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Effects of Light Condition after Simulated Acid Snow Stress on Leaves of Winter Wheat

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Winter plants regrow after freeze-thawing in acidic meltwater from the acid-snow layer in early winter or early spring. In this study, the responses of cold-acclimated wheat seedlings to different light conditions during the regrowth period after simulated acid snow (SAS) stress were investigated. After freeze-thawing in sulfuric acid (SAS stress) of pH 2.0, dry weight and the maximal quantum yield of photosystem II (PSII) decreased more in mature leaves than in young leaves. In a subsequent regrowth period under light condition, dry weight, relative water content, and the maximal quantum yield of PSII were severely affected in mature leaves but were only slightly affected in SAS (pH 2.0)-stressed young leaves. The levels of membrane lipid peroxidation and hydrogen peroxide in mature leaves of SAS (pH 2.0)-stressed seedlings were significantly higher than those in young leaves during the regrowth period under light condition. The superoxide dismutase activity in young leaves was higher than that in mature leaves during the regrowth period. These results indicate that mature leaves of seedlings during the snow melt season are more sensitive than young leaves to photooxidative stress because of their low acid snow stress tolerance and low capacity for the detoxification of superoxide.