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Indole-3-acetic acid modulates phytohormones and polyamines metabolism associated with the tolerance to water stress in white clover

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ABSTRACT

Endogenous hormones and polyamines (PAs) could interact to regulate growth and tolerance to water stress in white clover. The objective of this study was to investigate whether the alteration of endogenous indole-3-acetic acid (IAA) level affected other hormones level and PAs metabolism contributing to the regulation of tolerance to water stress in white clover. Plants were pretreated with IAA or L-2-aminooxy-3-phenylpropionic acid (L-AOPP, the inhibitor of IAA biosynthesis) for 3 days and then subjected to water-sufficient condition and water stress induced by 15% polyethylene glycol 6000 for 8 days in growth chambers. Exogenous application of IAA significantly increased endogenous IAA, gibberellin (GA), abscisic acid (ABA), and polyamine (PAs) levels, but had no effect on cytokinin content under water stress. The increase in endogenous IAA level enhanced PAs anabolism via the improvement of enzyme activities and transcript level of genes including arginine decarboxylase, ornithine decarboxylase, and S-adenosylmethionine decarboxylase. Exogenous application of IAA also affected PAs catabolism, as manifested by an increase in diamine oxidase and a decrease in polyamine oxidase activities and genes expression. More importantly, the IAA deficiency in white clover decreased endogenous hormone levels (GA, ABA, and PAs) and PAs anabolism along with decline in antioxidant defense and osmotic adjustment (OA). On the contrary, exogenous IAA effectively alleviated stress-induced oxidative damage, growth inhibition, water deficit, and leaf senescence through the maintenance of higher chlorophyll content, OA, and antioxidant defense as well as lower transcript levels of senescence marker genes *SAG101* and *SAG102* in leaves under water stress. These results indicate that IAA-induced the crosstalk between