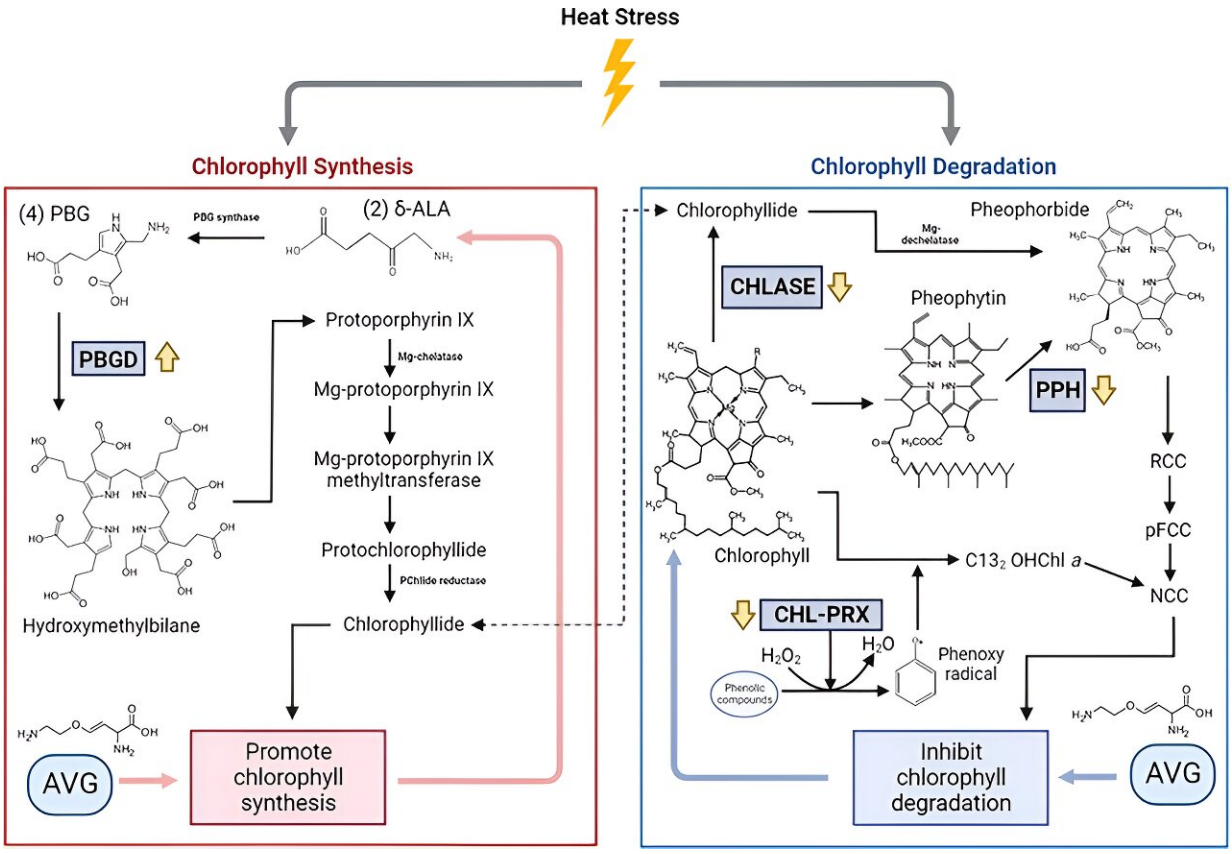
Apple preharvest drop not linked to xylem functionality

December 27 2023, by Jane Cerza



Pathway map for chlorophyll synthesis and degradation in creeping bentgrass foliar-treated with aminoethoxyvinylglycine (AVG) under heat stress showing chlorophyll enzymes promoted or suppressed by AVG treatment: δ-ALA = δ-aminolevulinic acid; C132 OHChl a = C132 hydroxychlorophyll a; CHL-PRX = chlorophyll-degrading peroxidase; CHLASE = chlorophyllase; NCC = nonfluorescent chlorophyll catabolites; pFCC = primary fluorescent chlorophyll catabolite; PBG = porphobilinogen; PBGD = porphobilinogen deaminase; PPH = pheophytinase; RCC = red chlorophyll catabolite. Credit: *Journal of the*

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Heat stress induces and accelerates leaf senescence, which is characterized by a loss of chlorophyll and cellular membrane deterioration, as well as oxidative damage). Leaf senescence can be exacerbated by the hormone ethylene, which acts as a signal to trigger cellular maturation and senescence.

Ethylene is produced at higher rates in plants exposed to heat stress, which induces premature leaf senescence. Inhibition of ethylene synthesis or action has been found to be effective for suppressing leaf senescence in different plant species subjected to abiotic stresses, including heat stress; therefore, the application of ethylene inhibitors is a viable approach to prolonging leaf growth to improve plant stress tolerance.

The objective of this study was to determine whether foliar-spraying the ethylene inhibitor, aminoethoxyvinylglycine (AVG), may suppress heat-induced leaf senescence through effects on chlorophyll synthesis and degrading enzymes in creeping bentgrass (Agrostis stolonifera).

Plants were maintained in environmentally controlled growth chambers under non-stress (22/17 °C day/night) or heat stress (35/30 °C day/night) temperature conditions for 25 days, and turf quality, electrolyte leakage, and chlorophyll content were measured to assess the extent of leaf senescence.

Plants were foliar-sprayed with 25 µm AVG before and during heat stress at 7-day intervals. From 21 through 25 days of heat stress, AVG-treated plants had significantly higher turf quality and chlorophyll

content, whereas electrolyte leakage was significantly lower in comparison with untreated controls

The findings of the current study in tandem with previous studies suggest that AVG could suppress heat-induced leaf senescence by maintaining chlorophyll synthesis and alleviate chlorophyll degradation in creeping bentgrass exposed to heat stress through action on enzymatic activities, in addition to the other mechanisms previously reported.

Understanding how AVG may regulate chlorophyll metabolism at the molecular level may facilitate the development of novel lines of cool-season grass species with stay-green traits to maintain high-quality turfgrass during summer months.

The paper is published in the *Journal of the American Society for Horticultural Science*.

More information: Stephanie Rossi et al, Heat-induced Leaf Senescence in Creeping Bentgrass Suppressed by Aminoethoxyvinylglycine Involving Regulation of Chlorophyll Metabolism, *Journal of the American Society for Horticultural Science* (2023). DOI: 10.21273/JASHS05297-23

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