

Integrated metabolome and transcriptome analyses provide new insight into norisoprenoid biosynthesis of winegrape (*Vitis vinifera* L. cv. Cabernet Sauvignon)

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Introduction:

Norisoprenoids are a group of pleasant aromatic substances that bring floral and fruity odor to grape berry and wine. But there are few studies on the molecular regulatory mechanism of norisoprenoid biosynthesis, even though in the other plants.

In this study, we performed transcriptomic and metabolomic analyses of 17 developmental periods in grapevines. It was found that several structural genes and transcription factors (TFs) were possibly involved in the production and regulation of important norisoprenoid component, β -damascenone, which provides essential insights into the complex regulatory mechanisms of norisoprenoids accumulation in developing grape berries.

Result 1:

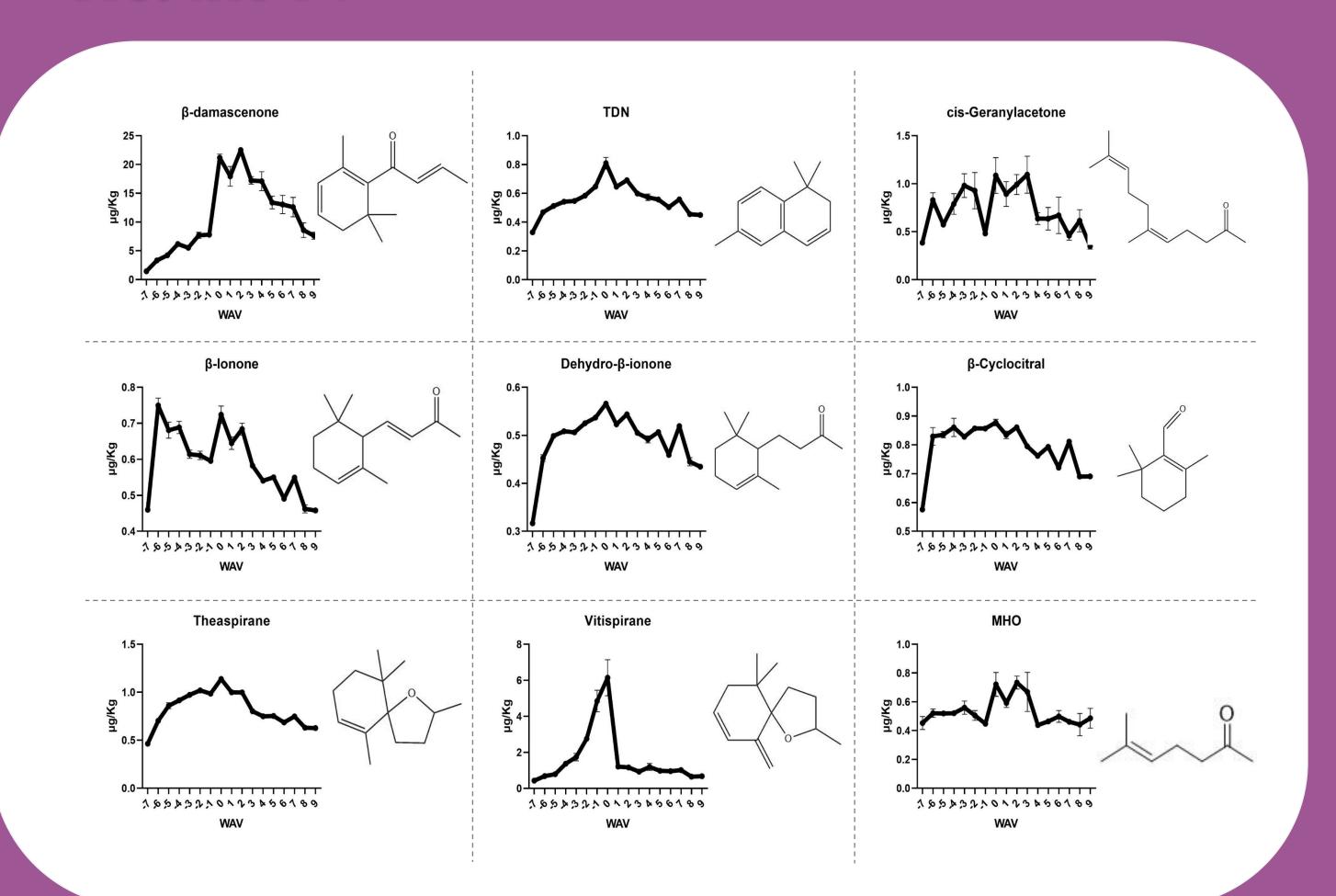


Fig. 1 Nine norisoprenoid metabolites showed an increasing and then a decreasong trend, and the transition mainly occured at Veraison stage.

Result 2:

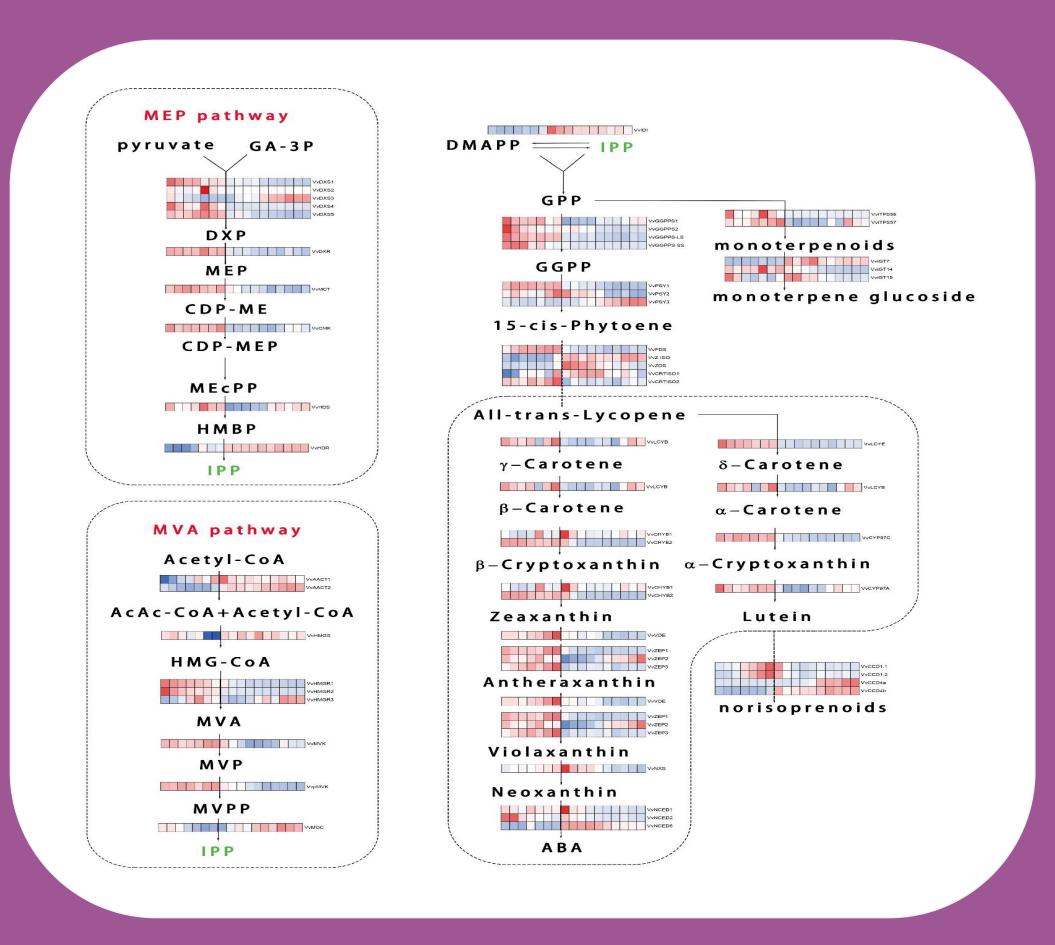


Fig. 2 The most genes involving in norisoprenoid biosynthetic pathway displayed an obvious reduced expression at Veraison.

Result 3:

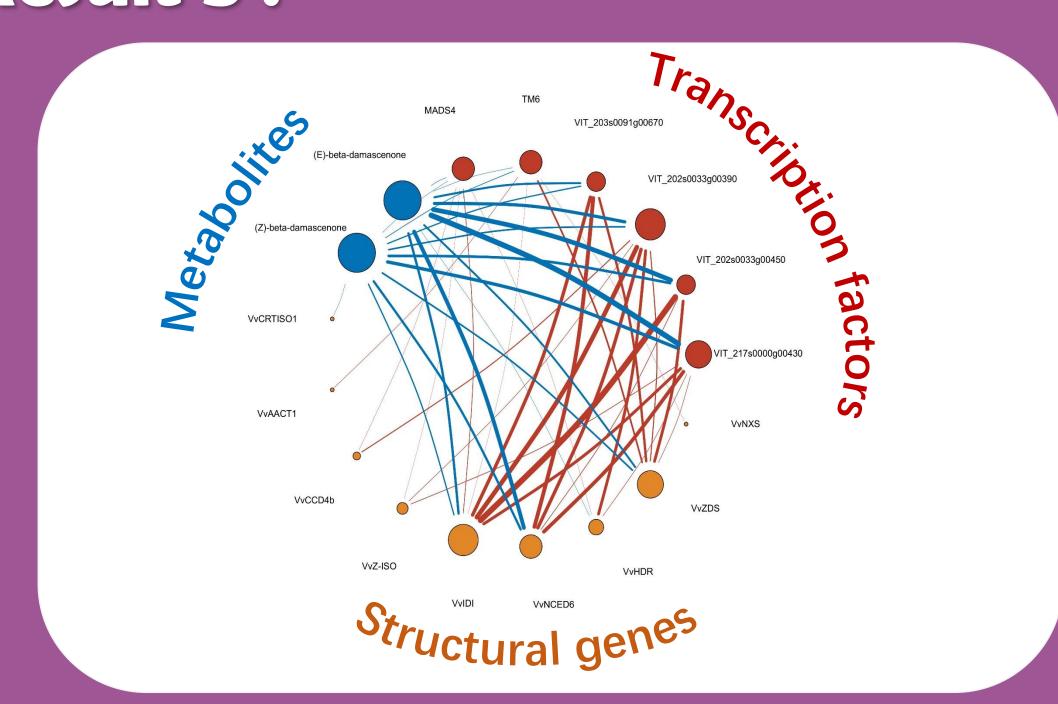


Fig. 3 Network was constructed to propose critical genes and transcription factors associated with β -damascenone accumulation.

Result 4:

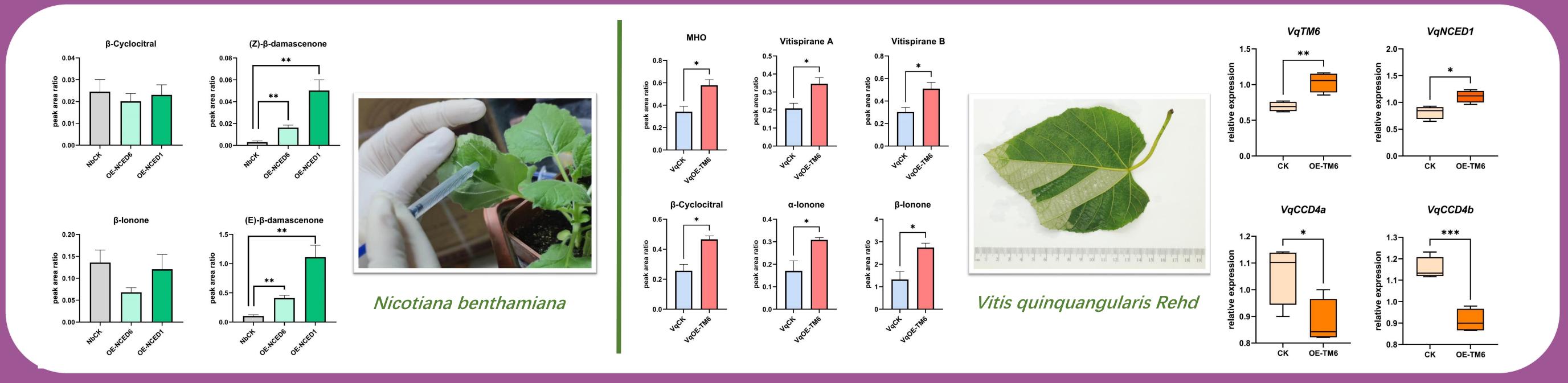


Fig. 4 The content of β-damascenone was increased in *VvNCEDs* transiently overexpressed *N.b.* leaves.

Fig. 5 The contents of norisoprenoid compounds were all improved in *VvTM6* transiently overexpressed *V.g.* leaves.

Fig. 6 VqCCDs were downregulated and both VqTM6 and VqNCED1 were upregulated in VvTM6 transiently overexpressed V.q. leaves.

Conclusions:

- VvNCED1 is a key enzyme involved in the β -damascenone biosynthesis in developing grape berry;
- Transcription factor TM6 may be involved in the regulation of norisoprenoid biosynthesis by regulating the expression of *NCED1* and *VqCCD4a/b*.

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