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Selenium biofortification enhances the growth and alters the physiological response of lamb's lettuce grown under high temperature stress

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Abstract

We examined the possibility to enhance the growth and the physiological tolerance of lamb's lettuce (*Valerianella locusta* L.) grown under heat stress (HS) by biofortification with selenium (Se). The plants were grown at optimal (22/19 °C; day/night) or high (35/22 °C; day/night) temperature and Se was applied via foliar or soil treatment. The HS reduced plant biomass and photosynthetic pigment concentration and impaired some parameters of chlorophyll *a* fluorescence. The lamb's lettuce grown under HS accumulated large amounts of H₂O₂ in the leaves, especially in younger ones. The Se fertilization (both foliar and soil) at HS was beneficial to plant growth, whilst the concentration of photosynthetic pigments and the analysed parameters of chlorophyll *a* fluorescence were unaffected by the Se supply. The application of Se enhanced the thermo-tolerance of plants through cooperative action of antioxidant enzymes, such as guaiacol peroxidase (GPOX; EC 1.11.1.7) and catalase (CAT; EC 1.11.1.6), and reduced glutathione (GSH) among low-molecular-weight non-enzymatic antioxidants, in removal of excess of H₂O₂. Although under HS the content of different phenolic compounds in the leaves was higher than under normal temperature (NT), the application of Se did not affect their concentration at stress conditions. On the other hand, at NT the Se-biofortified plants accumulated significantly more phenolic compounds with health-promoting properties than Se-untreated plants. Therefore, biofortification of lamb's lettuce with Se can be beneficial in terms of plants yield and their nutritional value under both NT and HS.

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