Differential Gene Expression in Plants Stressed by the Peroxidizing Herbicide Oxyfluorfen [§]

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The response of plants to the peroxidizing herbicide oxyfluorfen was investigated. The action of this *p*-nitrodiphenyl ether is based on inhibition of plastidic protoporphyrinogen oxidase, which leads to accumulation of protoporphyrin IX in the cytosol yielding reactive oxygen species by light activation. The induction of activities of antioxidative enzymes was followed in *Nicotiana tabacum* plants, var. BelW3. Glutathione reductase activity was elevated by 75% compared to control, monodehydroascorbate reductase by 65% and glutathione *S*-transferase by 110%. The mRNA of ascorbate peroxidase and catalase isoform 2 was induced, the catalase isoform 1 was reduced. These findings were confirmed and supported by measuring enzymatic activity changes in photoheterotrophically grown soybean (*Glycine max*) suspension cultures. To find a possible involvement of compounds regulating oxidative stress response, we investigated the influence of salicylic acid and BTH (benzo(1,2,3)thiadiazole-7-carbothioic acid *S*-methylester), both inducers of pathogen defense, on soybean cell suspension cultures. The specific activities of glutathione reductase, monodehydroascorbate reductase and glutathione *S*-transferase increased strongly, comparable to oxyfluorfen treatment. Both compounds protected the cells against oxyfluorfen-induced lipid peroxidation and alleviated the accumulation of protoporphyrin IX.