Effects of A200 superabsorbent, bentonite and water stress on physiological traits and vitamin C of lettuce under greenhouse cultivation

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Abstract

Water stress is a global crisis and is considered a serious threat for agriculture. Superabsorbent polymers, through improving soil physical conditions, prevent moisture stress in arid and semi-arid areas. To evaluate the effects of a natural superabsorbent (bentonite) and a synthetic superabsorbent (A200) on growth of lettuce, a factorial experiment in a completely randomized design with four replications was conducted. The amount of each superabsorbent at 3 levels (0, 0.15 and 0.3% w/w) and 2 levels of water stress (60 and 100% of field capacity) were tested. The results showed that in 100% of field capacity treatment, leaf relative water content, chlorophyll index and stomatal conductance were more than 60% of field capacity treatment. Electrolyte leakage, vitamin C, total soluble solids and chlorophyll b were higher in 60% of field capacity treatment. Application of 0.3% bentonite decreased electrolyte leakage, vitamin C and soluble solids by 74, 19 and 31 percent, respectively, and increased relative water content, chlorophyll index, stomatal conductance and total chlorophyll content by 3, 2, 22 and 8 percent, respectively, relative to the control. While, application of 0.3% of superabsorbent A200 decreased electrolyte leakage, vitamin C and soluble solids by 28, 18 and 37 percent, respectively, and increased relative water content, chlorophyll index, stomatal conductance and total chlorophyll content by 6, 32, 25 and 42 percent, respectively, as compared to the control treatment. These results indicated that bentonite can reduce the negative impacts of drought stress as much as artificial superabsorbent.

Keywords: Physiological traits, Synthetic superabsorbent, Natural superabsorbent, Water-deficit stress.

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