Fourth Article (Common with others inside and outside the specialization).

Broccoli growth, antioxidant activity and health tissues responses to ascorbic acid under deficit irrigation

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SUMMARY

Two field experiments were conducted during 2013/2014 and 2014/2015 in a private Farm, Ibshway district, Fayoum, Egypt to study deficit irrigation (60, 80 and 100% ETc) and ascorbic acid foliar application (0, 200 and 400 mg l^{-1}) on growth, relative water content (RWC), membrane stability index (MSI), electrolyte leakage (EL), leaf photosynthetic pigments (LPS), osmoprotectants (OS) and DPPH radical-scavenging activity of broccoli plants. The obtained results clarified that, irrigation amount at 80% or 100% ETc, significantly, resulted in higher mean values of stem length and diameter, number of leaves $plant^{-1}$, leaf MSI, RWC, carotenoids, DPPH-radical-scavenging and total free amino acids content than irrigation amount at 60% ETc. On other side, irrigation amounts, irrespective the level used, did not reflect any noticeable impact on number of branches $plant^{-1}$ and head contents of ascorbic acid. Increasing irrigation water from 60% up to 100% ETc decreased the contents of leaf EL, chlorophyll A, B, A + B, anthocyanin, free proline and TSS. Exogenous application of ascorbic acid at concentrations of 200 and 400 mg l^{-1}, significantly improved most studied growth parameters, RWC, MSI, anthocyanin, DPPH, total free amino acids and endogenous ascorbic acid however, leaf EL decreased gradually. Moreover, the impact of ascorbic acid, irrespective of the concentration used, on leaf photosynthetic pigment, free proline and total soluble sugars contents was at par.