FLOWER QUALITY AND REPRODUCTIVE BIOLOGY IN AVOCADO
CALIDAD DE LA FLOR Y BIOLOGÍA REPRODUCTIVA EN AGUACATE

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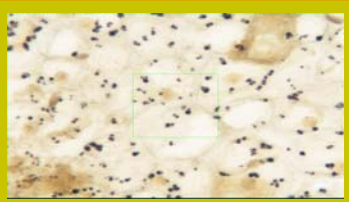
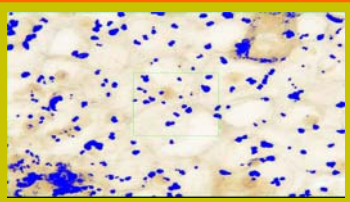
In avocado, only a very small fraction of flowers produced at anthesis are able to set fruits. However, information is elusive to explain why most flowers prematurely abscise while some of them remain in the tree. The term flower quality is used to express something inherent to the flower that has a reflection on the subsequent fruit set.

To explore the implications of the nutritive status of the flower in relation to fruit set, starch content in the pistil has been examined in avocado flowers at anthesis. Quantification of starch within individual flowers may be limited by the small amount of tissue available. As an alternative, changes in small structures and differences among flowers can be histochemically detected and measured with the help of an image analysis system attached to the microscope.

For this purpose, flowers of avocado cv Hass were collected at anthesis and proccesed histochemically. The starch content of individual flowers was measured under the microscope. The procedure is based on the measurement the optical density of black and white images obtained from the microscope.

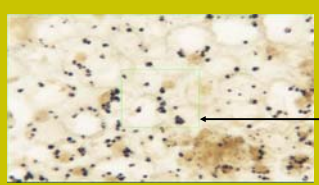


Starch granules were clearly distinguished from the background after staining with I_2KI and they were easily recognized by image analysis.



A binary image corresponding to starch was obtained and used as a superimposed mask on the black and white original image.

Starch content values for each flower were obtained by measuring the optical density of the image collected that was considered as an estimation of the starch content.



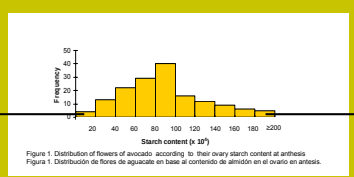
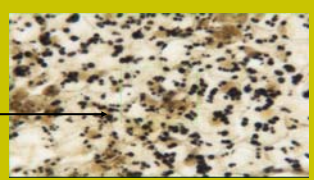


Figure 1. Distribution of flowers of avocado according to their ovary starch content at anthesis
Figura 1. Distribución de flores de aguacate en base al contenido de almidón en el ovario en antesis.



While no external differences could be recorded among flowers, a wide variability exist in starch content at flower opening, with some flowers showing an amount of starch up to 1000 times higher than others.

In order to establish whether the nutritional status of the flower at anthesis is related to the reproductive success of each flower, starch content in the ovary was measured in two flower populations with different capacity of set fruit. Thus, flowers of different fruit-bearing inflorescences were analyzed: early inflorescences that usually produce fruits and very late inflorescences which flowers usually do not produce fruits.

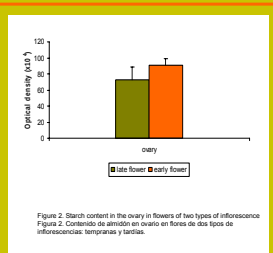
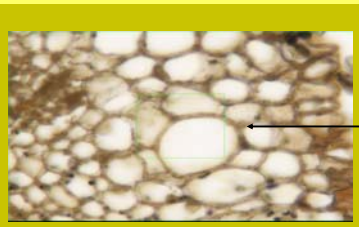


Figure 2. Starch content in the ovary in flowers of two types of inflorescence
Figura 2. Contenido de almidón en ovario en flores de dos tipos de inflorescencias: tempranas y tardías.

The starch content was significantly higher in flowers with more potential to set fruit.

Finally, to examine the influence of the nutritional status of the flowers in the subsequent fruit set, another experimental procedure was perfomed based on the direct correlation obtained in starch content between the ovary and the style in the experiments described above. Thus, in a population of individually labelled and hand-pollinated flowers, the styles were cut off once the pollen tubes had reached the ovary and the ovaries remained in the trees. This approach allowed to relate the starch content of the dissected style of each flower to the subsequent fate (set or abscission) of the corresponding ovary.



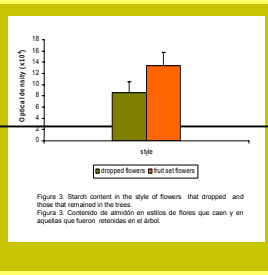
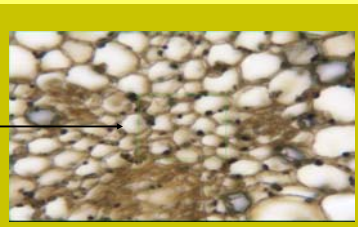


Figure 3. Starch content in the style of flowers that dropped and those that remained in the trees.
Figura 3. Contenido de almidón en estilos de flores que caen y en aquellas que fueron retenidas en el árbol.



The starch content in the styles of flowers that finally set fruits was significantly higher than the starch content in the styles of flowers that finally abscisse.

The nutritional status of the pistil seems to be related to the capacity of a flower to set a fruit, since: 1) Clear differences exist in starch content among flowers at the same stage of development. 2) The amount of starch is higher in flowers with more chances to set fruits and 3) The flowers that set fruits presents higher starch content than those that abscisse.