Approaches to the production of avocado cuttings with etiolated bases, and the endogenous changes involve in the rooting process

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Etiolation of bases of cuttings is an efficient way to increase their rooting potential. In this study different techniques for obtaining high yield of etiolated avocado cuttings were examined. This was achieved by a method which involved various regimes of light and dark periods in the following steps of production:

1. Stock plants were pruned so that only one main branch was left. Side branches which developed at the lower part of the plant were cut above the ring of buds so that large number of buds developed in a limited area in each stock plant.

2. Exposure of the buds to light was shown to be the most efficient way to induce bud burst out

3. The buds were kept in a dark environment during the initial stages of growth for the purpose of obtaining etiolated twigs.

4. The bases of the secondary branches were covered with a transparent paste in order to maintain their etiolation while the rest of the branch was exposed to light.

This paste was developed during the study and contained other chemicals which prevented rotting and enhanced rooting. To the best of my knowledge this is the first time such a paste has been used for the production of etiolated cutting bases.

The above technique permitted the use of the same stock plants in repeated cycles of cutting production. Moreover, it was found that the older the stock plants were the higher the yield of cuttings.

Repeated experiments have demonstrated that cuttings with etiolated bases rooted at higher rates and in shorter time than cuttings with green bases. Additional treatments such as high levels of IBA in the rooting powder, in the paste and ringing of the cuttings increased rooting rates but not to a significant degree.

Cell and tissues at the bases of the etiolated cuttings differed from the green cuttings in the degree of differentiation, sclarification, lignification (which was lower for etiolated cuttings) and the number of parenchymatic cells (which was greater). Anatomical studies of the adventitious roots initiation and differentiation revealed the following developmental stages:

1. The formation of an initiation site around which cell division occurs. This was found in the starch sheath outside the pericycle strands;

2. Development of distinct meristems;

3. Differentiation of the meristemoids with well defined tissues; and

4. Termination of root differentiation and root growth.
In cuttings whose bases were etiolated this process was completed 40 days after planting. In green cuttings rooting was much slower, fifty days after planting the cuttings were only in the first stages of initiation.

Tests were conducted for content of endogenous rooting promoters which were extracted from the leaves and bases of the cuttings during the rooting process. Crude extracts were separated by paper chromatography and sections from the chromatogram were tested separately. Two inducing regions were detected one, at Rf = 0.4-0.6 in leaves and cuttings bases and the other at Rf = 0.9-1.0 in leaves alone. At the time of separation of the cuttings from the stock plants the level of the rooting promoter at Rf = 0.4-0.5 was quite low. Ten days after the cuttings were planted a peak level of root promotion was found in leaves cuttings which had etiolated bases at the same chromatogram region. Maximal activity was detected 20 days after planting in the bases of the cuttings. This finding suggests the possibility that biosynthesis of rooting promoter(s) takes place in the leaves and is then transferred to the cutting bases. In green cuttings a similar trend was observed but the promoting activity level was much lower. The region, Rf = 0.9-1.0, which was active in leaves alone demonstrated an opposite trend to the activity of the Rf = 0.4-0.5 region. High activity of the one was associated with low activity of the other. This finding suggests a possible relationship between the two rooting promoters.