Photosynthetic Pigments, Photosynthesis and Plastid Ultrastructure in *Rbc*S Antisense DNA Mutants of Tobacco (*Nicotiana tabacum*)

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*Rbc*S antisense DNA mutants of tobacco have reduced amounts of ribulose bisphosphate carboxylase oxygenase (Rubisco). We found that carotenoid and chlorophyll contents decrease in parallel as Rubisco is decreased, however, pigment levels are not significantly altered until Rubisco levels are reduced sharply. The mutants have normal Chl *a* /Chl *b* ratios and normal plastid ultrastructures, suggesting that reductions in Rubisco do not dramatically alter the composition of the thylakoid membranes. Nevertheless, chlorophyll fluorescence measurements, in which developmentally homogenous leaves were sampled, showed that there is reduced photosynthetic capacity of PSII and an enhanced photosensitivity in the mutants, especially in transgenics with severe reductions in Rubisco content. Support for this conclusion comes from several observations: 1) light saturation occurs at a lower light intensity in the mutants, resulting in an earlier closure of PS II (lower photochemical quenching); 2) the mutants have reduced photosynthetic efficiency (lower $\Delta F/Fm'$); and 3) the mutants have a slower recovery of Fv/Fm. We found that acclimation to increasing light intensies in the mutants appears to involve an enhanced inactivation of PSII reaction centers as well as an increased activation of photoprotective mechanisms, notably an engagement of the xanthophyll cycle at lower than normal light intensities. We conclude that the photosensitivity of the antisense mutants is due, in part, to a limitation in Rubisco activation state.