Response of avocado to irrigation with saline water

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Practical experience in Israel has shown that avocado (cvv. Hass, Fuerte, Ettinger) on non-Mexican rootstocks can tolerate 5.7 to 7.0 mM NaC1 in the irrigation water without fruit yield loss (1). Shortage of good quality irrigation water in Australia, Israel and other parts of the world requires that the tolerance of avocado to salinity be improved substantially. This paper reports investigations into the physiological oasis of the sensitivity/tolerance of avocado to increasing salt during irrigation.

Methods

Salt was applied at 3 concentrations (1.9, 5.7 and 10.8 mM NaCl) through the irrigation water using an injector system (Dema, Missouri) to avocado plants (cv. Hass on Nabal rootstock) growing in 15 L pots. Four plants (55+7cm high, 6.5+0.8 cm circumference 5cm above graft) were used for each salt treatment. Plants were automatically irrigated (DRIPTHINKER[™]) at recommended rates (8L/48h) using pressure compensated drippers (Netafim, Israel). Nutrients (N,3.6; P,1.0; K,1.3; mM) were applied through the irrigation system. Transpiration, net photosynthesis and stomatal resistance were measured using a portable infra-red gas analyser (Li-Cor) on 3 leaves of each plant at midday. Leaf water potential was measured at the same time using a pressure chamber.

Results and discussion

Irrigating with 5.7 mM NaC1 nad no significant effect on water relations or photosynthesis of Hass avocado leaves compared with low salt (Taole 1). By contrast 10.8 mM Nadi resulted in a 23% and 27% reduction in rates of transpiration and net photosynthesis respectively compared with 1.9 and 5.7 mM AaCl. This corresponded with increased stomatal resistance and decreased leaf water potential, indicating reduced plant water status.

TABLE 1 Transpiration (T), Photosynthesis (PH), Stomatal Resistance (Rs) and Water Potential
(WP) at Midday of Avocado (cv. Hass) Leaves from Plants Irrigated at 3 Salt Concentrations after
28 days

mM	mg m-2 s-1	mg m ⁻² s ⁻¹	scm-1	kPa
1.9	86 ^a	0.30 ^a	2.67 ^a	- 875 ^a
5.7	82 ^a	0.31 ^a	2.35 ^a	- 925 ^a
10.9	65 ^b	0.22 ^b	3.8 ^D	-1250 ^b

These findings support practical experience in Israel that Naoal a Guatemalan rootstock can tolerate 5.7 to 7.0 mM NaCl in the irrigation water without fruit yield reduction. Improvement in salt tolerance of avocado will most probably come from selection of tolerant West Indian rootstocks (2). Agronomic practices such as increased A fertilisation (25 ppm) to increase salt-tolerance of avocado have had some success (1).

1. Steinhardt R. Pers. Comm.

2. Ben-Yaacov A. (1984) Special Publication 232 ARO Bet Dagan Israel p 68.