

CYTOKININS: THE KEY TO DIFFERENCES IN PATTERNS OF CANOPY SENESCENCE IN STAY-GREEN AND FAST DRY-DOWN SUNFLOWER HYBRIDS

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ABSTRACT

This study documents the dynamics of cytokinin levels in leaves and their association with root functionality and leaf senescence in irrigated crops of two sunflower hybrids with different patterns of leaf senescence (stay-green[SG] and fast dry-down[FDD]) grown in two years. During the grain filling-phase, green leaf area index (GLAI) and live root length density (LRLD) were followed, together with total chlorophyll content (CT), fluorescence (Fv/Fm), net photosynthesis (Pn) and trans-zeatin (ZT) levels in leaves of positions H17, H20, H22 and H24. In all positions, hybrids and years the beginning of leaf senescence was firstly associated with decreases in CT, followed by falls in Fv/Fm and Pn. Root senescence differed ($p < 0.05$) between hybrids, where FDD always started first, and changes in LRLD preceding those of GLAI. ZT levels in leaves decreased ($p < 0.05$) between active-phase and those in senescence-phase. At all positions, the beginning of decrease was later ($p < 0.05$) and initial ZT levels were higher ($p < 0.05$) in SG: 2.34(H17), 3.03(H20), 4.14(H22) and 7.96(H24) times higher than FDD leaves positions. The decrease per degree-day was 1.11%(H17), 0.63%(H20), 0.39%(H22), 0.58%(H24) of initial values in FDD and 0.79%(H17), 0.72%(H20), 0.27%(H22), 0.64%(H24) in SG. Differences in leaf senescence between SG and FDD were mainly associated with initial ZT levels in leaves. These results are the first to describe variations of leaf cytokinin levels during leaf senescence in sunflower (and other cultivated species), suggest that beginning of leaf senescence is inversely related to leaf ZT levels, and demonstrate that root senescence precedes that of leaves.

Key Words : Canopy senescence, Chlorophyll content, Cytokinins, Leaf senescence, Root senescence, Sunflower, Trans-zeatin levels