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Influence of high salinity on root biomass and sap flow of adult olive trees

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Olive is one of the most economically valuable trees in the Mediterranean countries especially because of its drought and salt tolerance.

Two drip-irrigated varieties of 11 yrs-old olive (*Olea europaea* L.) trees, ‘Barnea’ and ‘Proline’, considered as tolerant and sensitive to salinity respectively, were examined in the Negev desert, Israel. Three levels of salinity (1.2, 4.2 and 7.5 dS m^{-1}) were applied on ‘Barnea’ trees, and two salinity levels (1.2 and 4.2 dS m^{-1}) on ‘Proline’ variety. Bio- and necromass of fine and coarse roots and fine root surface area were determined and correlated to water content and salinity respectively to soil patches. A tetrazolium test was used to confirm the applied criteria of root sorting into living and death. Sap flow rates and xylem sap osmolality were measured on coarse roots.

Fine root biomass of both olive varieties was highly correlated to soil moisture and salt concentrations. Whereas there were no major differences in root sap flow rates, Barnea variety possessed a much higher root biomass and subsequently a larger absorbing root surface area than Proline variety under moderate salt stress. Furthermore, fine root biomass of Barnea variety was still considerably high under severe salinity. Xylem sap osmolality was found to be significantly higher in salt-stressed Proline roots.

The ability of Barnea variety to sustain a high root biomass under salinity and the higher salt exclusion capacity are likely to contribute to the high salt tolerance of this variety. Influences of root biomass on water uptake and a possible mechanism of Proline to compensate the biomass loss partially by increasing root axial conductivity are discussed.

Keywords: *Olea europaea*, root biomass, root sap flow, salt stress, xylem sap osmolality