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OVER-EXPRESSION OF A TOMATO GLUTATHIONE S-TRANSFERASE GENE HIGHLIGHTED ITS ROLE IN CONTROLLING THE CELL REDOX STATE

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Supplying food to an ever-increasing population is one of the biggest challenges that humans are facing with at a global level. Crops often fail to provide sustainable yields under environmental extremes and this can be even exacerbated by global warming. The functional characterization of stress-responsive genes is critical to confirm their involvement into plant response to stress. The aim of this research was to add insights on the role of a tomato glutathione S-transferase (GST) gene in regulating the cell redox homeostasis.

Because of its homology to the GST Tau 28 of A. thaliana (AT1g53680), the tomato Solyc07g056420 was included in the Tau GST family thus, inferring its involvement in the regulation of the cell redox system and in the control of tolerance to abiotic stresses.

The functional characterization of the Solyc07g056420 gene was carried out through overexpression induced by heterologous genetic transformation of tobacco. The expression of the Solyc07g056420 led to a significant non-linear reduction in the total flavonoid content, an effect on chlorophyll A, chlorophyll B and total carotenoids and xanthophylls content. The production of hydrogen peroxide in tobacco leaves showed an increasing trend correlating with the lipophilic and total antioxidant activity. Evidences suggest that the overexpression of GST can induce hyper-production of hydrogen peroxide that the plant controls by adjusting the antioxidant capacity.

The present results highlight the involvement of the GST Solyc07g056420 in the modulation of the cell redox balance and in the regulation of the photosynthetic apparatus. Ongoing experiments will investigate genetic mechanisms involving the expression of the GST and the regulation of the plant response to biotic and abiotic stresses. As a regulator of redox homeostasis, the Solyc07g056420 gene could open interesting perspectives towards the engineering of resilient plants for future scenarios arising from global warming.