

# Biocontrol mechanism of *Bacillus velezensis* XS142 against Sunflower Verticillium Wilt

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## INTRODUCTION

The difficulties in crop rotation facilitated the occurrence of different soil-borne diseases and affected the yield and quality of sunflower seriously. Meanwhile, the traditional cropping system between sunflower and potato in Inner Mongolia region accelerated the severity of soil-borne diseases of sunflower. We isolated *Bacillus velezensis* XS142 from soil rhizosphere of potato, and it has antagonist effects on potato wilt, this promoted us to test its effects on controlling sunflower Verticillium wilt.

## MATERIAL METHODS

In this study, the efficacy of *B. velezensis* XS142 in controlling sunflower Verticillium wilt was validated through plate assays and pot experiments. The colonization ability was explored using a XS142-GFP strain, while the non-volatile metabolites of *B. velezensis* XS142 were analyzed by LC/MS.

## RESULTS AND DISCUSSION

Preliminary data indicated that XS142 exhibits a certain broad-spectrum antifungal activity against pathogenic fungi which caused Sunflower Verticillium Wilt (SVW) on plates. *B. velezensis* XS142 is capable of affecting the hyphal morphology and toxin secretion level of *V. dahliae*. Indoor pot experiments showed that, when the roots of sunflower plants were pretreated with the suspension of XS142, followed by artificial inoculation with *Verticillium dahliae*, reduced the disease index of sunflower Verticillium wilt. Additionally, the stable colonization of XS142 on the roots of sunflower was confirmed by using GFP tag. After pretreatment with XS142, accumulation of H<sub>2</sub>O<sub>2</sub>, and activity of defense-related enzymes (such as POD, SOD, PPO, etc.) in the roots of the sunflower were also detected accordingly. The non-volatile metabolites produced by XS142 exhibited significant antifungal effects. Multiple antibacterial metabolites have been identified through LC/MS analysis.

In a word, we concluded that the *B. velezensis* XS142 strain showed antagonist effects on the occurrence of Sunflower Verticillium Wilt via producing antifungal metabolites, competing spatially with pathogenic fungi on the root surface, and promoting the establishment of resistance of sunflower.

Fig. 1 The Influence of *B. velezensis* XS142 on Sunflower Verticillium Wilt.

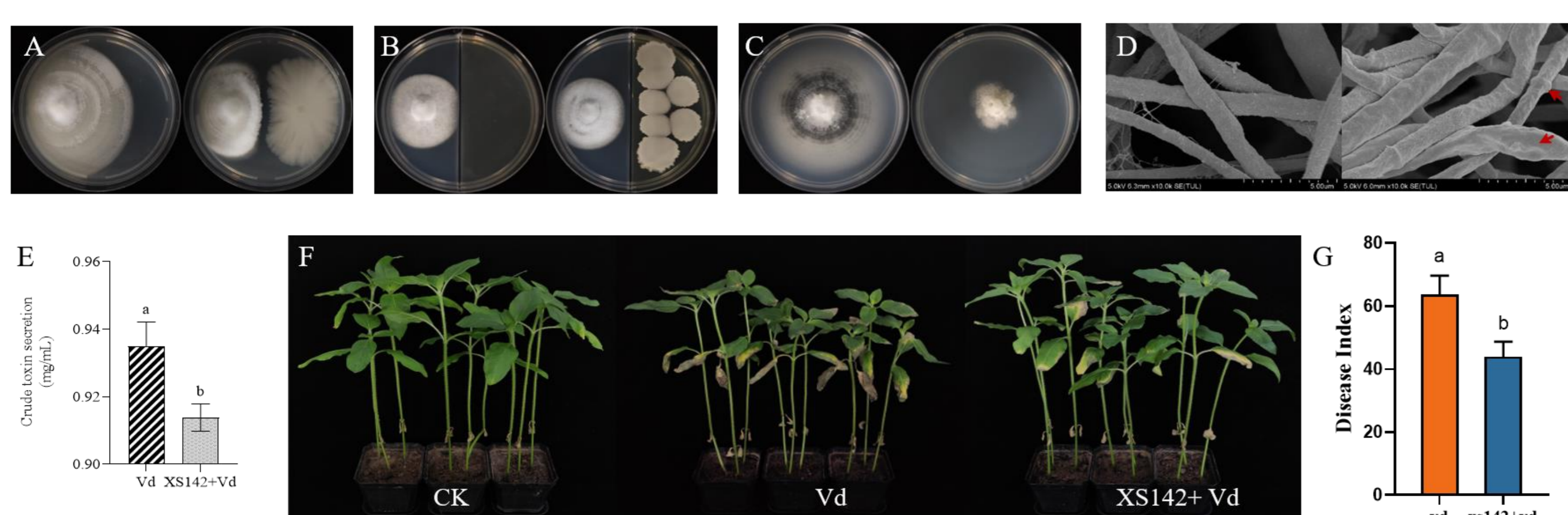


Fig. 2 Colonization of *B. velezensis* XS142 in sunflower roots.

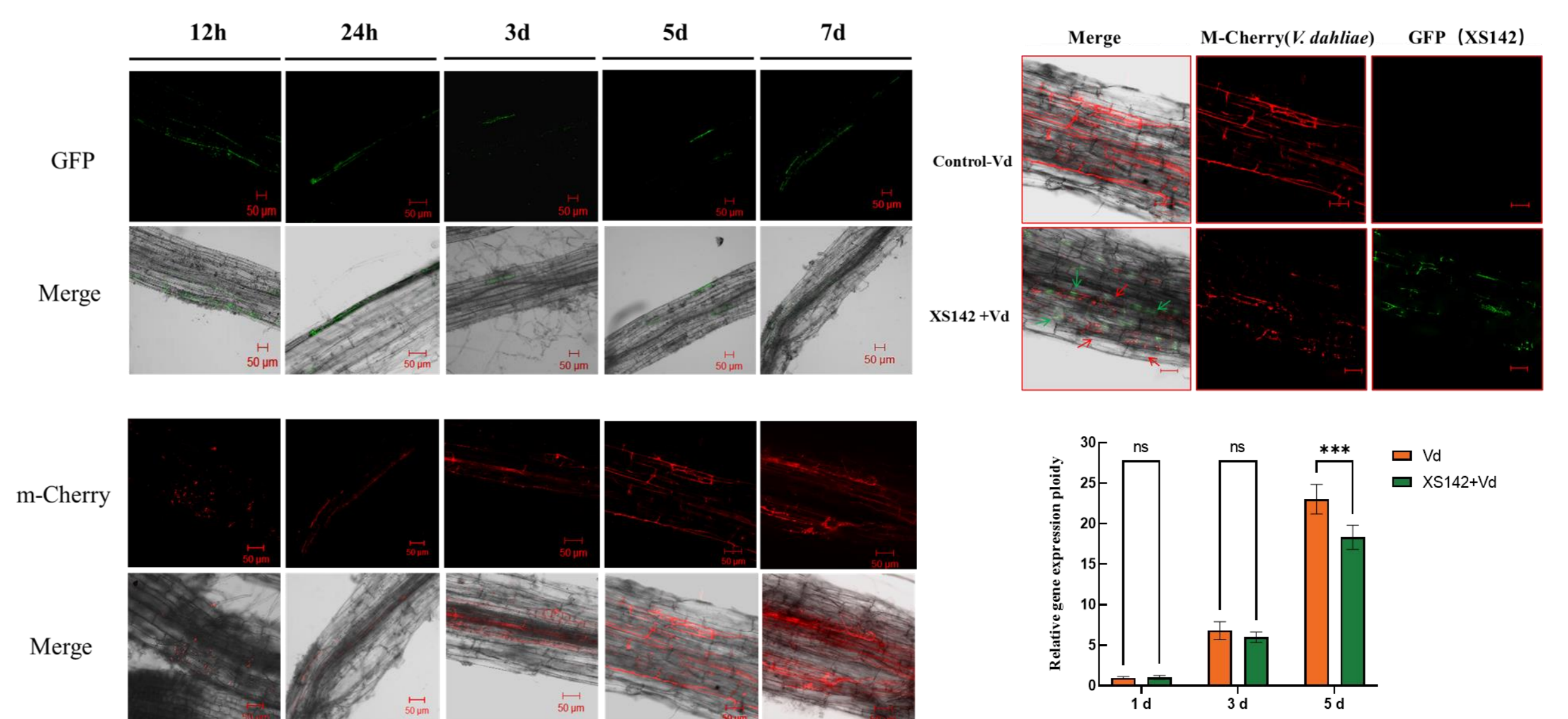


Fig.3 Effects of *B. velezensis* XS142 on the activities of defense-related enzymes in sunflower roots.

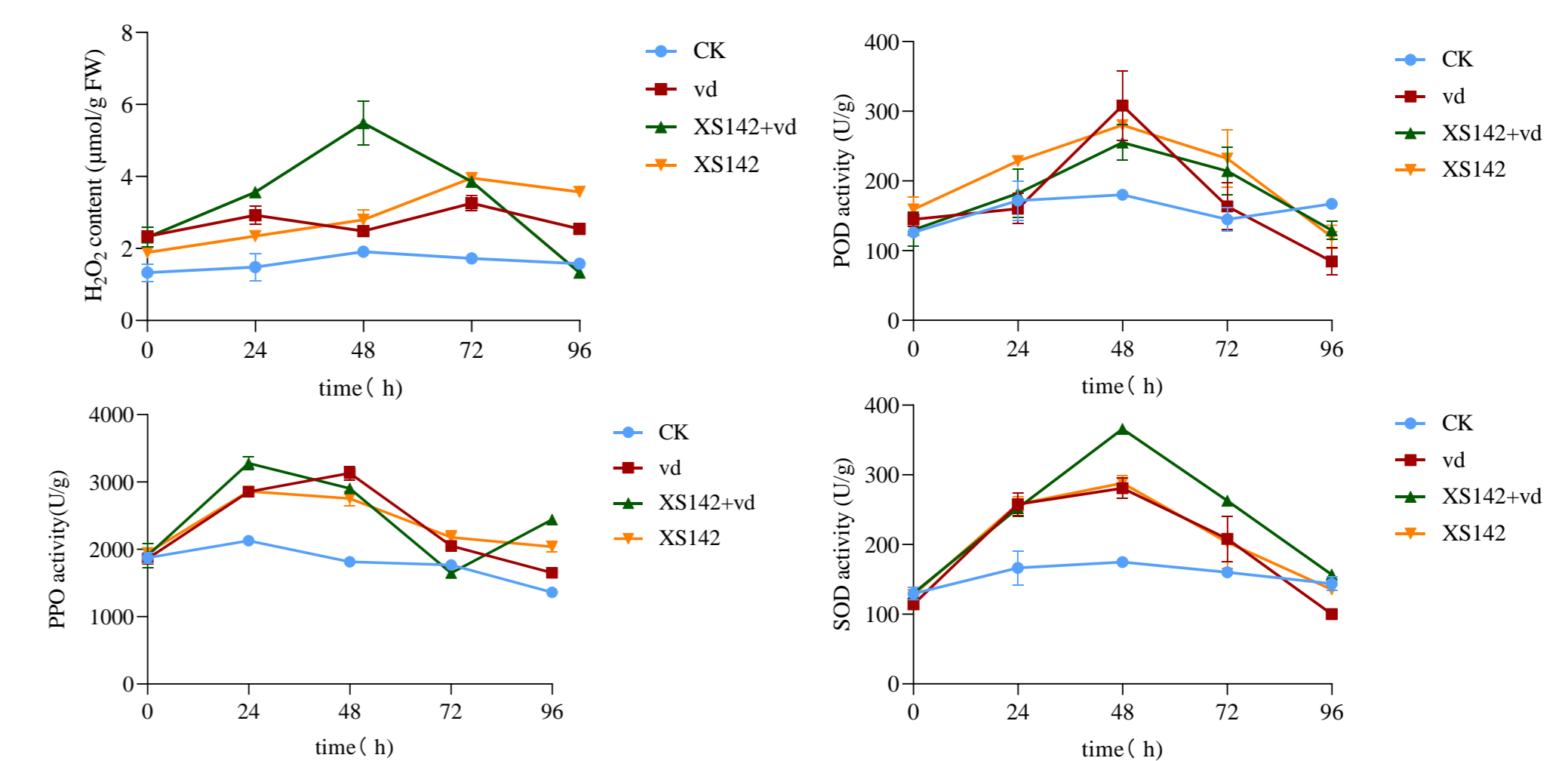


Fig. 4 Functional analysis of non-volatile metabolites produced by *B. velezensis* XS142.

