Fatty acid synthases gene is essential for the synthesis of fatty acids in insect parasitoids

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Lipid can support a large energy source for organism and play a key role in survival and reproduction. Fatty acids are the important components of lipids in the form of glycerol. Insects are rich in fatty acids, and the types and contents of fatty acids vary greatly among insect species during their different developmental stages and food changes (Pornpimol, 2010; Torruco, 2019). Most insects contain palmitic acid, palmitic acid, stearic acid, oleic acid, linoleic acid and α-linolenic acid (Guil, 2018). Fatty acid synthases genes *(FASs*) are highly conserved and crucial genes in the fatty acid biosynthetic pathway, especially for the synthesis of palmitic acid (Visser, 2008). In insect parasitoids, fatty acid synthases (FASs) have received less attention and their roles associated with lipogenesis loss are far from clear. At present, the synthesis of fatty acids in parasitic insects has not been studied, which may contain important sources of fatty acid alternatives.

In this study, four FAS genes (*MpulFAS1- MpulFAS4*) were identified from the transcriptome database of *Meteorus pulchricornis* (Wang, 2020). In order to evaluate the functions of *FASs* in fatty acid synthesis, RNA interference technology was used. The expression level of *MpulFAS1* was downregulated at 24h and 48h in *dsMpulFAS1* injection group compared to *dsGFP*-injection cohorts (Fig. 1). By using gas chromatography, we tested the content of four fatty acids (palmitic acid, oleic acid, linoleic acid and α-linolenic acid) compared to the control group, and the results revealed that the contents of four fatty acid were all decreased after 24h in *dsMpulFAS1* injection group, and the content of α-linolenic acid decreased most significantly (Fig. 2).

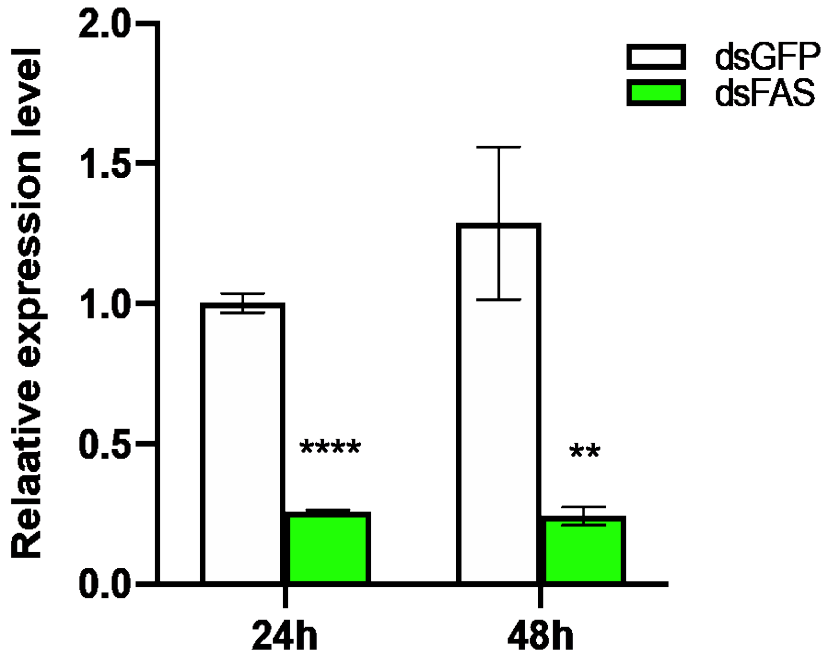

Fig. 1 Effect of dsRNA injection on the expression of *MpulFASs* in *M. pulchricornis* adults

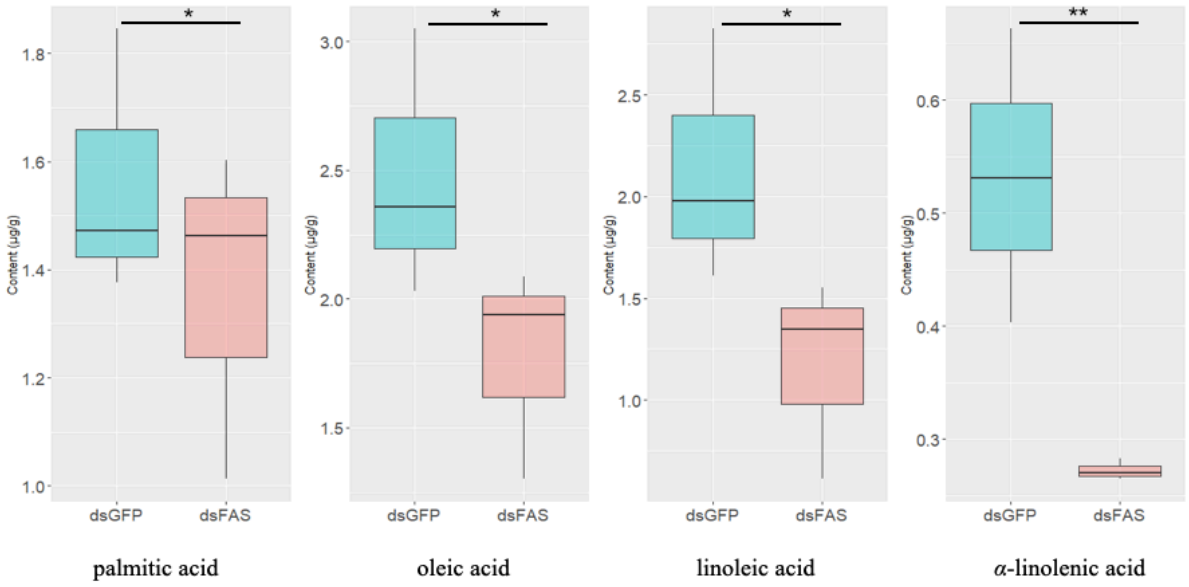

Fig. 2 Effect of silencing *MpulFASs* on the fatty acids content in *M. pulchricornis*

In conclusion, this study revealed that *MpulFASs* contributes to the synthesis of fatty acid in the parasitoid wasp *M. pulchricornis*. Therefore, this study provides fundamental knowledge of fatty acid synthesis in insect parasitoids and promotes the utilization of fatty acids from insect species.

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