Photosynthetic induction upon transfer from low to high light is affected by leaf nitrogen content in tomato

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April 16, 2024

Abstract

The response of photosynthetic CO2 assimilation to changes of illumination affects plant growth and crop productivity under natural fluctuating light conditions. However, the effects of nitrogen (N) supply on photosynthetic physiology after transition from low to high light are seldom studied. To elucidate this, we measured gas exchange and chlorophyll fluorescence under fluctuating light in tomato (Solanum lycopersicum) seedlings grown with different N conditions. After transition from low to high light, the induction speeds of net CO2 assimilation (AN), stomatal conductance (gs) and mesophyll conductance (gm) delayed with the decline in leaf N content. The times to reach 90% of maximum AN, gs and gm were negatively correlated to leaf N content. This delayed photosynthetic induction in plants grown under low N concentration was mainly caused by the slow induction response of gm rather than that of gs. Furthermore, the photosynthetic induction upon transfer from low to high light was hardly limited by photosynthetic electron flow. These results indicate that decreased leaf N content declines carbon gain under fluctuating light in tomato. Increasing the induction kinetics of gm has the potential to enhance the carbon gain of field crops grown in infertile soil.

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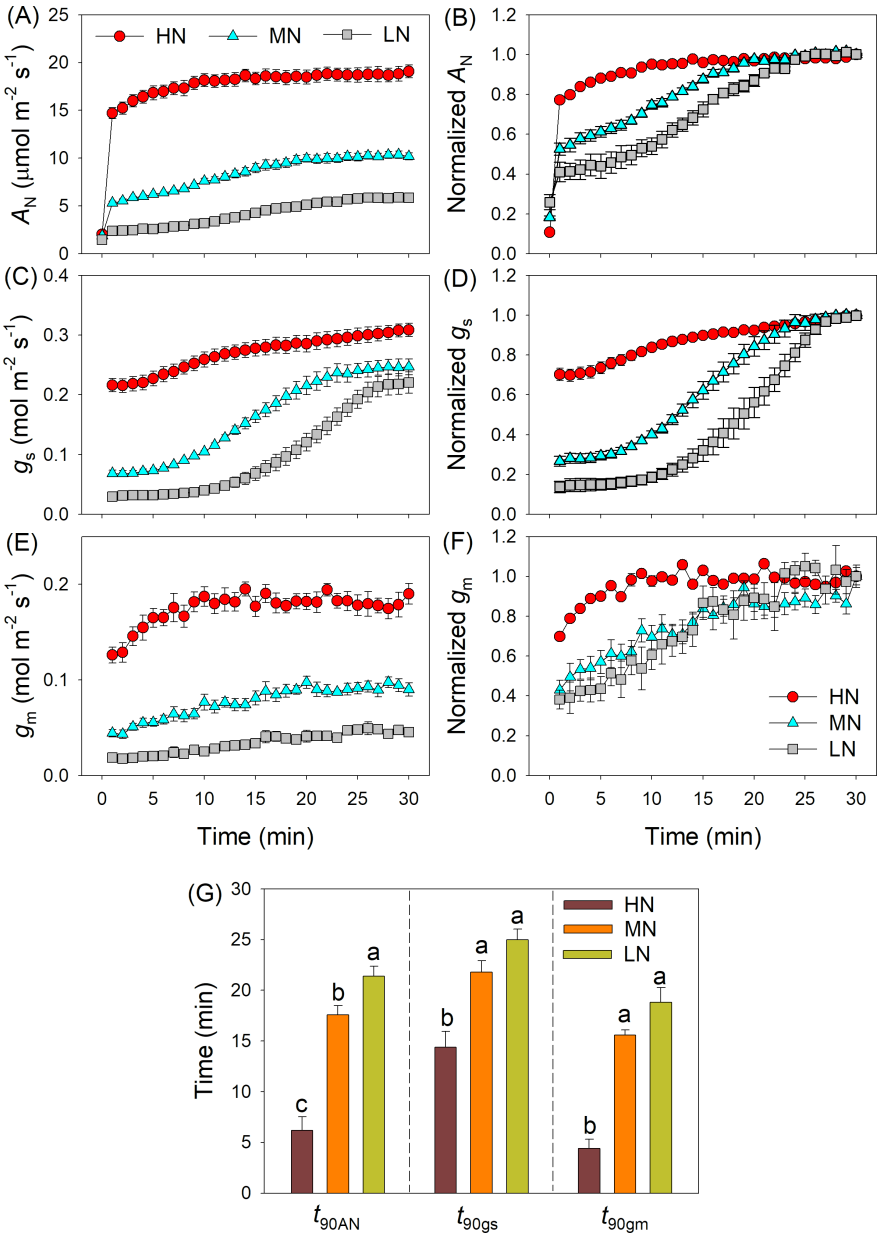

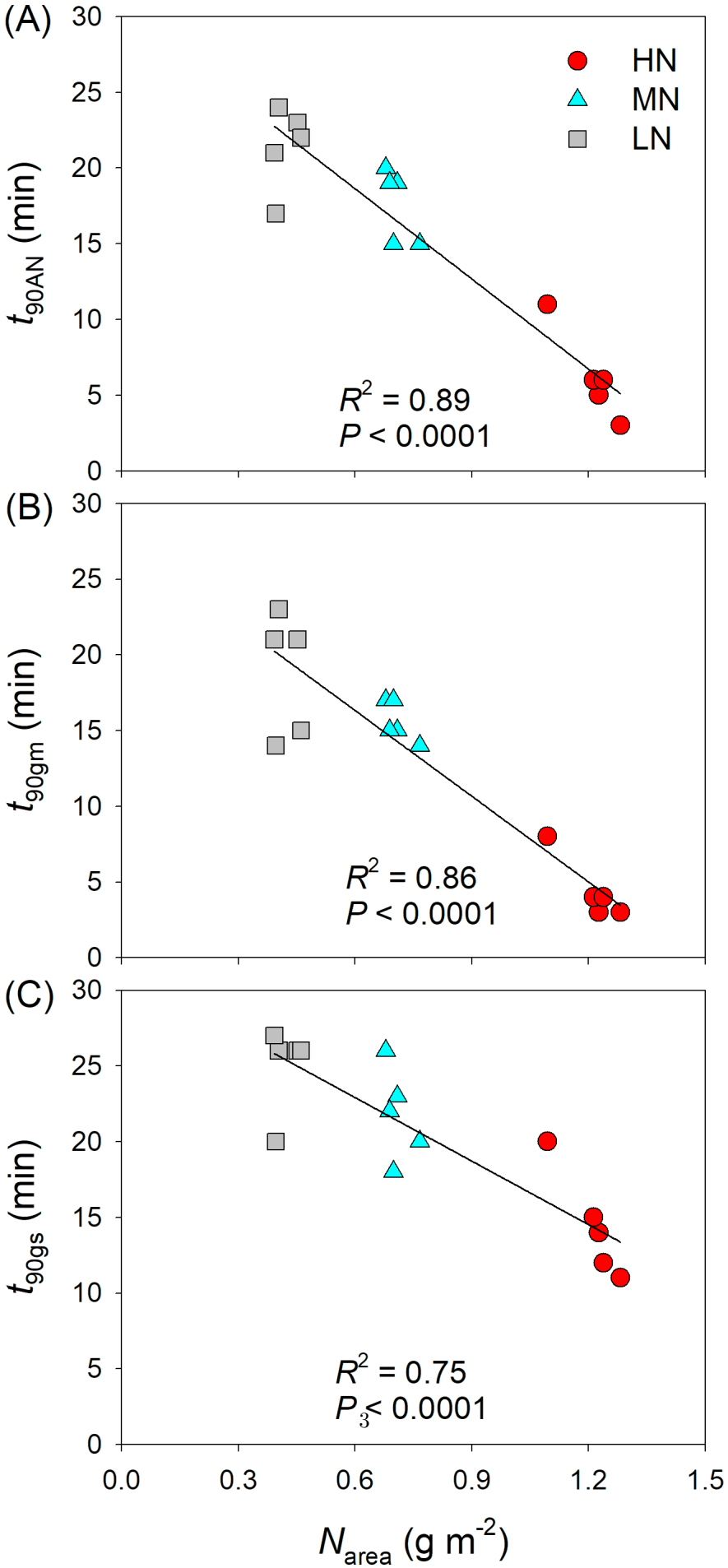

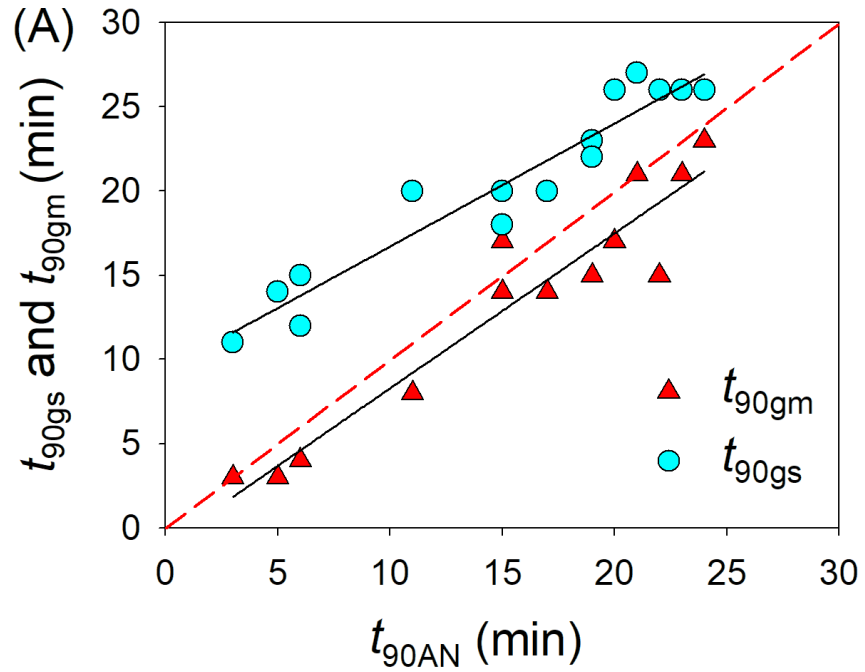

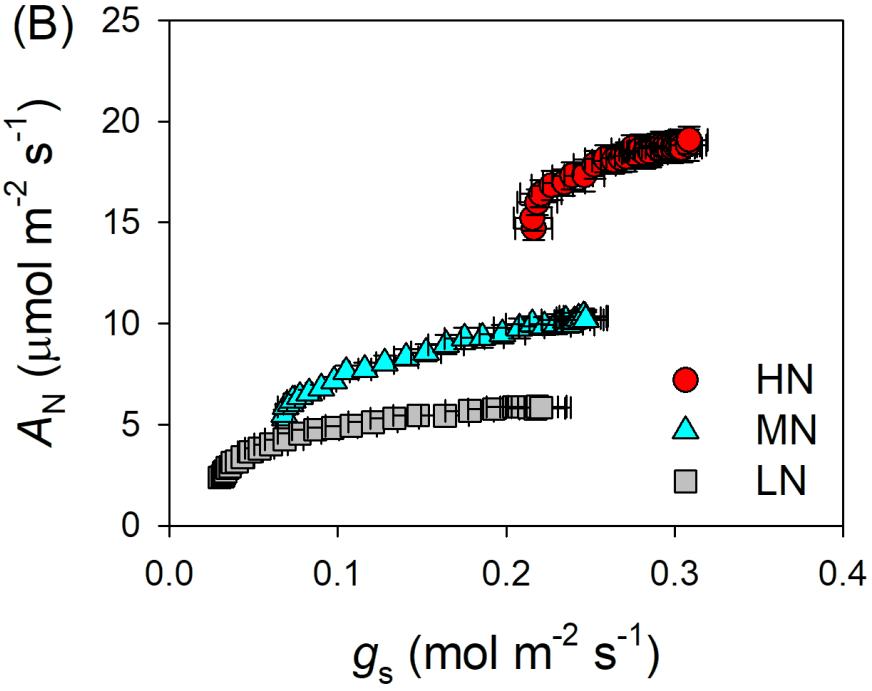

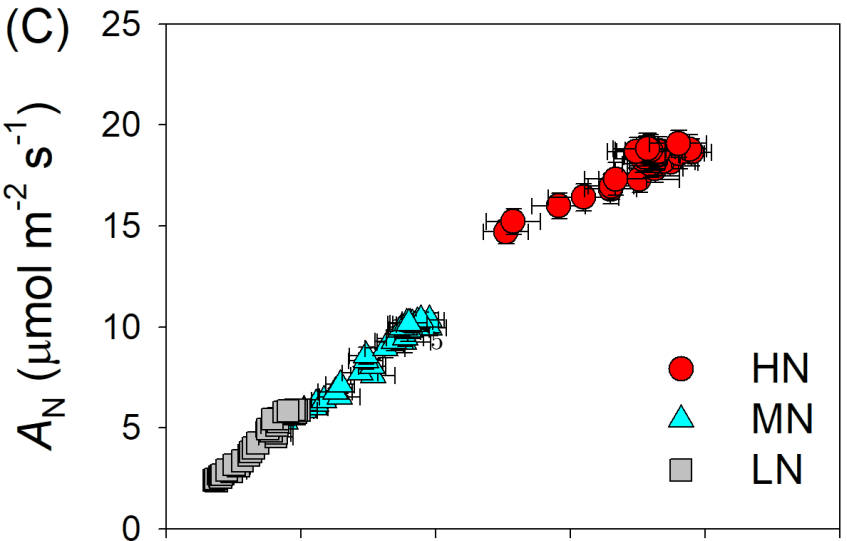

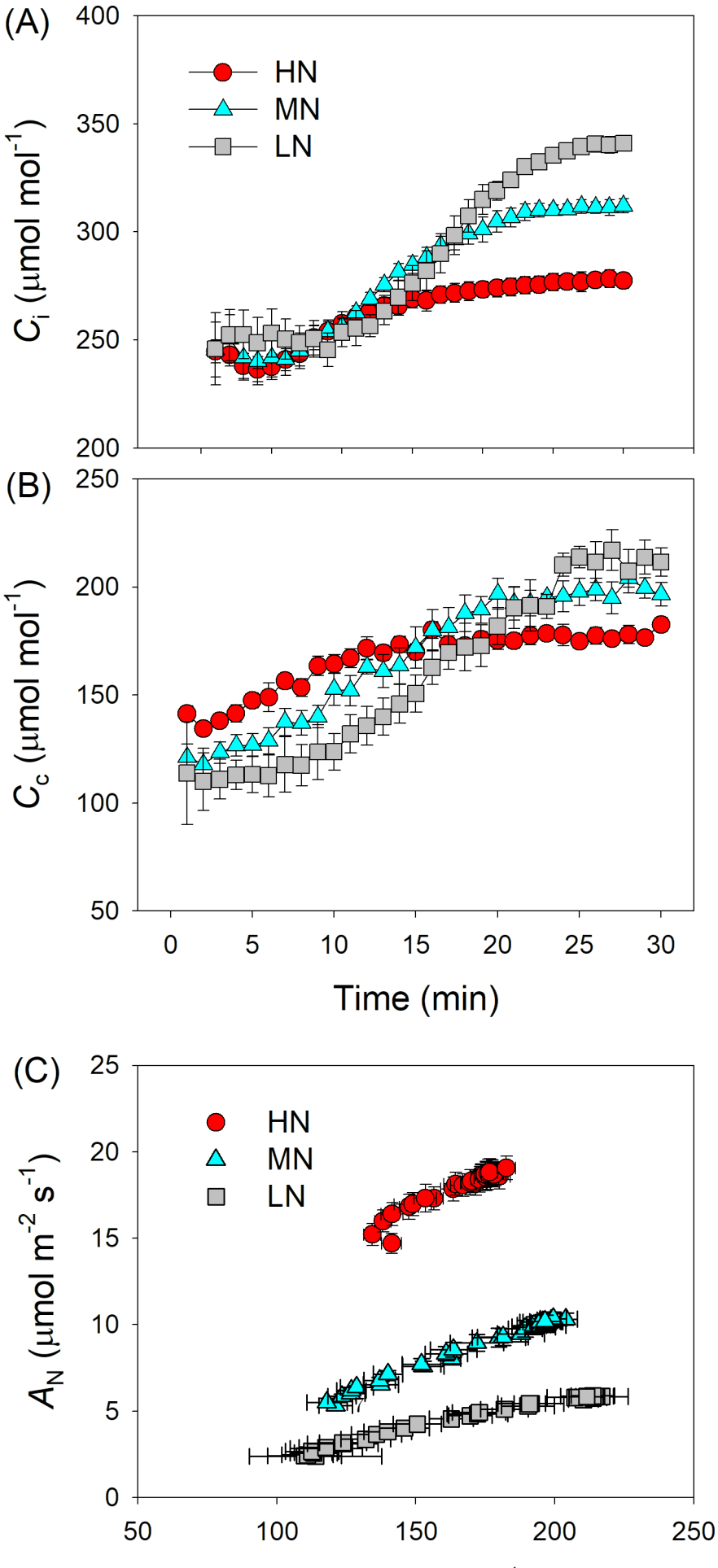

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