INFLUENCE OF MODERATE LEVELS OF NaCl– AND $CaCl_2$– SALINITY ON CUCUMBER GROWN IN A CLOSED HYDROPONIC SYSTEM

Fidanka Trajkova

ABSTRACT

The effects of different levels and sources of salinity on growth, yield and quality of cucumber (*Cucumis sativus* L. cv. Palmera*)*, grown in a closed hydroponic system using perlite as a substrate were studied in a greenhouse experiment. Five different salinity treatments imposed in the nutrient solution supplied to the crop were tested: a control treatment involving a standard nutrient solution for cucumber (EC = 2.1 dS m^{-1}), low NaCl-salinity (EC = 3.0 dS m^{-1}), high NaCl-salinity (EC = 5.0 dS m^{-1}), low $CaCl_2$-salinity (EC = 3.0 dS m^{-1}) and high $CaCl_2$-salinity (EC = 4.80 dS m^{-1}). The salinity treatments were obtained by adding as much NaCl or $CaCl_2$ to the standard nutrient solution as required to increase the EC to 3.0 or 5.0 dS m^{-1}. The corresponding salinity levels in the drainage solutions were 2.4 dS m^{-1}, 4.1 dS m^{-1} and 6.3 dS m^{-1}. The above EC values are means for the entire growing period; the actual values fluctuated to some extent at each irrigation event, depending on the actual amount and EC of drainage solution that was recycled.

The yield of cucumber was restricted as the electrical conductivity increased from 2.1 to 3.0 and 5.0 dS m^{-1} by NaCl salinity and from 3.0 to 4.80 dS m^{-1} by $CaCl_2$ salinity. The high NaCl-salinity treatment resulted in a yield reduction of 12%, while the high $CaCl_2$-salinity treatment reduced yield by 6% as compared to the control treatment. The most marked reduction in the vegetative growth of cucumber plants was observed also with the high NaCl-treatment. The N and P tissue concentrations were not affected significantly by the salinity treatments, but the K and Na concentrations in plant tissue revealed a competitive uptake pattern in when NaCl was the source of the salinity stress. The Mg level in tissues of old leaves was significantly affected by the high $CaCl_2$-salinity treatment. The concentration of Na was significantly increased in the plants under NaCl stress, whilst Ca was increased in the plants when $CaCl_2$ was the source of salinity. The micronutrient contents (Fe, Cu, Mn, Zn and B) in the different plant fractions either showed no significant differences or no consistent pattern was observed when different salinity sources and concentrations were applied. The different salinity levels imposed either by NaCl or $CaCl_2$ did not affect the vitamin C and chlorophyll content of cucumber fruits. However, the total soluble solids were significantly enhanced when the EC level in the nutrient solution increased from 3.0 to 5.0 dS m^{-1} regardless of using NaCl or $CaCl_2$ to raise salinity.

Keywords: ***Hydroponics, Perlite, Electrical Conductivity, Salinity, NaCl, $CaCl_2$***

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