Transformation of Tobacco with a Mutated Cyanobacterial Phytoene Desaturase Gene Confers Resistance to Bleaching Herbicides

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Carotenoids are constituents of the photosynthetic apparatus and essential for plant survival because of their involvement in protection of chlorophylls against photooxidation. Certain classes of herbicides are interfering with carotenoid biosynthesis leading to pigment destruction and a bleached plant phenotype. One important target site for bleaching herbicides is the enzyme phytoene desaturase catalysing the desaturation of phytoene in ζ-carotene. This enzymatic reaction can be inhibited by norflurazon or fluridone. We have transformed tobacco with a mutated cyanobacterial phytoene desaturase gene (*pds*) derived from the *Synechococcus* PCC 7942 mutant NFZ4. Characterization of the resulting transformants revealed an up to 58 fold higher norflurazon resistance in comparison to wild type controls. The tolerance for fluridone was also increased 3 fold in the transgenics. Furthermore, the transformed tobacco maintained a higher level of D1 protein of photosystem II indicating a lower susceptibility to photooxidative damage in the presence of norflurazon. In contrast, the genetic manipulation did not confer herbicide resistance against ζ-carotene desaturase inhibitors.