
Allelochemical-microbial interactions between ferulic acid and *Myxococcus xanthus* enhance the growth inhibition on barnyardgrass

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Abstract

The populations of *Myxococcus*, a gram-negative bacteria, is accumulated in the rhizospheric soil of allelopathic rice PI312777 and significantly larger than that of non-allelopathic rice Lemont, which suggests that *Myxococcus* plays a potential role in the rhizospheric biological process of PI312777 in suppression of weeds. In this study, the *Myxococcus xanthus* separated from the rhizospheric soil of PI312777 was used to study the interaction with ferulic acid (FA). The results show that exogenous FA promotes the cell proliferation of *M. xanthus*. A dimethyl labeling quantitative proteomic technique was used to reveal the protein expression on *M. xanthus* induced by FA. A total of 76 proteins were found up-regulated whilst 56 proteins were down-regulated in the FA-induced *M. xanthus*. These up-regulated proteins were involved in the cell growth, motility, signal response and transduction, metabolic process, biosynthesis of secondary metabolites, and social predation. Some target proteins, including frzS, BofA/YrbA family protein, methyl accepting chemotaxis protein, ABC transporter, and ATP-binding protein were selected to detect their genes transcript level, which showed that transcript level of the five genes was also up-regulated in the 0.10 mM FA-induced *M. xanthus* compared to the FA absent control. Additionally, transcript level of five other gene members from frz multigene family including *frzA*, *frzB*, *frzCD*, *frzE*, and *frzG* were also significantly up-regulated. Jointed application of FA and *M. xanthus* led to strongest growth inhibition of barnyardgrass. The results indicated that FA induced the chemotaxis and cell proliferation of *M. xanthus*, whilst the interactions between FA and *M. xanthus* lead to enhance growth inhibition on barnyardgrass.

Keywords: Allelopathy, barnyardgrass, ferulic acid, interaction, *Myxococcus xanthus*

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