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CsUGT84J2 exhibiting activity on both flavonols and auxins in root growth of tea plants induced by aluminum

Sanyan Lai[1], Xiaolan Jiang[1], Liping Gao[2] and Tao Xia[1*]

[1]State Key Laboratory of Tea Plant Biology and Utilization, Anhui Agricultural University, Hefei, Anhui 230036, China

[2]School of Life Science, Anhui Agricultural University, Hefei, Anhui 230036, China

Abstract

Although aluminum is not necessary or even toxic to most plants, it is indispensable for growth of tea plants. The mechanism by which aluminum regulates root growth of tea plant remains obscure. In this paper, an aluminum-induced UDP glycosyltransferase (CsUGT84J2) was discovered to be involved in this mechanism. Enzyme activity experiments showed that rCsUGT84J2 had catalytic activity on multiple types of substrates, including phenolic acid, flavonol and auxin *in vitro*. The metabolic analysis based on UPLC-QqQ-MS/MS showed that the accumulation of flavonols and auxin glycosides were increased significantly in *CsUGT84J2*-overexpressed *Arabidopsis thaliana*. And the gene expression of the flavonol and auxin pathways were increased in *CsUGT84J2*-overexpressed *Arabidopsis* and decreased in *CsUGT84J2*-silenced tea plants, respectively. In conclusion, aluminum treatment could induce the expression of *CsUGT84J2*, promote the glycosylation of flavonol and auxin in tea roots, and then regulate the homeostasis of endogenous auxin, thus promoting the growth of tea plants.

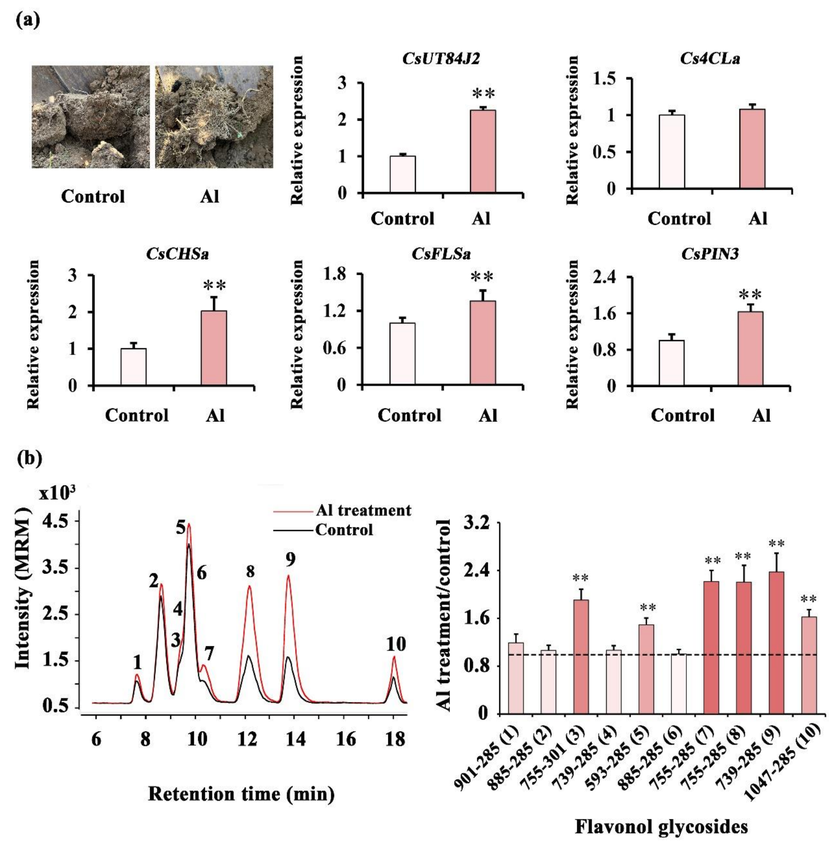

Fig. 5 The gene expression pattern and metabolic changes of flavonols and auxins biosynthetic pathway under aluminum treatment in the tea plant.

Results

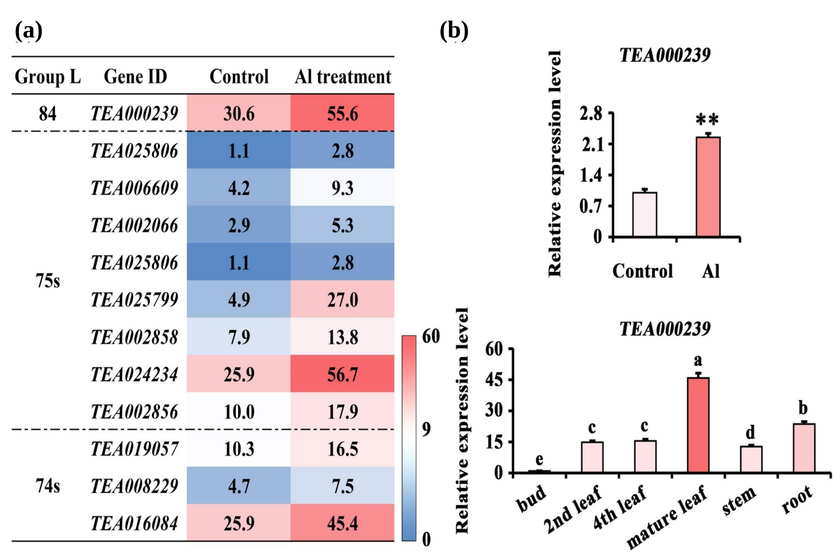

Fig. 1 Identification of an Al-induced UGT in the tea plant.

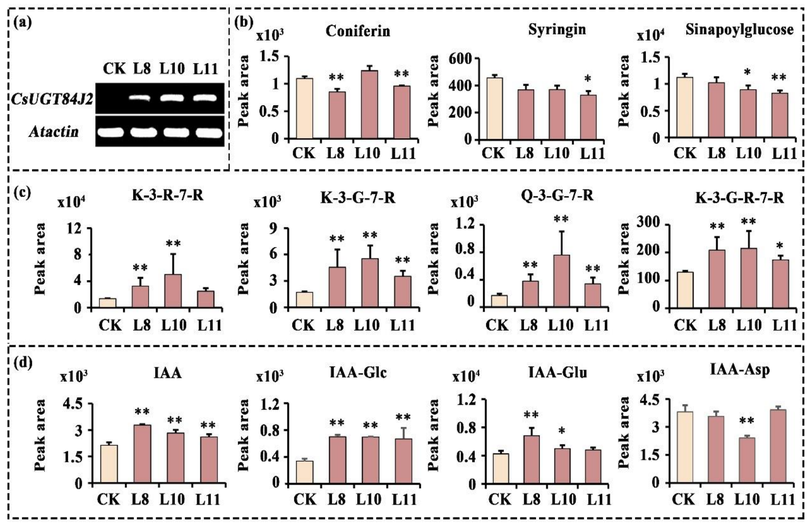

Fig. 3 Metabolic analysis of phenolic acid, flavonols and auxins in *CsUGT84J2*-overexpressed *Arabidopsis thaliana*.

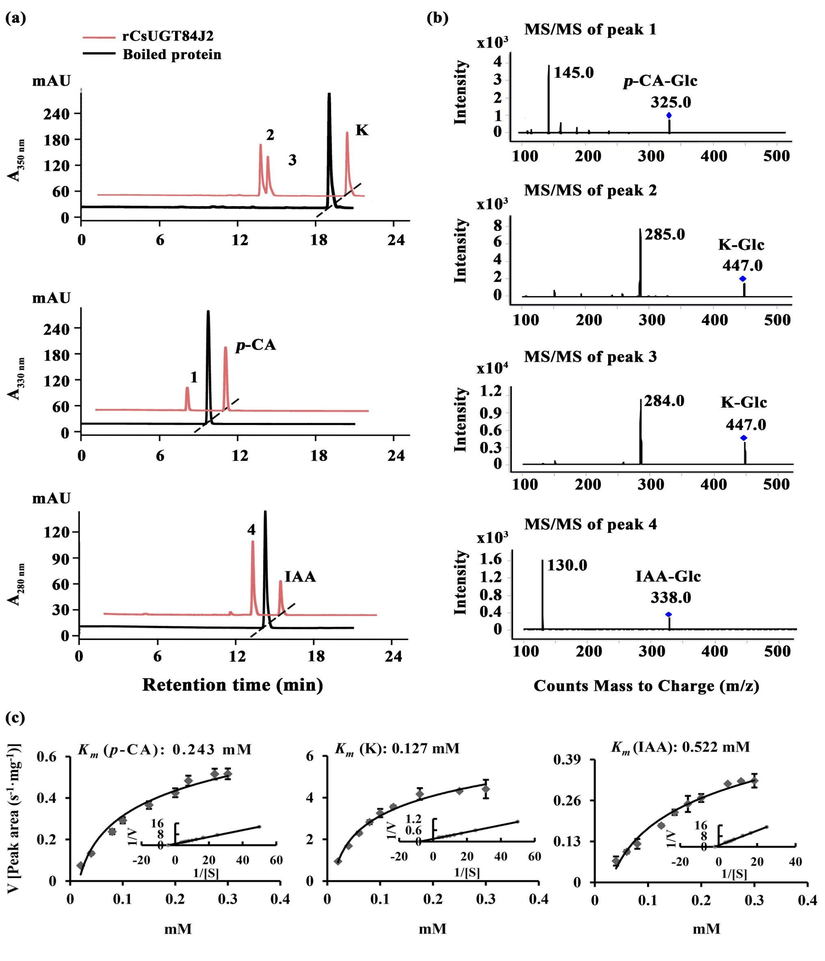

Fig. 2 UPLC and UPLC-QqQ-MS/MS analyses of enzymatic products of the rCsUGT84J2.

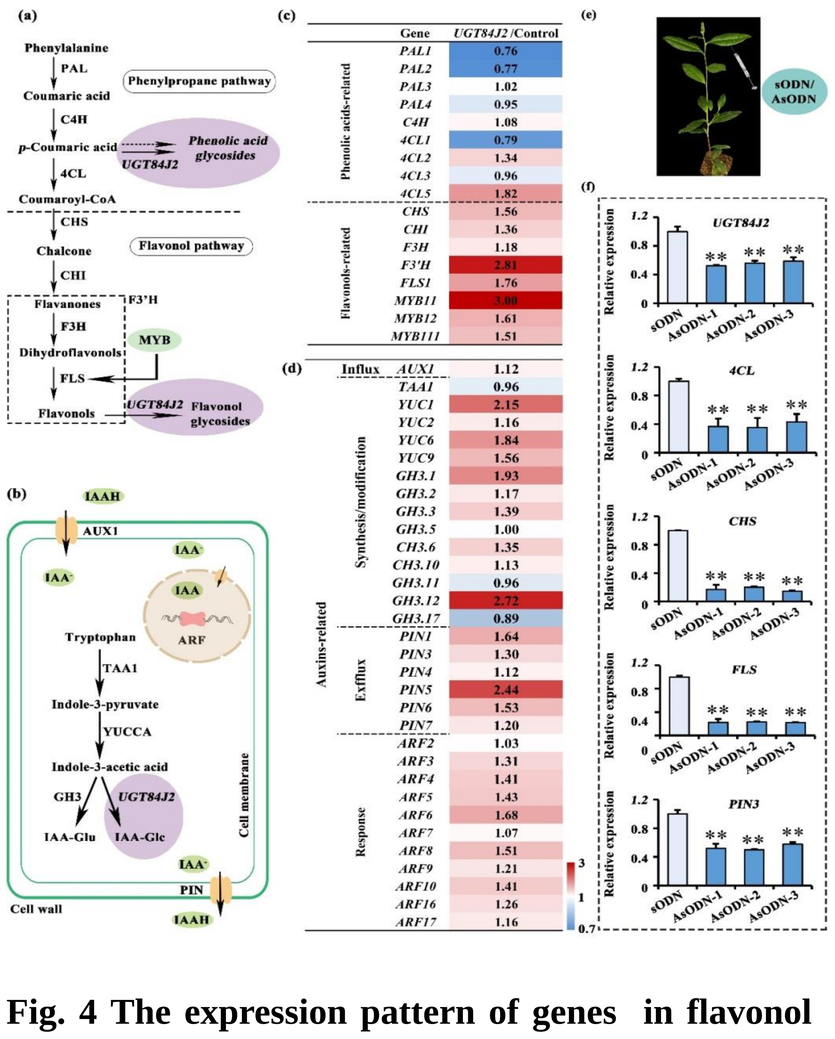

Fig. 4 The expression pattern of genes in flavonol and auxin pathways in *CsUGT84J2*-overexpressed *Arabidopsis* and *CsUGT84J2*-silenced tea plants

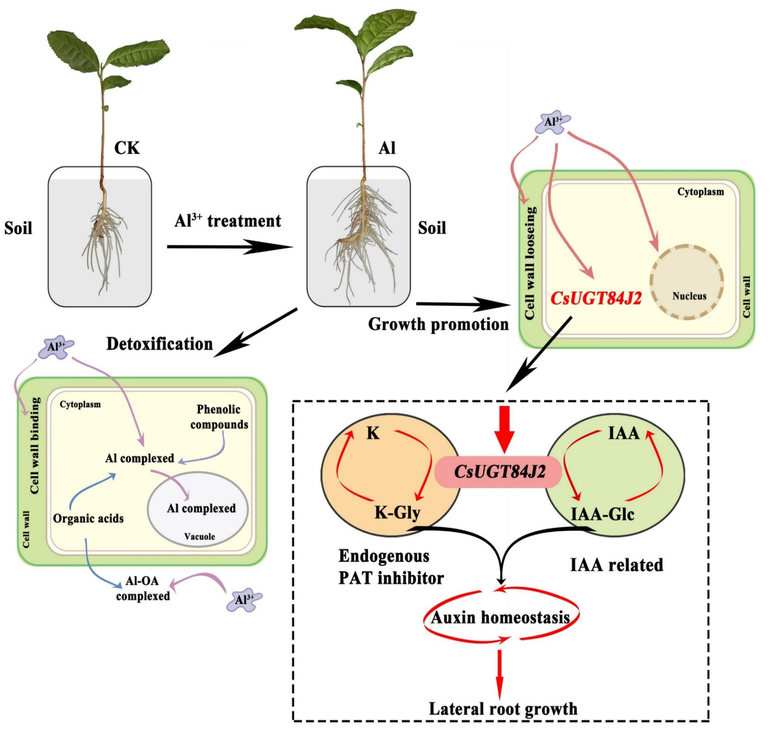

Fig. 6 Work model of *CsUGT84J2* promotion the growth of tea plant under aluminum treatment.

Acknowledgments

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