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Glutathione peroxidases act as important antioxidant regulators in response of mulberry to drought stress

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Summary: The iTRAQ-based proteomic analysis revealed that thiol-dependent enzymes especially glutathione peroxidases (GPXs) play a significant role in response to drought. Drought stress induces the expression of GPXs at the transcript and protein levels.The significant increase of GPX enzymatic activity further demonstrated that GPX-dependent antioxidant system has positive function in mulberry response to drought. Overexpression of MaGPX3 and MaGPX5 strongly increase the activities of GPX and enhance the capacities of whole antioxidant system in the transgenic plants under drought stress.

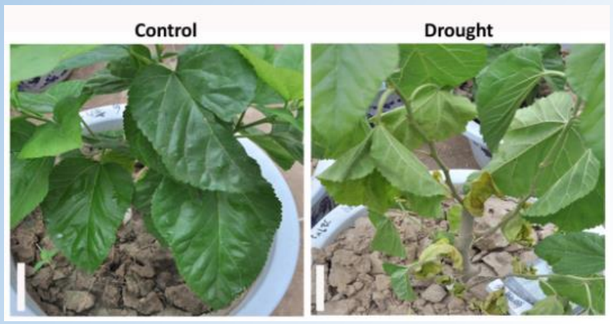

Fig.1 Mulberry seedlings displayed a drought stressed phenotype after drought treatment, drought stress significantly repressed mulberry growth and development.

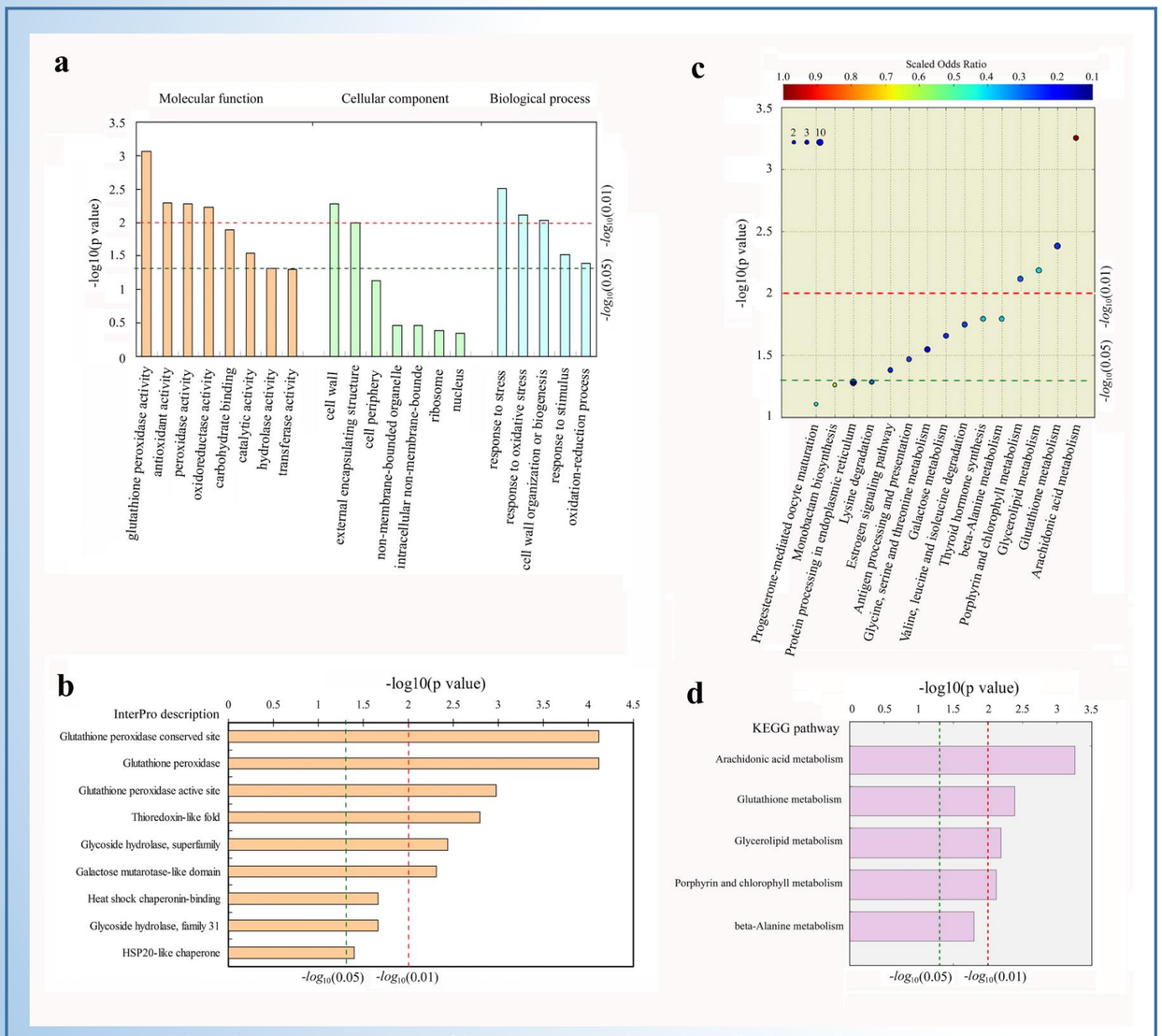

Fig.2 Notably, the proteomic profiles associated with cellular redox and antioxidant system were extensively changed by drought stress. Some thiol-dependent antioxidant enzymes especially the glutathione peroxidase (GPX) proteins, acting as scavenger of reactive oxygen species (ROS), were extensively up-regulated, whereas another important ROS scavenger, ascorbate peroxidase (APX) was significantly decreased under drought stress.

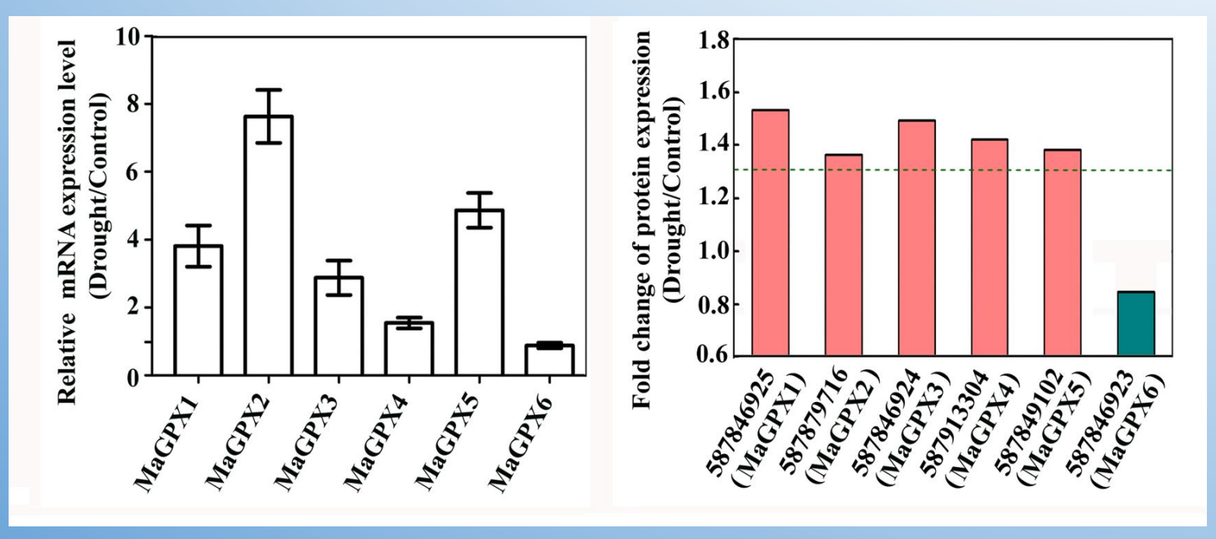

Fig.3 Mulberry genome encodes six GPX isoforms, five of them were significantly induced by drought stress, indicating a significant role of GPX in response to drought.

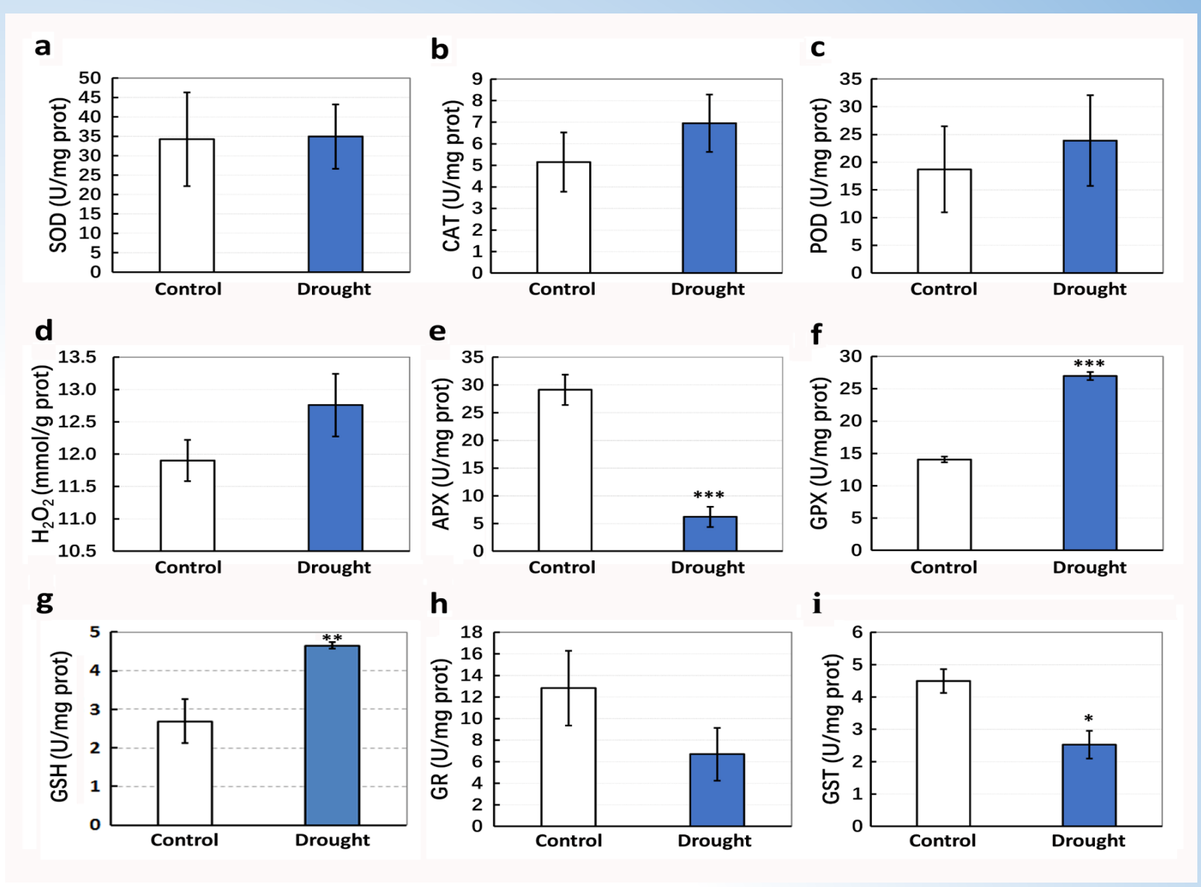

Fig.4 GPX for ROS-scavenging modulates mulberry response to drought stress.

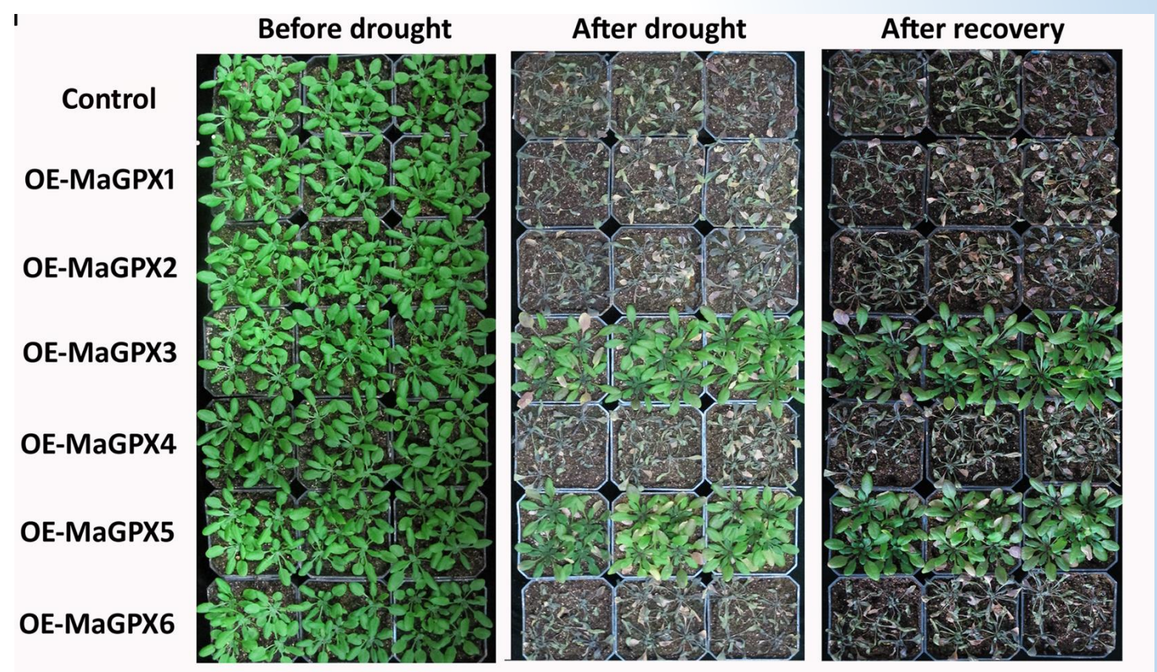

Fig.5 The overexpression of mulberry *MaGPX3* and *MaGPX5* in *Arabidopsis* led to comprehensive enhancement of antioxidant system and ROS-scavenging capacity and drought tolerance in the transgenic plants.

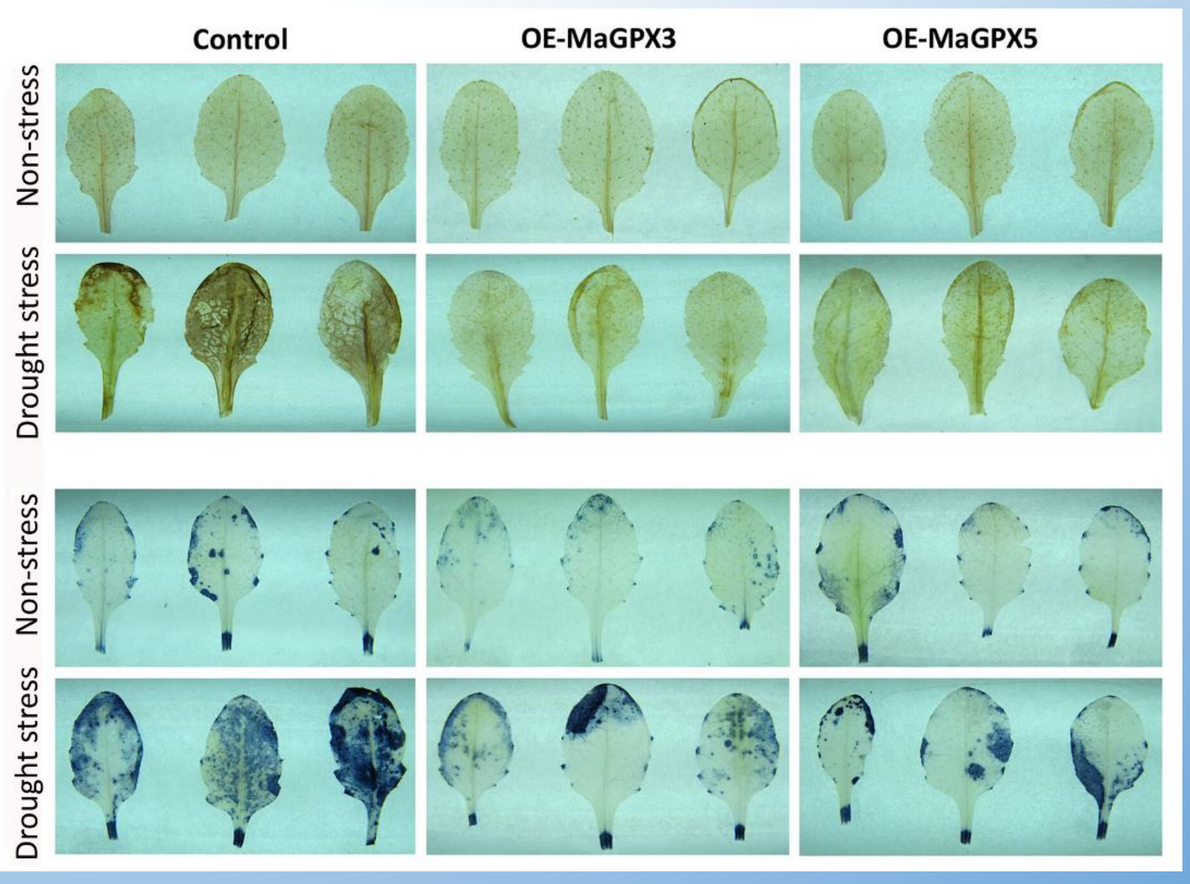

Fig.6 Under drought stress condition, the leaves in MaGPX3 and MaGPX5 transgenic lines had significantly less staining by DAB and NBT as compared with that of control