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Title of the Thesis:

"Biochemical and Physiological Analyses of Transgenic Plants Expressing *γ-TMT* Gene Under Constitutive and Seed-Specific Promoter"

Abstract

The major objective of my doctoral work was to evaluate the efficacy of increased α-tocopherol levels in an important oilseed crop *Brassica juncea* in conferring better tolerance against abiotic stress. About 6-fold increased production of α-tocopherol was obtained in *Brassica juncea* transformed with *γ-TMT* gene. The increased α-tocopherol content in the transgenic plants was seen to confer advantage to them over the wild type control ones when grown under different abiotic stress conditions. The JIP-test has been used to obtain information on the effects of the applied stresses on different sites of the photosynthetic machinery. I have also looked at the interaction of increased α-tocopherol levels with other antioxidant molecules and enzymes present in the cell. Our findings implicate the role of higher α-tocopherol levels in conferring better tolerance against salt, heavy metal, and osmotic stresses and also establish the existence of interplay between this lipid-soluble antioxidant and other water-soluble components of plant antioxidant defense and the differences between the α-tocopherol enriched transgenic and wild type control plants at the proteome level using 2-D protein electrophoresis followed by MALDI-TOF MS and MS/MS was also analyzed. The *γ-TMT* cDNA from *B. juncea* (*BjTMT*) has also been cloned in the laboratory (Accession no: DQ864978). The transgenic *Brassica juncea* plants was generated by overexpression of *BjTMT* under the control of constitutive and seed-specific promoter resulted in upto 11-fold higher levels of α-tocopherol as compared to the wild type control plants. The tocopherol profile, as estimated by HPLC, was found to be developmentally regulated and was also observed to change

under various abiotic stress conditions. The efficacy of the α-tocopherol enriched transgenic *Brassica juncea* seeds on modulatory effects on the components of xenobiotic metabolism and antioxidant enzyme system in animal models are expected to have chemopreventive significance in protection against different cancers, have given an insight to work further efficacy in animal models of cancer are under investigation in our laboratory.