Evaluation of soil moisture levels on growth and productivity of young citrus trees

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INTRODUCTION

Although citrus production is presently not a major commodity in Puerto Rico it does have potential for future development. Growing conditions, potential high yield and fruit quality, and motivation to improve citrus production are favorable. Several factors constrain citrus production in Puerto Rico. Some of them are diseases, poor orchard management and edaphic problems in citrus production areas. An important problem that citrus growers need to deal with is the lack of information on the proper management of irrigation systems. Information on citrus production under our growing conditions is limited. Improper use of irrigation systems may cause high incidence of Phytophthora, and nitrogen leaching, if an excess of irrigation is utilized. Through proper irrigation, it should be possible to apply the water that matches crop evapotranspiration reducing losses. The use of tensiometers to schedule irrigation has been strongly recommended in Puerto Rico and Florida (Goyal, 1989; Servis, 1990). Most of the irrigation research on citrus management and production has been conducted in Florida. However, not all the information can be extrapolated to Puerto Rico due to large difference in soil and temperature. The objective of the research is to evaluate the effect of moisture levels on growth and development of young citrus trees.

MATERIALS AND METHOD

A citrus orchard (Citrus sinensis [L.] Osb.) was established at the Isabela Agricultural Experiment Station, Puerto Rico on 2001. The predominant soil series at the experimental site is Coto clay, which is classified as very fine, kaolinitic, isohyperthermic, Typic Eutrustox. One hundred-eight Rhode Red Valencia trees (Citrus sinensis [L.] Osb.) grafted on Cleopatra rootstock were planted on 10 April, 2000 at a distance of 4.5 x 6.0 m, resulting in a tree density of 370 trees/ha. Irrigation water applied by microsprinkler installed on 1.3 cm polytubing line at an average range of 29.07 L/hr with a diameter of 3.8 m giving a wetted area of approximately 11.8 m²/tree. The irrigation is applied based on tensiometer readings at 30 and 45 cm depth installed approximately one meter from the trunk. Tensiometers are read three times per week. The experimental plots were arranged in a randomized complete block design with four replications. Plots consist of six trees and data is recorded on the middle four. Trees were irrigated when tensiometers reached a low depletion level (10-15 kPa) and high depletion level (30-35 kPa), and rainfed treatment was included as a check. Irrigation treatments did not affect orange trees growth neither yields during 2004. Trees canopy volume varied from 13.61 to 14.62 m³ producing an average of 42 fruits. Tough drip irrigation is a common practice for fruit orchards at the location; the results obtained during 2004 showed that rainfall distribution was adequate to maintain growth.

RESULTS AND DISCUSSION

Irrigation treatments did not affect orange trees growth neither yields during 2004. Canopy volume varied from 13.61 to 14.62 m³ (Table 1). The orchard produced an average of 42 fruits per tree. Trees needed more frequent irrigations during January to March and July to September, period corresponding to the dry season. Rhode Red Valencia was not affected by irrigation treatments. Even though drip irrigation is a common practice for fruit orchards at the location, the results obtained in this research showed that rainfall distribution is adequate to maintain growth.

In one year period, oranges trees submitted to the 10-15 kPa treatment required a total of 29 irrigation events to maintain soil moisture near field capacity (10-15 kPa). An irregular and low production is expected for trees harvested for the first time. Orange trees with a higher fruit load probably will require more frequent irrigations, mainly during the dry season.

Table 1: Growth and yield response of young Rhode Red Valencia to microirrigation treatments scheduled by using tensiometers grown at Isabela, Puerto Rico.

<table>
<thead>
<tr>
<th>Irrigation Treatment</th>
<th>Canopy volume m³</th>
<th>Yield fruits/tree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfed</td>
<td>13.61</td>
<td>41.9</td>
</tr>
<tr>
<td>10-15 kPa</td>
<td>14.82</td>
<td>39.6</td>
</tr>
<tr>
<td>30-35 kPa</td>
<td>14.62</td>
<td>45.8</td>
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<tr>
<td>NS</td>
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LITERATURE CITED

