

Proceedings of The World Avocado Congress III, 1995 pp. 211- 216

RESPONSE OF COTYLEDONS DETACHMENT OVER THE DEVELOPMENT OF NURSERY SEEDLINGS OF AVOCADO (*Persea americana* Mill.)

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Abstract

When cotyledons detachment was practiced in avocado seedlings of 1-2 and 6-8 cm they did not survive more than 28 and 35 days, respectively, because during these stages of development the seedling depends totally on the cotyledon reserve. On the other experiments when cotyledons removing was done on seedlings of more height (13-16, 20-25 and 30-35 cm), they survived more that the evaluation period, although a unequal development was found for stem diameter, stem length and number of leaves. The estimated number of leaves that assures the change of the function paper of the cotyledons on the supply of reserves for development of the seedling is of 6 to 8 leaves.

1. Introduction

The propagation in Mexico of the avocado (*Persea americana* Mill.) is carried out mainly by means of sexual reproduction to obtain seedlings for subsequent grafting with selected cultivars. The propagation is sometimes delayed by the lack of uniformity of seed germination. This period of dormancy, being understood as such to the endogenous causes that hinder the germination of the seed, even if the environmental conditions will be optimum, cause that many plants reach the conditions for grafting outside of the advisable time. Currently in the

commercial nursery plant production of avocado, there are several treatments to obtain a rapid and uniform seed germination, among these; the removal of the seed cover (Eggers, 1942), cuts on the apex of the cotyledons (Johnston and Frolich, 1956), punctures (Martinez et al., 1969), among others. However, it has not been evaluated the paper of the cotyledons on the initial development of the plant. Exist preliminary evidences that the permanency of the cotyledons favor the initial growth of the plantules of avocado (Flores-Meza, 1990a), however, also were observed effects of not to favor it.

The objective of this investigation was to evaluate the effect of the removal of the cotyledons in different plant height, on the initial shoot growth of avocado.

2. Materials and methods

The present study was carried out under glasshouse conditions at the Department of Fitotecnia of the Universidad Autónoma Chapingo, Chapingo, State of Mexico.

The plant material that was used in this work were "criollo" type avocado seeds of the Mexican race (*Persea americana var. drymifolia*), obtained from a single tree at Tenancingo, State of Mexico.

They were completed a total of 5 experiments where 30 plants were used, on 15 of them the cotyledons removal was practiced as variation factor and the other 15 plants were used as controls. They were carried out Student's t tests with $P < 0.05$, in which the experimental unit was a plant with 15 replications.

To all the seeds the coats were removed and treated with a solution of benomyl at the rate of 1 mg-liter to prevent possible fungous infections. The embryos were sown directly in the bags (15 x 30 cm) for all experiments, which were previously filled with substrate formed by a soil and sand mixture in proportion of 3:1 and disinfected with methyl bromide. Each experiment was begun when the plantules of avocado reached a height within each interval, as follows: Exp. 1.- 1 to 2 cm; Exp. 2.- 6 to 8 cm; Exp. 3.- 13 to 16 cm; Exp. 4.- 20 to 25 cm; and Exp. 5.- 30 to 35 cm.

In each experiment 30 plants were selected, those which had reached the agreed height. The cotyledons removal was accomplished with scalpel eliminating them completely and without injuring the embryonic axis. Data of stem length and diameter, as well as number of present leaves, was recorded weekly. Of these the increases accumulated were analyzed statistically. The period of evaluation was of 4 months after the removal of the cotyledons.

3. Result

In the first two experiments, after the removal of the cotyledons, the plants did not achieve to survive beyond 28 and 35 days, while for the others three experiments, the plants continued their development after 117 days.

The effect of cotyledons detachment over the stem length, in the first three experiments, shows a reduction in the growth (figure 1 and 2). In experiment 4 until 62 days after the cotyledons detachment there were no differences compared with the control and for the experiment 5 they were not found differences.

Stem diameter growth was affected by the cotyledons detachment in all experiments where differences were detected in almost all evaluation dates (figures 3 and 4), only in experiments 1, 2 and 5 some of the first dates there were no differences among the treatment and the control.

Leaf number was found also to be affected by the cotyledons detachment in the first three experiments, with some not significant differences in the experiments 1 and 3 in early stages (figures 5 and 6). In the experiment 4 after 83 days from the cotyledons removal no differences were found and for the experiment 5 all the evaluation dates showed no differences.

4. Discussion

It was observed the maintenance of the cotyledons adhered to the plant beyond 180 days after germination, this contrasts with the reported by Wetzstein et al. (1983), in which they found that the cotyledons of pecan were maintained adhered by a minimum of 42 subsequent days after the germination. After this time, in some control plants, the cotyledons began to be demoted gradually. With this we can say, that the growth of plantules of avocado depends on greater time on the reserves or on the synthesized in the cotyledons in comparison with other species, as in the case of pecan.

Flores-Meza et al. (1990b) found that the components of the size of the seed and residual weight of the cotyledons, influence not only the germination, but also control the development of some components of the plant in its early stages. The first stage of the germination involves the development of the primary root and of the shoot that it is much more slow. It is a heterothrophic stage that depends on the stored in the cotyledons or of the synthetic activity. Blumenfeld and Gazit (1970) mention that the seeds are not only a reservoir of growth regulators for the development of the fruit, but also for cytokinins that influence the germination and growth of the plantules. In response to the question formulated by Flores-Meza et al. (1990b), of which is the number of leaves that assures the paper change of the cotyledons and acceptance of the leaves of the supply function for the development of the stem and root, we can say, that the results of our study, show that is required an average of 6 to 8 leaves in the plantule. This does not mean that their function stops here, since until the cotyledons removal when the plantules had a height of 30 to 35 cm, there were not found differences for two components of the shoot part, more however, concerning to stem diameter yet showed differences.

In the results it was appreciated clearly the importance of the permanency of the cotyledons for the production of plants ready to graft. Given the importance that have the cotyledons, we can think that a cut or cuts to the cotyledons can cause also a growth reduction in the components of the plant. For the moment, there are evidences that the cotyledons cuts results in a stimulation from the emergency of the shoot (Bergh, 1988). Because of this, it is important to

evaluate the response to growth of the produced plants after cotyledons cuts on the avocado embryo or seed.

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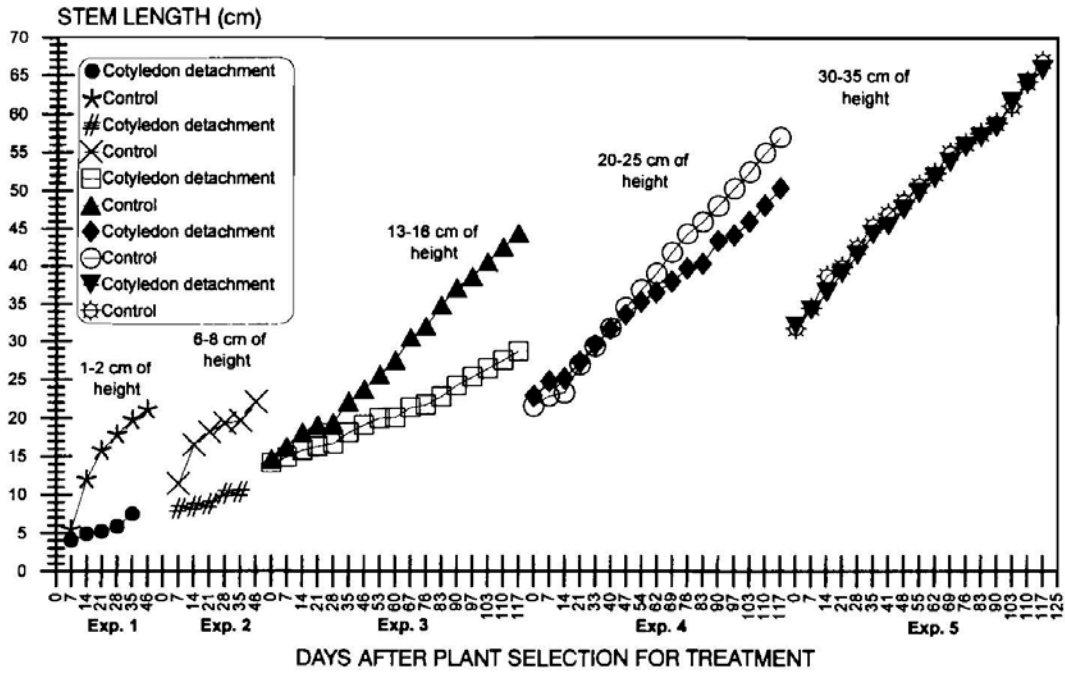
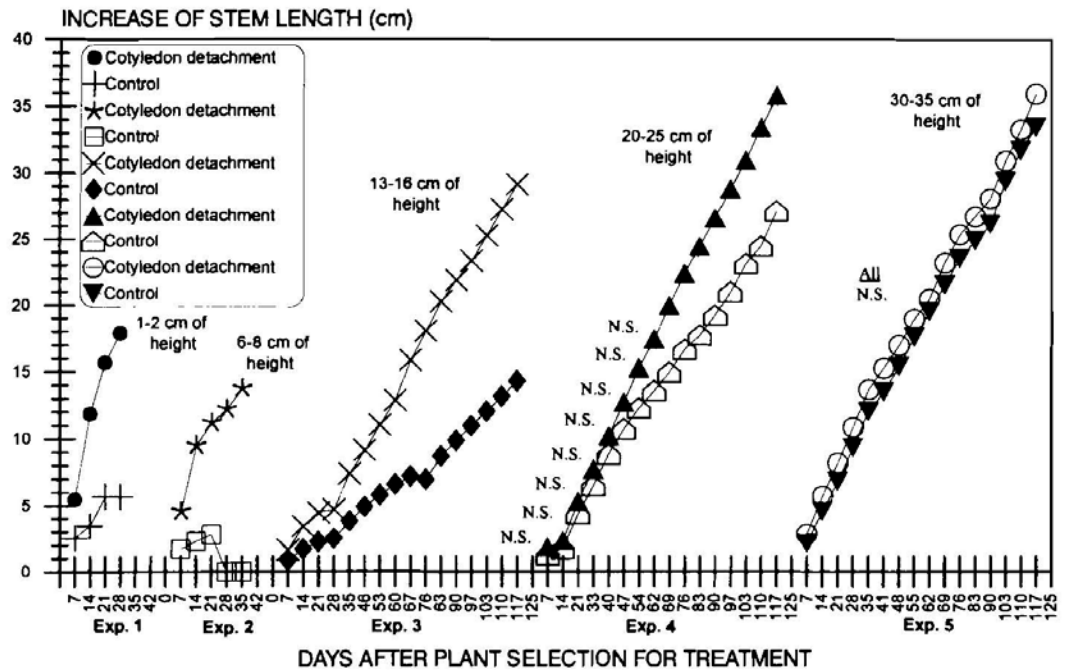


Figure 1 - Response of avocado seedlings stem length to cotyledon detachment on different plant heights.



N.S.- Indicates no significant difference between treatments in each evaluation date according to the Student's *t* test with $P=0.05$, the dates not indicated have significant differences.

Figure 2 - Stem length increase of avocado seedlings in response to cotyledon detachment on different plant heights.

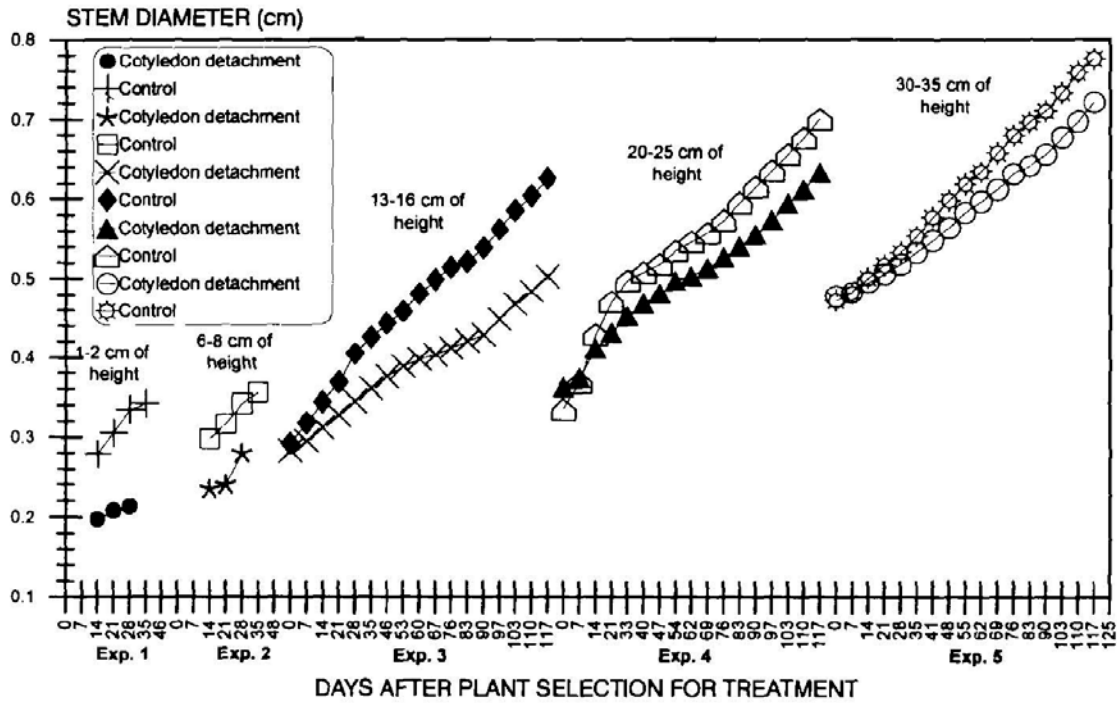
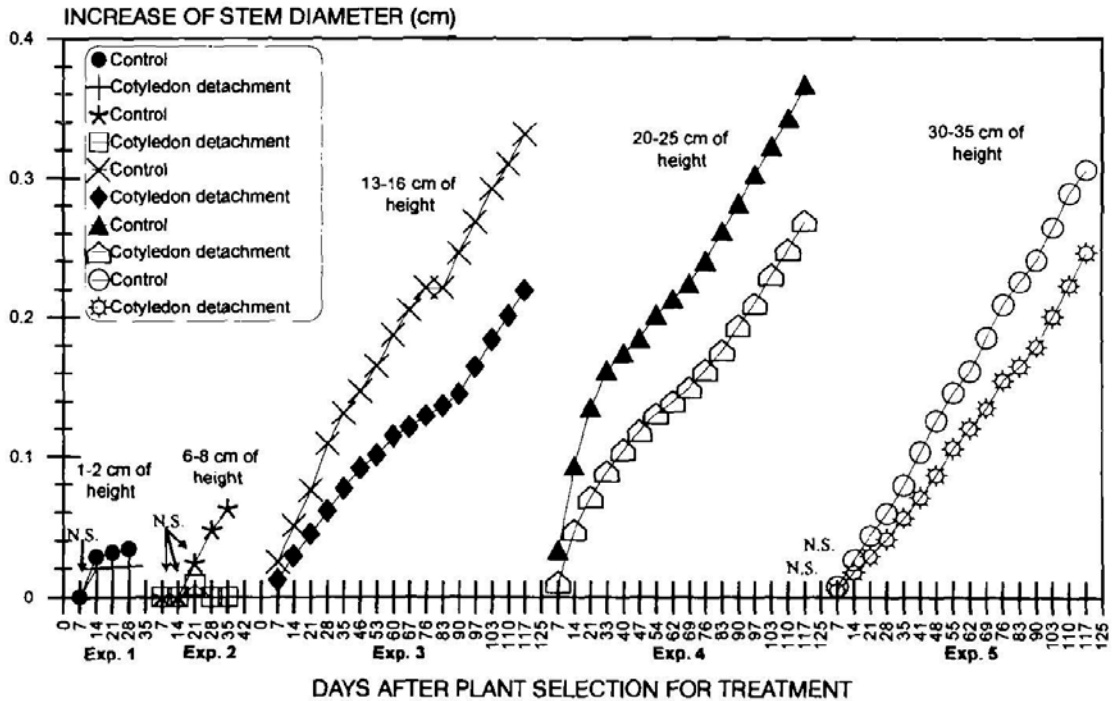


Figure 3 - Response of avocado seedlings stem diameter to cotyledon detachment on different plant heights.



N.S.- Indicates no significant difference between treatments in each evaluation date according to the Student's *t* test with $P=0.05$, the dates not indicated have significant differences.

Figure 4 - Stem diameter increase of avocado seedlings in response to cotyledon detachment on different plant heights.

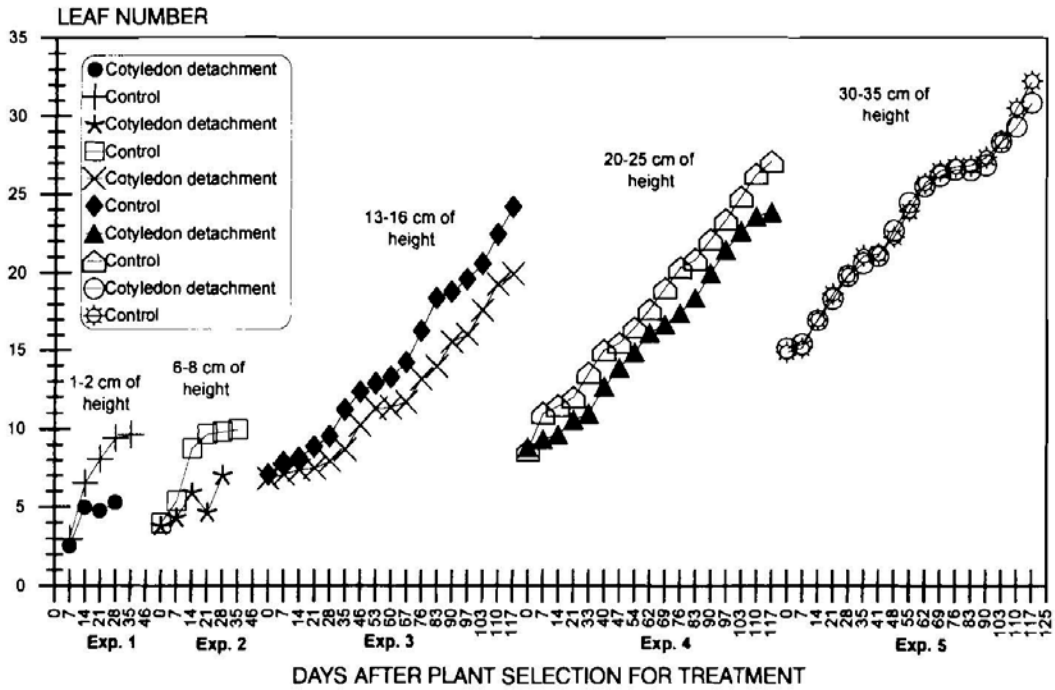
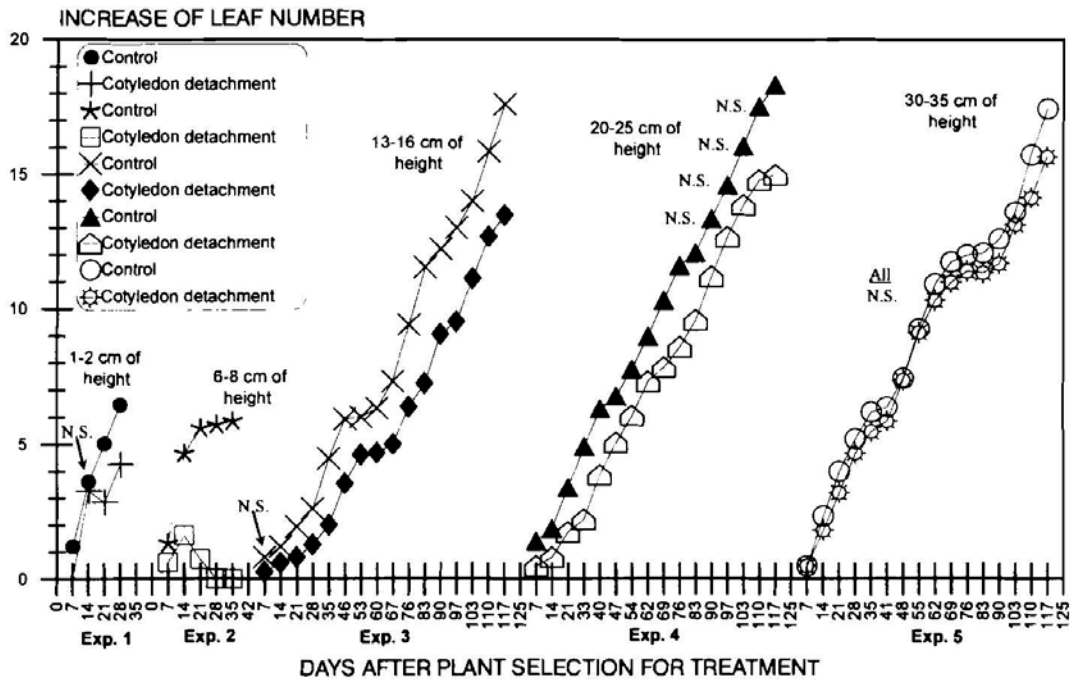


Figure 5 - Response of avocado seedlings leaf number to cotyledon detachment on different plant heights.



N.S. - Indicates no significant difference between treatments in each evaluation date according to the Student's *t* test with $P=0.05$, the dates not indicated have significant differences.

Figure 6 - Leaf number increase of avocado seedlings in response to cotyledon detachment on different plant heights.