

## Eucalyptol serves a signaling function to enhance *Cinnamomum camphora* thermotolerance

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### INTRODUCTION

*Cinnamomum camphora* releases an abundance of monoterpenes to tolerate high temperature, and is subdivided into 5 chemotypes, such as camphor chemotype, eucalyptol chemotype, linalool chemotype, borneol chemotype and isonerolidol chemotype. It is widely reported that the isoprenoids emission is beneficial to plant thermotolerance. However, the thermotolerance mechanism of these isoprenoids is unclear. To uncover thermotolerance mechanism of the uppermost monoterpenes in *C. camphora* and promote their development as anti-high temperature agents, the thermotolerance functions of eucalyptol in the corresponding chemotype of *C. camphora* were investigated.

### METHOD



Treatments  
28°C  
38°C  
Fos+38°C  
Fos+38°C+eucalyptol

Determination of ROS and TBARS content

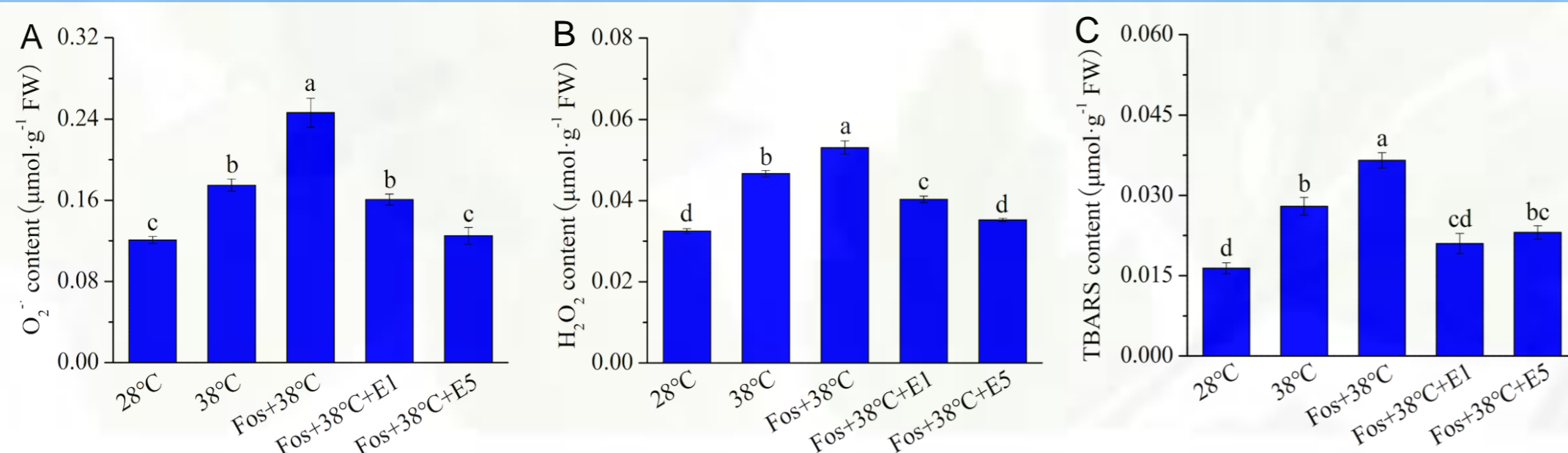
Assessment of SOD and POD activities

Determination of photosynthetic pigment levels and photosynthetic abilities

Transcriptome analysis

### RESULTS

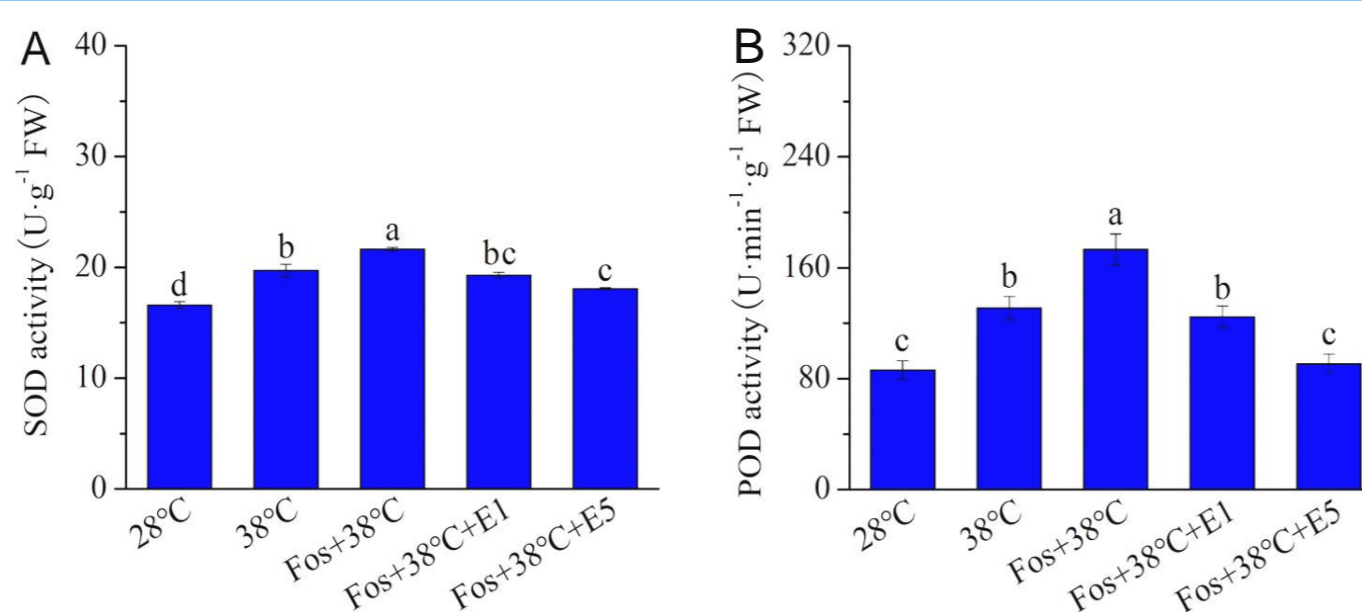
#### Changes in ROS and TBARS content



In contrast to 28°C, ROS and TBARS levels increased under 38°C, and further increased in the treatment with fosmidomycin (Fos) at 38°C (Fos+38°C) but decreased in Fos+38°C treatment with eucalyptol fumigation (Fos+38°C+eucalyptol).

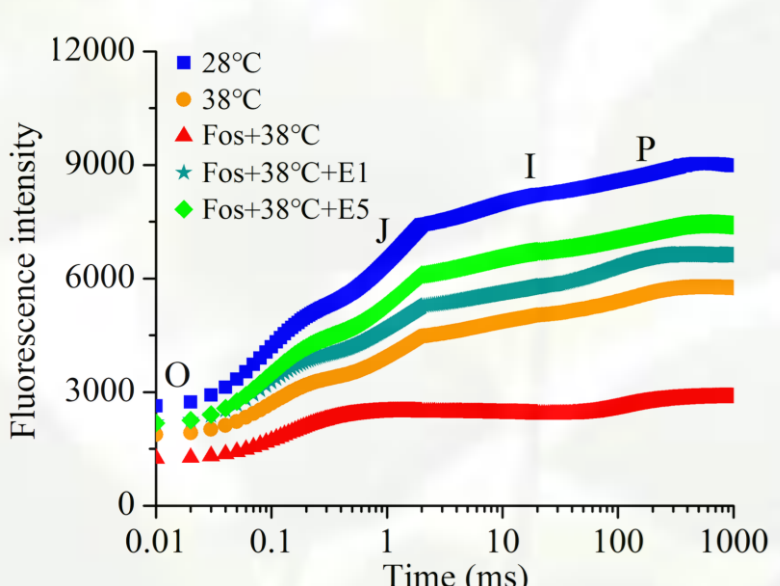
#### Variations in SOD and POD activities

Similar to ROS and TBARS levels, the activities of SOD and POD increased under 38°C, and further increased in Fos+38°C treatment, but decreased in Fos+38°C+eucalyptol treatment.



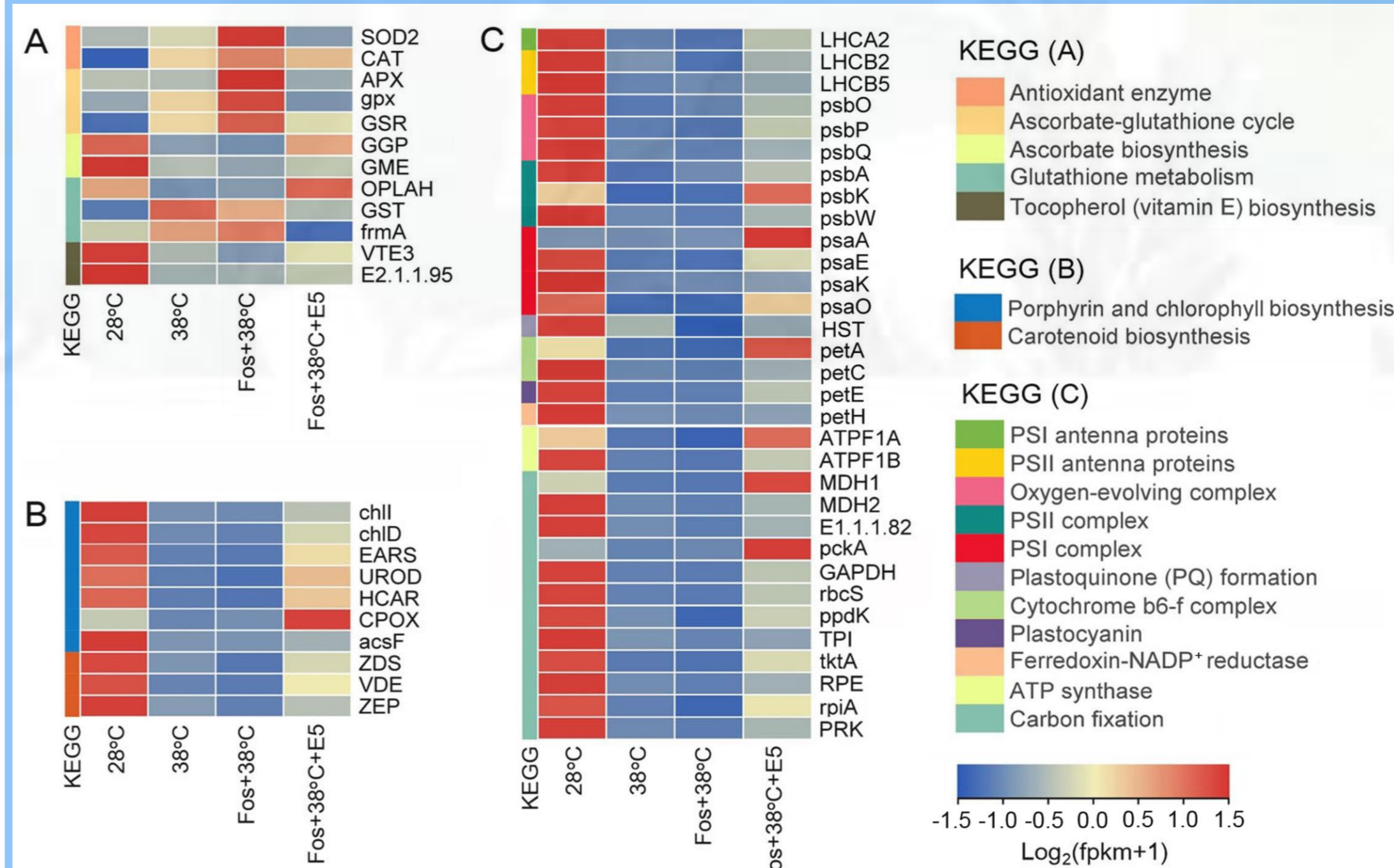
#### Variations in photosynthetic pigment levels and photosynthetic abilities

	Chlorophyll a (μg·mm <sup>-2</sup> )	Chlorophyll b (μg·mm <sup>-2</sup> )	Carotenoids (μg·mm <sup>-2</sup> )	φP <sub>O</sub>	φD <sub>O</sub>
28°C	1.01 ± 0.01a	0.37 ± 0.01a	0.28 ± 0.01a	0.71 ± 0.01a	0.29 ± 0.01d
38°C	0.66 ± 0.02c	0.27 ± 0.01c	0.20 ± 0.02bc	0.62 ± 0.01c	0.38 ± 0.01b
Fos+38°C	0.49 ± 0.02d	0.23 ± 0.01d	0.13 ± 0.01d	0.55 ± 0.01d	0.45 ± 0.01a
Fos+38°C+E1	0.68 ± 0.01c	0.26 ± 0.02cd	0.19 ± 0.01c	0.64 ± 0.01c	0.36 ± 0.01b
Fos+38°C+E5	0.87 ± 0.01b	0.33 ± 0.01b	0.24 ± 0.01b	0.67 ± 0.01b	0.33 ± 0.01c



High temperature at 38°C reduced the chlorophyll and carotenoid content as well as photosynthetic abilities. Fos+38°C treatment aggravated the reduction, but Fos+38°C+eucalyptol treatment countered or even reversing this trend.

#### Alterations in gene expression levels



Compared with 28°C, 38°C treatment changed expression of 12 genes related with antioxidation (A). This alteration further aggravated in the treatment with Fos+38°C. The expression levels of these genes in Fos+38°C+eucalyptol treatment were similar with or trended to that at 28°C. The similar alterations were also found in expression of 10 genes in photosynthetic pigment biosynthesis (B) and 28 genes in photosynthetic abilities (C).

### CONCLUSION

- (1) Eucalyptol fumigation lowered ROS levels and antioxidant enzyme activities for increased non-enzymatic antioxidant gene expression and decreased enzymatic antioxidant gene expression.
  - (2) Eucalyptol fumigation increased photosynthetic pigment content and improved photosynthetic abilities by up-regulating related gene expression.
- Therefore, eucalyptol should serve important signaling functions in enhancing *C. camphora* thermotolerance.