

Identification of cytochrome P450s genes in an endoparasitoid wasp and their expression patterns under stress of insecticides

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Insect parasitoid wasps are key agents in biological control practice of insect pests in the agroecosystem. It is of great importance to evaluate the effect of insecticides on the natural enemies in the to coordinate the chemical and biological control practices. In insects, cytochrome P450 monooxygenases have received considerable attention for their roles in the detoxification of insecticides. In this study, we identified dozens of *CYP* gene and CYP3 clan had the largest number among them. We used three insecticides to quantitatively measure the expression levels of *CYP* genes by qRT-PCR. The results showed that phoxim, cypermethrin and chlorfenapyr all have significant effects on the expression of *CYP* genes. The expression level upregulated from more than 100-folds to near 500 folds compared to control groups after the wasps were treated. To further study the function of *CYPs*, dsRNA injection knocked down the expression and resulted in a significant decline of detoxification. The mortality of wasps that silenced *CYPs* were significantly higher than that infected with *dsGFP*. In conclusion, the present study revealed that cytochrome P450s contributed to the detoxification process of parasitic wasps when they were under the stress of commonly used insecticides.

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