12 Increased Susceptibility to Photoinhibition in the Dehydrated Leaves of Green Pepper (*Capsicum annuum* L.) without Incremental Damage to PS II

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Photosynthetic responses to photoinhibition in the dehydrated leaves of green pepper were examined by the simultaneous measurement of O_2 evolution and chlorophyll fluorescence. Photoinhibition was given at the light intensity of 900 μmolm ^{2}s ^{1} and dehydration was induced by immersing the roots of whole plant directly in the Hoagland solution containing 5% (w/v) polyethylene glycol (PEG). Water potential of the leaf was decreased time-dependently by PEG-treatment. The maximal photosynthetic rate of O_2 evolution (Pmax) was linearly decreased with increasing time of photoinhibitory treatment exhibiting 30% inhibition after 6 h. The decrease in Pmax was also linearly correlated with the decrease in the water potential of leaf showing 50% inhibition after 6 h. However, if photoinhibitory treatment was given together with dehydration, Pmax was synergistically decreased in a hyperbolic fashion showing near complete inhibition just after 2 h. Photoinhibitory treatment decreased the maximal photochemical efficiency (Fv/Fm), but dehydration did not. When photoinhibition was given together with dehydration, Fv/Fm were similarly decreased as in photoinhibition alone. The number of functional Photosystem (PS) II was not decreased by dehydration alone, but was decreased to the same extent by photoinhibition alone or together with photoinhibition. The photochemical quenching was decreased more by simultaneous treatment of dehydration and high light than high light treatment alone while nonphotochemical quenching (NPQ) was similarly decreased by photoinhibition alone or photoinhibition together with dehydration. The results would indicate that no incremental damage to PS II occurred when photoinhibition was given together with dehydration although overall photosynthetic efficiency was exacerbated.

Keywords: photoinhibition, dehydration, photosynthesis, functional PS II, chlorophyll fluorescence