

## The 9<sup>th</sup> International *Horticulture Research* Conference



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

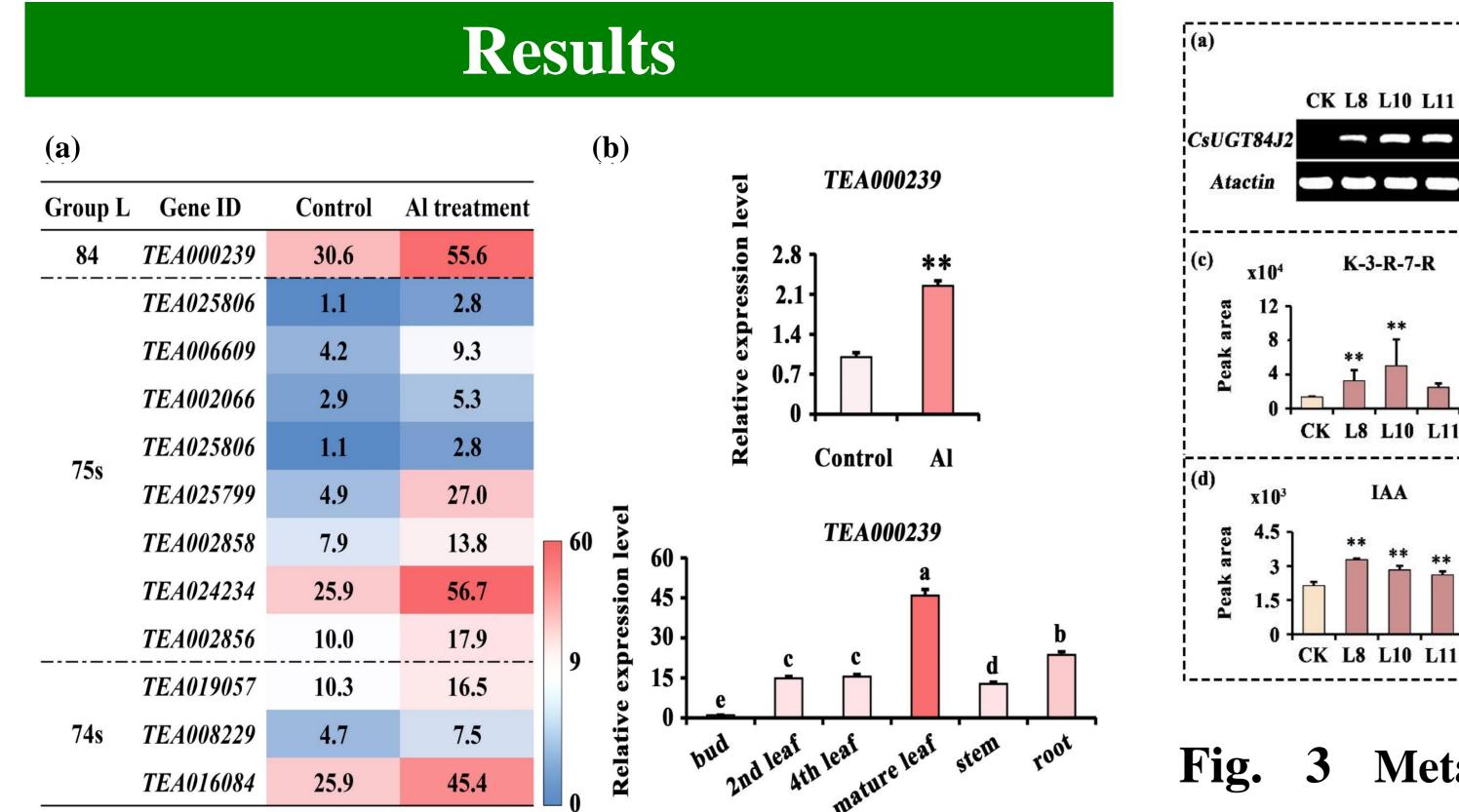
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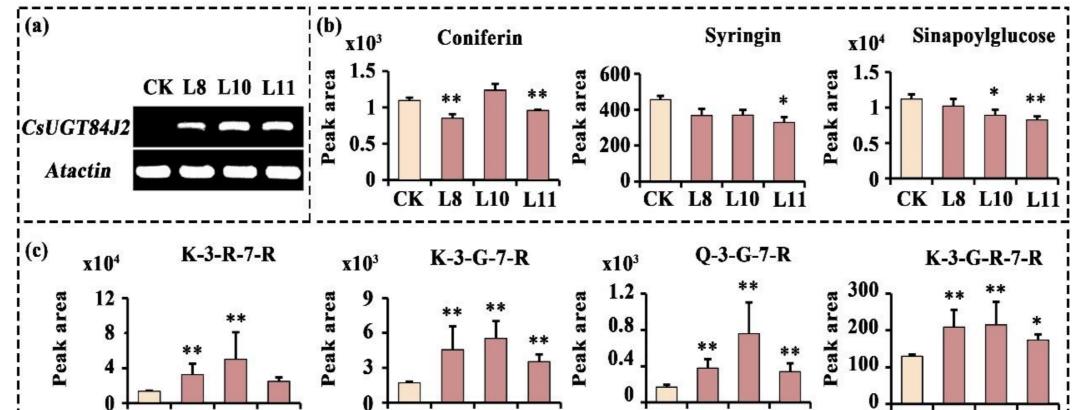
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## Abstract

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 **(a)** 

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 CsUGT84J2overexpressed 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.





CK L8 L10 L11

CK L8 L10 L1

CK L8 L10 L11

AA-Asp

CK L8 L10 L11

CHS

0.8

0.8

CK L8 L10 L1

CK L8 L10 L11

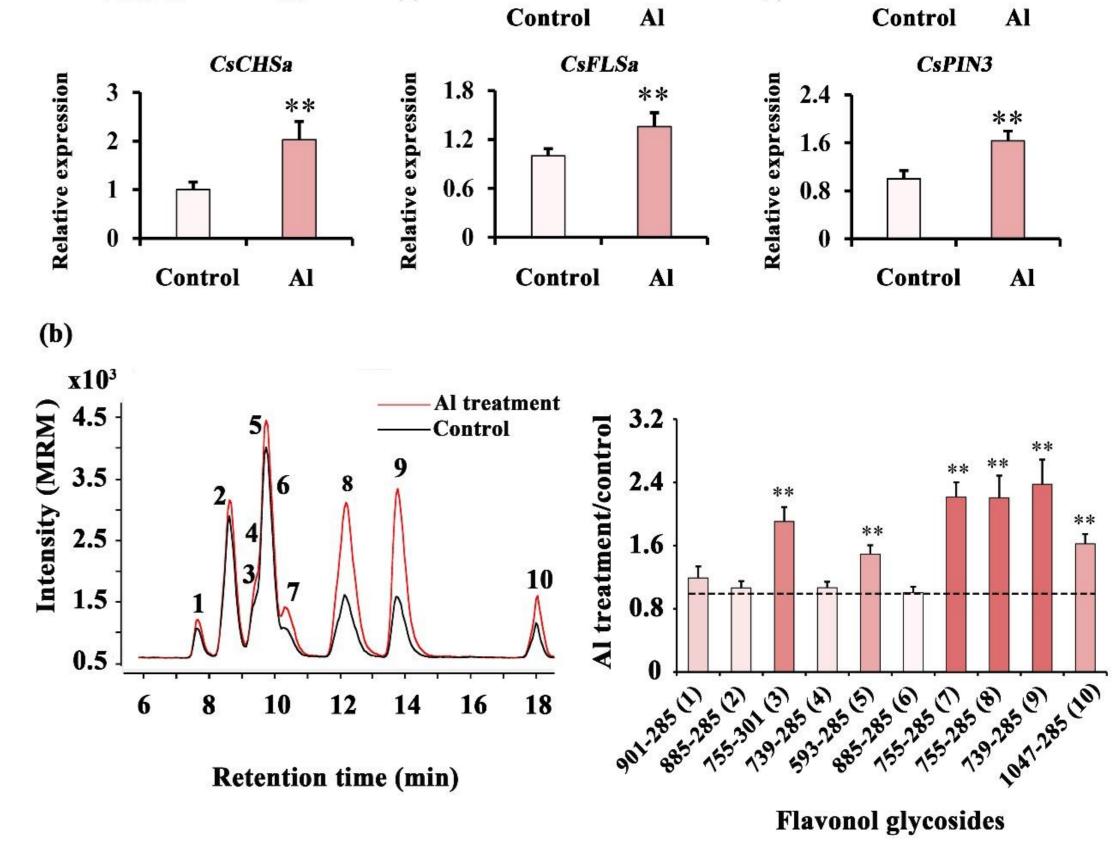
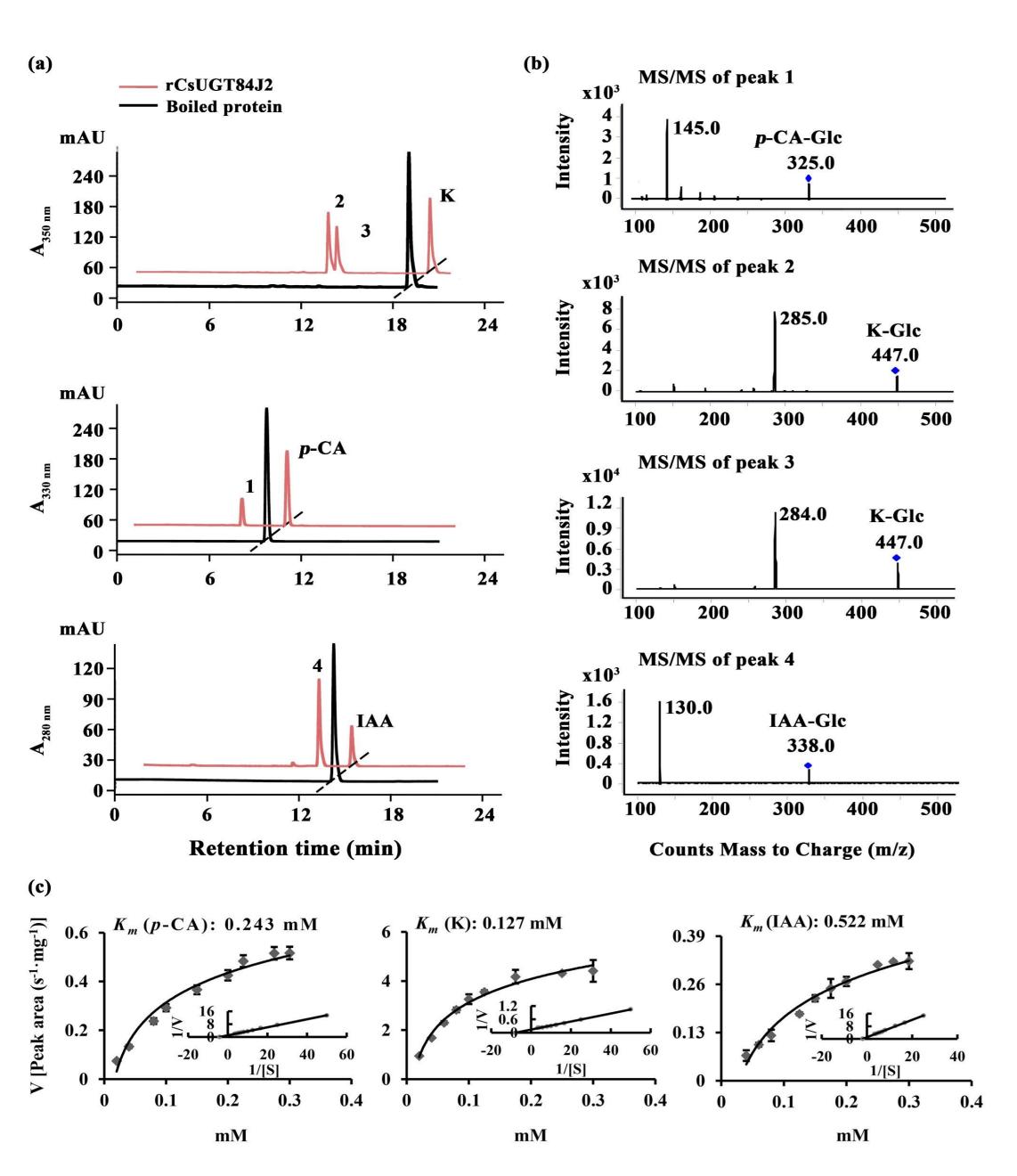


Fig. 5 The gene expression pattern and metabolic changes of flavonols and auxins biosynthetic pathway under aluminum treatment in the tea plant.

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



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

Gene UGT84J2/Control Phenylalanine 0.76 PALI PAL 0.77 PAL2 Phenylpropane pathway sODN/ 1.02 PAL3 **Coumaric** acid AsODN 0.95 PAL4 C4H C4H1.08 4CL1 0.79 Phenolic ac p-Coumaric acid 4CL2 1.34 4CL 4CL3 0.96 4CL5 1.82 Coumaroyl-CoA 1.56 CHS UGT84J2 CHS CHI 1.36 Flavonol pathway 0.8 -F3H 1.18 Chalcone F3'H CHI 1.76 FLS1 MYB11 3.00 Flavanones MYB12 1.61 F3H MYB111 1.51 Dihydroflavonols Influx AUXI 1.12 0.96 TAAI 0.8 2.15 JGT84J2 Flavono YUCI YUC2 1.16 YUC6 YUC9 1.56 SODN DN-1 ODN-2 ODN-3 GH3.1 1.93

GH3.2

GH3.3

GH3.5

CH3.6

CH3.10

GH3.11

GH3.12

PINI

PIN3

PIN4

PIN5

PIN6 PIN7

ARF2

ARF3

ARF4

ARF5

ARF6

ARF7

ARF8

ARF9

ARF10

ARF16

ARF17

GH3.17

AUX1

Tryptophan

Indole-3-pyruvate

Indole-3-acetic acid

IAA-Glu IAA-Glc

GH3/

Cell wall

TAA1

YUCCA

UGT84J2

IAA-

IAA

m

ARF

PIN

1.17

1.39

1.00

1.35

1.13

0.89

1.64

1.30

1.12

2.44

1.53

1.20

1.03 1.31

1.41

1.43

1.68 1.07

1.51

1.21

1.41

1.26

1.16

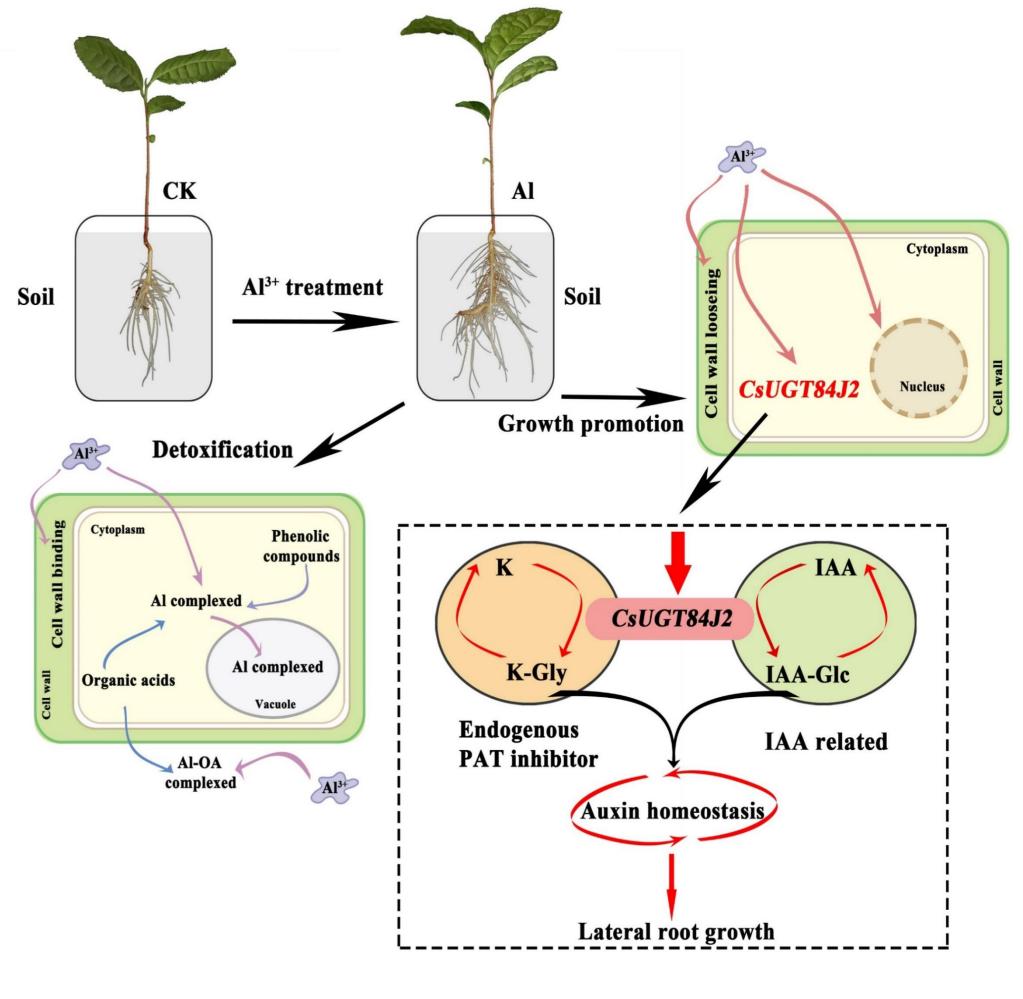


Fig. 6 Work model of CsUGT84J2 promotion the growth of tea plant under aluminum treatment.

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

## Acknowledgments

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