

Effect of Salinity on Growth and Gas Exchange Parameters in Citrus Rootstocks

Davood Khoshbakht

davod.khoshbakht@gmail.com

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Department of Horticultural Science

Isfahan University of Technology, Isfahan 8415683111, Iran

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Supervisor: Prof. Ali A. Ramin; aa_ramin@cc.iut.ac.ir

Abstract

Salt is one of the greatest factors that limit the growth of plants and production of crops. This topic has been of utmost importance since long ago. Current reports show that this problem is increasing. Citrus are plants which are sensitive to salt. Since most species of citrus are reproduced with grafting, the tolerance of the scion to salt is to a great extent dependent on the type of rootstock. Except part of citrus orchards in the north, other citrus are in areas which have the potentiality of getting salty because of the decrease of rainfall, excessive use of under ground waters, penetration of salty water to sweet water, high evaporation and bad management of irrigation. Consequently, the damages related to being salty increase every day. Therefore, according to the above mentioned limitations, a greenhouse study was arranged to assess the salt tolerance of nine citrus rootstocks namely, Sour orange (*Citrus aurantium*), Bakraii (*Citrus reticulata* × *Citrus limetta*), Cleopatra mandarin (*Citrus reshni*), Rangpur lime (*Citrus limonia*), Rough lemon (*Citrus jambhiri*), Macrophylla (*Citrus macrophylla*), Swingle citrumelo (*Poncirus trifoliata* × *Citrus paradisi*), Citrange (*Poncirus trifoliata* × *Citrus sinensis*) and Trifoliolate orange (*Poncirus trifoliata*). A factorial experiment through complete randomized design (CRD) with three replications and four levels of salt including 0, 25, 50 and 75 mM NaCl with electrical conductivity of 1.5, 4.5, 6.79 and 9.06 dS/m² were used. The study was done in the Department of Horticulture, College of Agriculture, Isfahan University of Technology, Isfahan, Iran. By increasing the levels of salt, the number of leaves, plant height, leaf area, the weight of wet and dry leaf, stem and root, number and length of root, relative water content (RWC), chlorophyll content, chlorophyll fluorescence yield (Fv/Fm), net CO₂ assimilation rate (A_{CO2}), stomata conductance (g_s), transpiration (E) and water use efficiency (WUE) decreased. Being salty also increased electrolyte leakage. The result of comparison of the mean of growth parameters showed that there is a significant difference between various cultivars of citrus. Among of genotypes "Sour orange", "Cleopatra mandarin" and "Rang pur lime" had the least and "Trifoliolate orange", "Citrange", "Swingle citrumelo" showed the most decrease in growth indexes of shoots and roots. The most relative water content (RWC) was in the "Sour orange", "Cleopatra mandarin" and "Bakraii", respectively. The least and most electrolyte leakage was seen in "Sour orange" and "Trifoliolate orange", respectively. About the chlorophyll content, chlorophyll a and b "Cleopatra mandarin" and "Sour orange" had the most and "Trifoliolate orange", "Citrange" Swingle citrumelo" had the least amount, respectively. The most amount of production of proline was observed in "Rangpur lime" and "Rough lemon". However, "Citrange" possessed the least amount of proline. Related to gas exchange indexes "Sour orange",