Biostimulants, N level and drought stress intensity synergistically orchestrate yield, quality and physiology of greenhouse-grown basil

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Abstract

Accurate nitrogen (N) fertilization management is imperative with the view of achieving high crop performance without jeopardizing product quality. Nonetheless, excessive application of synthetic N fertilizers might have detrimental impacts on both environment and human healthiness. Moreover, climate changes modified water availability with repercussions on farmers' habits. Accordingly, there have been efforts aimed to reduce/optimize the application of agricultural inputs, such as fertilizers and water. Investigate and develop new approach able to reduce the crop damages caused by water restrictions and N shortage are pivotal to make agroecosystems more resilient and sustainable. At this regard, we evaluated the impact of three drought stress levels (100%, 80% and 60% of the field capacity) and four N supply doses (0, 50, 100 and 150 kg ha^{-1}) on the performance of 'Gervaso' F_1 hybrid sweet basil plants cultivated in a protected environment. Concomitantly, we also investigated the effects of two biostimulants application, a seaweed extract (Kelpstar®) and a protein hydrolysate (Tyson®), on plants - subjected or not - to drought stress and nitrogen shortage. The study focused on the influence of these treatments on plant yield, physiological parameters, resources use efficiency, nitrate, phenols and ascorbic acid concentrations. Drought stress significantly reduced yield, stomatal conductance and nitrogen use efficiency. Conversely, an increase of N dose had positive effect on yield, chlorophyll and nitrate content. The application of both biostimulants guarantee increase in yield, stomatal conductance, water productivity, chlorophyll, phenols and ascorbic acid. Remarkably, the improvement of yield and quality and the enhancement of physiological traits were also observed in water and nitrogen stressed plants when biostimulants were administered. Our study demonstrated that the use of seaweed extract and protein hydrolysate could be a valuable strategy for increasing the resilience of sweet basil plants exposed to drought stress or N shortage, increasing plant water and N use efficiency.