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PHYSIOLOGICAL AND ANTIOXIDANT MECHANISMS TO OVERCOME WATER STRESS ON GRAFTED PEPPERS

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Abstract: Among abiotic stresses affecting crops, water scarcity rises as a major problem in many parts of the world, causing important losses in crop yield and productivity every year (Ashraf, 2010; Farooq et al., 2009; Mastrangelo et al., 2012). Grafting emerges as a sustainable technique that can be used to face this threat, particularly in Solanaceae species, usually cultivated in areas suffering from water starvation (Fullana-Pericàs et al., 2020; Kumar et al., 2017; Rouphael et al., 2018). Little has been published about the processes underlying grafted plants tolerance to water stress, especially in pepper plants. This work aimed to unravel several physiological and antioxidant mechanisms responsible for tolerance in pepper grafted plants under water stress. For this purpose, two pepper experimental hybrids with different sensitivity to water stress (H92 and H90, tolerant and sensitive, respectively), were used as rootstocks and their behaviour under a 1-month water stress was compared between them and to the ungrafted variety. These responses were analysed in terms of photosynthesis, water relations, antioxidant compounds and oxidative stress. Tolerant grafted plants (variety grafted onto H92, Var/H92) were less affected by water stress in leaf relative water content (RWC), indicating a higher capacity of water retention in leaves. Regarding photosynthesis, Var/H92 was capable of maintaining a higher rate of CO_2 assimilation (A_N) under stress conditions, compared to sensitive grafted plants (variety grafted onto H90, Var/H90) and ungrafted variety (Var). Respect to the antioxidant system, higher concentration of free radical scavengers as proline and ascorbic acid was observed in Var/H92 under water stress, which is related to a less disturbed photosynthesis. In fact, significant linear correlations for A_N with proline and ascorbic acid (negative and positive, respectively) were observed. As a consequence, Var/H92 showed lower oxidative pressure displaying equal levels of membrane lipid peroxidation in control and stress conditions, while higher values were observed in Var/H90 and ungrafted variety under water stress. To conclude, H92 could be a promising tolerant rootstock that should be tested in long-term essays to be evaluated in terms of fruit productivity.