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Integrative Seed and Leaf Treatment with Ascorbic Acid Extends the Planting Period by Improving Tolerance to Late Sowing Influences in Parsley.

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Abstract

Abnormal production of reactive oxygen species (ROS) is an undesirable event which occurs in plants due to stress. To meet this event, plants synthesize ROS-neutralizing compounds, including the non-enzymatic oxidant scavenger known as vitamin C: ascorbic acid (AsA). In addition to scavenging ROS, AsA modulates many vital functions in stressed or non-stressed plants. Thus, two season (2018/2019 and 2019/2020) trials were conducted to study the effect of integrative treatment (seed soaking + foliar spray) using 1.0 or 2.0 mM AsA vs. distilled water (control) on the growth, seed yield, and oil yield of parsley plants under three sowing dates (SDs; November, December, and January, which represent adverse conditions of late sowing) vs. October as the optimal SD (control). The ion balance, osmotic-modifying compounds, and different antioxidants were also studied. The experimental layout was a split plot in a completely randomized block design. Late sowing (December and January) noticeably reduced growth traits, seed and oil yield components, and chlorophyll and nutrient contents. However, soluble sugar, proline, and AsA contents were significantly increased along with the activities of catalase (CAT) and superoxide dismutase (SOD). Under late sowing conditions, the use of AsA significantly increased growth, different yields, essential oil fractions, CAT and SOD activities, and contents of chlorophylls, nutrients, soluble sugars, free proline, and AsA. The interaction treatments of SDs and AsA concentrations indicated that AsA at a concentration of 2 mM was more efficient in conferring greater tolerance to adverse conditions of late sowing in parsley plants. Therefore,

this study recommends 2.0 mM AsA for integrative (seed soaking + foliar spraying) treatment to prolong the sowing period of parsley seeds (from October up to December) and avoid damage caused by adverse conditions of late sowing.