Malondialdehyde (MDA), a lipid peroxidation product considered a result as well as an indicator of increased oxidative damage, increased with the rise of the salinity level, indicating a higher degree of membrane damage due to the salinity. The concentration of total chlorophyll significantly decreased with the NaCl; explants exhibited a highly chlorotic appearance from 60mM NaCl. Sodium and Cl concentration in the explants significantly increased with salinity levels, but chloride increased more than sodium (with 150 mM NaCl the concentrations of Cl and Na were 30 and 8 times higher respectively than with 0 mM of NaCl). For osmotic adjustment high concentrations of compatible solutes (proline and quaternary ammonium compounds -QAC-) were accumulated in salt-stressed plants. Proline accumulation in response to salinity was well correlated with explant chloride whereas QAC concentrations were highly correlated with sodium concentrations, indicating a possible role of these compounds in osmotic adjustment. The concentrations of NO_3^-, P, K, Mg, Ca or Fe of plants were also affected by NaCl concentrations of the medium. We suggest that the important deleterious effects reported in the *in vitro* explants of *Citrus macrophylla*, grown under increasing NaCl concentrations, are mainly due to a cellular intoxication by saline ions, mainly by Cl.

[P217]

Effect of sodium chloride salinity on nitrate, proline and soluble protien levels in five citrus rootstocks

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Effects of four NaCl levels on nitrate, proline and soluble protein content in seedlings of five citrus rootstocks, namely Bakraei (*Citrus reticulata* × *C. limetta*), Volkamer lemon (C. volkameriana), Sour orange (*C. aurantium*), Sweet lime (*C. limetta*) and Mexican lime (*C. aurantifolia*), were studied in a glasshouse, using a factorial experiment in completely randomized design with four replications. One-year old seedlings of each rootstocks were grown in pots, containing a calcareous soil (pH=8.2) and irrigated with water supplemented with 0 (control), 20, 40 and 60 mM NaCl. At the end of experiment, levels of nitrate, proline and protein in leaves and roots were determined. Levels of nitrate, proline and protein varied among rootstocks even in control plants (no salt addition). Control plants had high levels of nitrate and low levels of proline in leaves and roots. Salinity decreased levels of nitrate in leaves and increased it in roots of all rootstocks. Proline levels were increased in leaves and roots with increasing of salinity levels. Under salinity stress, soluble protein levels were increased in leaves and roots of all rootstocks but were decreased at high salinity levels.

[P218]

Analysis of leaves chloride accumulation and phenotypic behavior of nine trifoliate citrus rootstocks under salt stress conditions

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Citrus in Morocco is mainly grafted on sour orange (*Citrus aurantium* L.) rootstock which should be abandoned due to its susceptibility to citrus tristeza virus (CTV). Salinity also becomes a serious problem in citrus growing areas of Morocco. The choice of the right rootstock is the most practical means to overcome the problem. *Poncirus trifoliata* (L.) Raf. and several of its hybrids (citrange, citrumello, citrandarin) are known to be tolerant to CTV. The purpose of the present work was to evaluate nine trifoliate citrus rootstocks, introduced in 1996 from San Giuliano Inra-Cirad Agronomic Research Station, Corsica France, for their behavior against salt stress. Seedlings of nine citrus rootstocks were evaluated for their leaf chloride accumulation under salt conditions. This study was carried out in greenhouse conditions at Inra Experimental station El Menzeh, Morocco. Three-month-old plants were grown, in 0.5 liter containers of sand and peat moss in proportion of 2/3 or 1/3 (v/v), and irrigated four times per week and fertilized with complete nutritional solution. NaCl at 0 (control), 2 and 5 g/l was added to the watering solution for 2 additional months. All rootstocks showed specific symptoms of toxicity when irrigated with NaCl solution. The severity of symptoms increased with time and salt concentration and varied between rootstocks. Diverse effects of salt stress on stem, leaves and roots fresh and dry weights were also observed according to the rootstock genotype. Rootstock leaf analysis revealed that accumulation of chloride, varied in relation with the rootstocks genotype and salt concentration. The relations between the different parameters analyzed are discussed and a standardized method for hybrids population screening proposed. Among the nine trifoliate hybrids tested Citrange C35 (ICVN 0110177), Citrumelo Sacaton (ICVN 0110144) and Troyer citrange (ICVN 0110197) have been identified, in our experimental conditions as the less sensitive to salt stress.

[P219]

The influence of NaCl in water relations and leaf gas exchange for Lane Late citrus plants and different rootstocks

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