations for honey bee race utilization can be made. This may result in increased avocado production while not relying solely on boosting the density of introduced hives, as has typically been the costly solution to pollination limitation in avocado. As an added benefit, any knowledge, generated from this study, of the key attributes of honey bee behavior affecting avocado pollination can also be of use in planning breeding programs for improved honey bee pollinators of avocado.

Reference

Ish-Am, G. and D. Eisikowitch. 1998. Low attractiveness of avocado (*Persea americana* Mill.) flowers to honeybees (*Apis mellifera* L.) limits fruit set in Israel. J. Hort. Sci. and Biotech. 73(2): 195-204.