

**Title :** Proof-of-Concept Engineering of *Escherichia coli* Expressing Bee Cytochrome P450 for Pesticide Detoxification

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## ABSTRACT

Bees play a crucial role in pollinating plants, which helps increase agricultural productivity and maintain biodiversity. However, the use of pesticides in agriculture exposes bees to toxins during pollination, which may affect their health and reduce bee populations. Although bees have a natural detoxification system, it has limitations when dealing with certain pesticides, such as thiamethoxam, a widely used pesticide in Thai agriculture. This research aims to explore the potential of genetic engineering to enhance the efficacy of symbiotic microbes in bee guts to aid pesticide detoxification. The study examined the growth of *Snodgrassella alvi*, a microorganism that plays a key role in bee health by regulating the host's immune response to toxins and promoting overall bee health. First, our study found that five *S. alvi* strains, cultivated under controlled conditions with 5% CO<sub>2</sub> at 37°C, exhibited different growth patterns when cultivated in the presence of thiamethoxam. The strain AD\_R2A\_I3, isolated from the giant honeybee (*Apis dorsata*), showed the highest growth at a concentration of 0.01 g/L thiamethoxam compared to other strains. This research further investigates the development of a genetically engineered *Escherichia coli* model for detoxifying thiamethoxam. and it showed that the expression of CYP450 burdened *E. coli* growth, yet demonstrated potential in thiamethoxam detoxification. Further research on optimizing this system could contribute to developing microbial solutions for mitigating pesticide toxicity in bees.

**Keywords:** *Snodgrassella alvi*, Thiamethoxam, Pesticide, Detoxification

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