

## **Isoenzymes as genetic markers for identification of avocado cultivars, and the male parent of fruitlets in the orchard**

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### ***The use of isoenzymes for identification of the male parent in avocado***

We assayed two new isozyme systems - Glutamate oxaloacetate transaminase (GOT), and Triose phosphate isomerase (TPI), and analysed their genetic control in avocado. These isozyme techniques can be used to determine the rate of cross-hybridization in orchards. Variability has been found also in 6-Phosphogluconate dehydrogenase (6PGDH), but its genetic control has not yet been interpreted.

We analysed duplication in the cytosolic gene coding for Phosphoglucose isomerase (PGI), and determined the genotype of some cultivars. The system can be used as a very accurate fingerprint to identify cultivars, and when the way of inheritance will be understood in most of the local cultivars, it will serve to identify the pollen parent in a large number of cultivars.

We used three isozyme systems to measure the rate of cross hybridization in the orchard: 'Hass' fruitlets were assayed in TPI-1, MDH-1 and LAP-2, by which we could determine the rate of fruitlets originating from 'Ettinger' and from 'Fuerte' pollination. 'Fuerte' fruitlets were assayed in LAP-2 in order to measure the rate of hybridization effected by 'Ettinger'.

### ***Comparison of isozyme patterns in different plant tissues***

We found that the isozyme pattern of the embryo was identical with that of the endosperm in all cases except one, in which we suspect that the endosperm had developed without fertilization. Further, we showed that the cotyledons and the evolving seedlings exhibit the same isozyme pattern. The importance of those analyses stems from the fact that tissue development is accompanied by changes in some enzymes activity, and also that different tissue of the same organism may exhibit different enzymatic activity. It was therefore necessary to show that this is not in the genetic markers we used, and that in every stage the plant tissue exhibited the "true and full" genotype of the plant.

### ***Cross pollination in the avocado orchard***

Working with isozyme techniques we followed the distribution of genotypes in populations of fruitlets and fruits in the orchard, from very young fruitlets to mature fruits.

In subsequent samples of the 'Hass' fruitlets in Givat-Brener, we found that the ratio of self's versus hybrids gradually changed, self's decreasing and hybrids increasing, until in late samples where most of the fruitlets were hybrids. The majority of the hybrids were 'Ettinger' offspring, and only a few 'Fuerte' offspring. In the same orchard we found that in the four 'Hass' rows adjacent to 'Ettinger' the yield was higher than in the rest of the orchard. We believe that there is genetic competition between fruitlets resulting from different pollen donors, and that hybrids of 'Ettinger' x 'Hass' have a greater chance to survive.

In Givat-Brener we found that the contribution of 'Ettinger' as a pollinizer to 'Fuerte' was not very high; about 50% when in close vicinity, and declining when farther away. We did not find any pollinizer effect on yield, but the cvs. 'Ettinger' and 'Fuerte' were not close to one another in the area studied. An effect might have been seen if they were. In any case we would not expect the effect to be very strong.

*Selective abscission.*

We found strong evidence of competition between fruitlets on a genetic base - and consequently a selective abscission. In 'Hass' we demonstrated competition between fruitlets effected by different pollen donors. Likewise there was an indication for competition between different genotypes in Lap-2, where heterozygotes are superior to the homozygotes.

Competition exists between selfed 'Ettinger' fruitlets as expressed in segregation distortion in the gene coding for LAP-2. Three genotypes are detected after pollination - FF, FS and SS. Fruitlets with the genotype SS abscise in time, but we failed to locate the exact stage at which they disappear. Most of the fruits found on the tree at harvest time are FS in Lap-2, only few are FF and none are SS.