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Effect of Progressive Soil Salinity on the Leaf Water Potential and Stomatal Conductance in Avocado (*Persea americana* Mill.)

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INTRODUCTION

It is well known that avocado plants are sensitive to soil salinity (mainly chlorides) (5). Chloride toxitity is detected when leaf necrosis from tip and edges is clearly seen. This toxicity can damage the total leaf area. Long periods under this environmental stress can reduce or affect leaf area (1), transpiration rate (3), photosynthesis (7), growth (2), leaf senescence (3 and 4), prevention of flowering (3), etc. of the plants.

Harvest is therefore reduced (2) although form and fruit size are not clearly affected (3).

A greater oil content of the fruit has been reported (3).

Physiological responses of avocado plants to salinity are diverse, depending upon the genetic material and experimental conditions (2, 6, and 7). The present report shows results for Mexican avocado cultivara on the effect of soil salinity on the leaf water potential (ψw) and stomatal conductance (g).

MATERIALS AND METHODS

Eighteen months old avocado seedlings of the Mexican race (Franco) and plants of the cv Fuerte of twelve month old grafted on the Mexican race rootstock were utilized. The plants were cultivated in black polyethylene bags with 71 of sandy soil under partially shaded nursery conditions until two months prior to the beginning of the present experiment, then transferred to a greenhouse.

Two treatments for each cultivar were established with three replicates per treatment in a totally randomized arrangement.

Solutions containing 233, 700, or 1400 ppm of chlorides (Cl^-) as potassium chloride (KCl) in tap water (containing the following levels in meq 1^{-1}, $CO_3^{=}$ =0.4; HCO_3^- = 2.8; $SO_4^{=}$ = 0.002; Ca^{++} =0.8; Mg^{++} = 1.32; Na^+ = 0.9) were prepared.

The pots were irrigated twice a week, applying nine times the solution with 233 ppm Cl^-, then five times the 700 ppm, and finally five times with 1400 ppm.

Mature leaves from the middle of the plants were harvested at 11:00 h for total water potential (ψw). Three replicate samples were utilized in each occasion. The ψw was measured using a pressure chamber after covering the leaf with a plastic bag.

Stomatal conductance was determined in the fifth leaf from the abaxial side using porometer MK-II (Delta-T Devices, U.K.).

RESULTS AND DISCUSSION

Leaf water potential [ψw]

The ψw of both cultivars without salinity treatments is different as can be seen in Fig. 1. Fuerte possess values of high ψw while Franco remains with low ψw. As chloride is applied to the plants Fuerte remains with high ψw in spite of the progressive salinity. Moreover, such ψw is even higher than the non-treated plants. Similarly, Franco had a higher ψw under stress than in non-stress conditions.

Stomatal conductance [g]

Both cultivara showed a similar stomatal conductance along the day under non-stress conditions (Figs. 2 and 3), although Franco tends to have a lower stomatal conductance than Fuerte. When a 700 ppm of chloride solution was irrigated, the stomatal conductance was reduced almost half of the control treatment. Similarly when a 1400 ppm of chloride solution was applied, the g was reduced. Both salinity treatments affect g, which is a usual stomatal behaviour for plants under stress.

The obtained results showed no difference in stomatal behaviour under any of the treatments. Both cultivara showed differences were more relevant for the ψw. Moreover the salinity increased ψw of the plants.

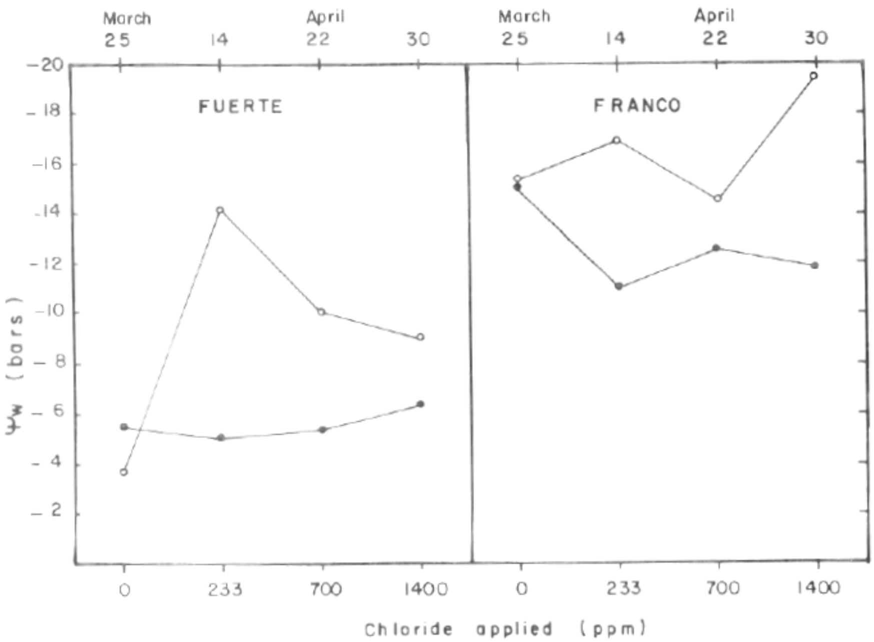


Figure 1. Leaf water potential (Ψw) values from avocado plants determined at different time intervals. Plants under progressive soil salinity stress (●——●) and water control (o——o). Each point is the mean value of three plants.

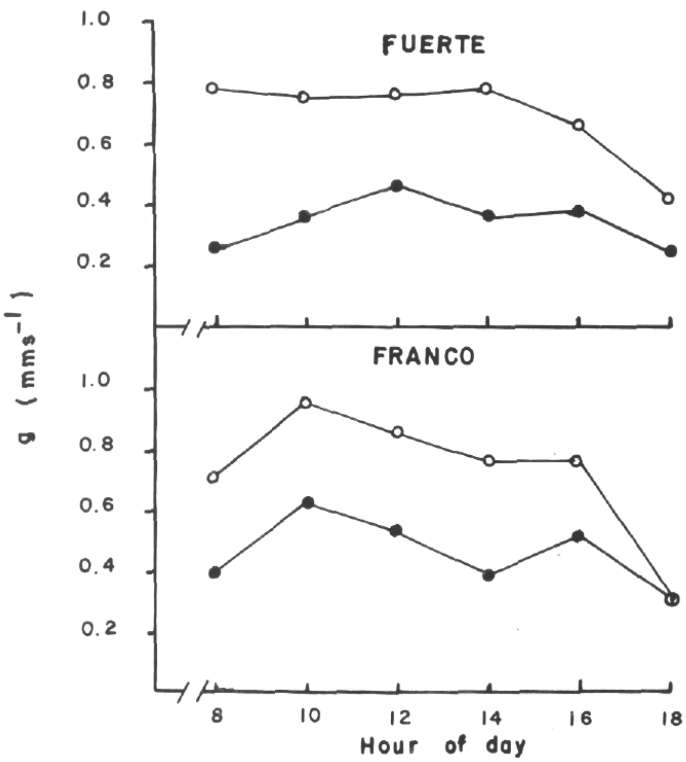
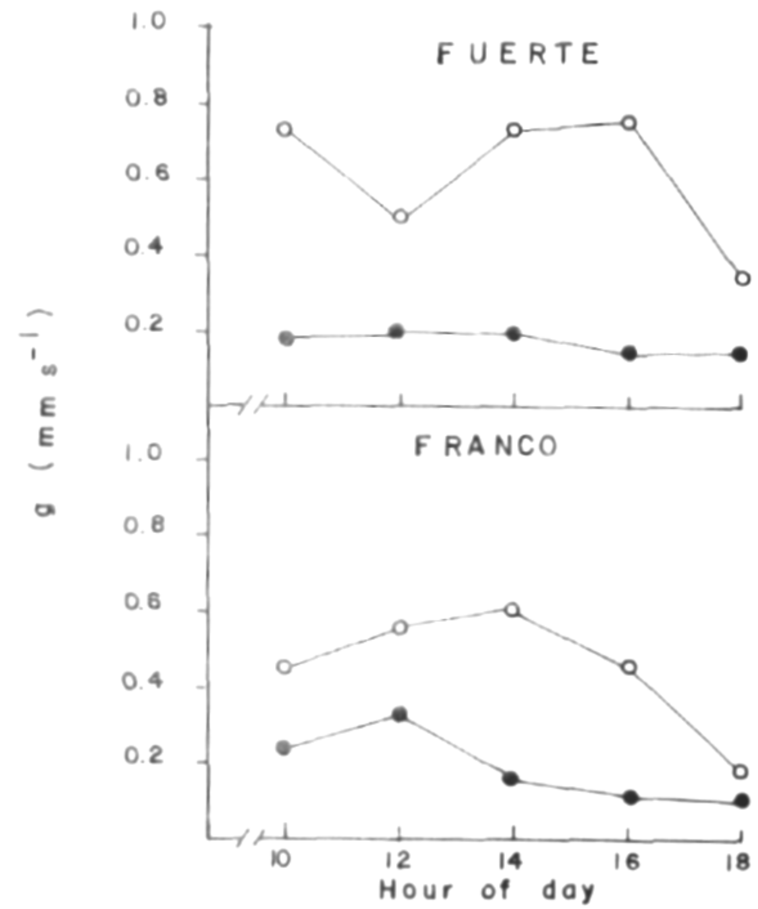


Figure 2. Stomatal conductance (g) of Persea americana grown under salt stress (700 ppm Cl^-)(●——●)or non-stress (o——o) conditions. Each point is the mean value of three plants.

Figure 3. Stomatal conductance (g) of Persea americana grown under salt stress (1400 ppm Cl⁻) (●——●) or non-stress (○——○) conditions. Each point is the mean value of three plants.



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