

Photosynthetic limitation in soybean during cold stress

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CO₂-gas exchange behaviour and direct chlorophyll fluorescence kinetics were investigated to obtain a better insight into the stress-induced changes that occur in soybean (*Glycine max* L. Merr.) during cold stress. CO₂ assimilation during photosynthesis was measured by infrared gas analysis, while the function of photosystem II (PSII) was assessed by fast-phase chlorophyll fluorescence at different periods of exposure to low night temperature (8°C). The rate of CO₂ assimilation decreased by 87% after a single night of cold stress in the cultivar Fiskeby V. Analysis of A:C_i* response curves and the polyphasic fast chlorophyll fluorescence rise, using the JIP test, showed that the observed inhibition of photosynthesis was due to mesophyll limitation. Cold stress markedly decreased the carboxylation efficiency of Fiskeby V and also resulted in severe impairment of PSII function, mainly through reaction centre deactivation and reduced electron transport capacity. We predict that CO₂-gas exchange analysis and the JIP test will prove invaluable in future studies of the basis of cold injury and tolerance in soybean.
