



# Antifeedant activity of five plant ingredients against the general cutworm, *Spodoptera litura* (Lepidoptera: Noctuidae)

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## INTRODUCTION

The general cutworm, *Spodoptera litura* (Lepidoptera: Noctuidae) is a worldwide distributed omnivorous and polyphagous pest. It can damage 109 families and more than 380 plants species. Among them, more than 90 species are fond of eating, mainly Cruciferae and aquatic vegetables. They are one of the most serious crop pests in the world. It affects the yield of all kinds of cultivated crops, vegetables, weeds and ornamental plants by eating leaves in groups, resulting in huge economic losses. *S. litura* destroys most during larval period. In China, India and Japan, the larval stage of *S. litura* causes up to 30% damage to several crops, including tobacco, castor, peanut, cotton and other cruciferous plants. The occurrence of *S. litura* has the characteristics of many generations, many hosts and strong resistance to insecticides, so it is necessary to choose a candidate green and harmless novel insecticide. Plants can synthesize various secondary metabolites during their growth and development acting as vital roles in defensive reaction such as azadirachtin, a well-known plant-derived insecticide with high effective anti-feeding activity on a variety of pests. Besides, alkaloids and terpenes also demonstrate having prominent antifeedant activities (Tab.1).

Tab.1 Common substances with biological activity to pests.

Type	Material	Target	LD <sub>50</sub>	Reference
Alkaloids	Total ginsenosides	<i>Plutella xylostella</i>	4.98 mg/mL	(He et al., 2018)
	Sanguinarine	<i>Lymantria dispar</i>	4.963 µg/insect	(Zou et al., 2019)
Terpenes	Zerumbone	<i>Helicoverpa armigera</i>	10.64 µg/mL	(Benelli et al., 2018)
	α-humulene		12.89 µg/mL	

## RESULTS & DISCUSS

In this study, the antifeedant activities of camphene (A), eugenol (B), cantharidin (C), berberine (D) and norcantharidin (E) were measured (Fig.1). Using acetone as a solvent, these substances were formulated to different concentrations, and the leaf disc method was used to detect the antifeedant activity of these substances against *S. litura* after treatment. Antifeedant rate was calculated using the following formular:

$$\text{Antifeedant activity (\%)} = \frac{FA_{\text{control}} - FA_{\text{Test}}}{FA_{\text{control}}}$$

FA means the Feeding area.

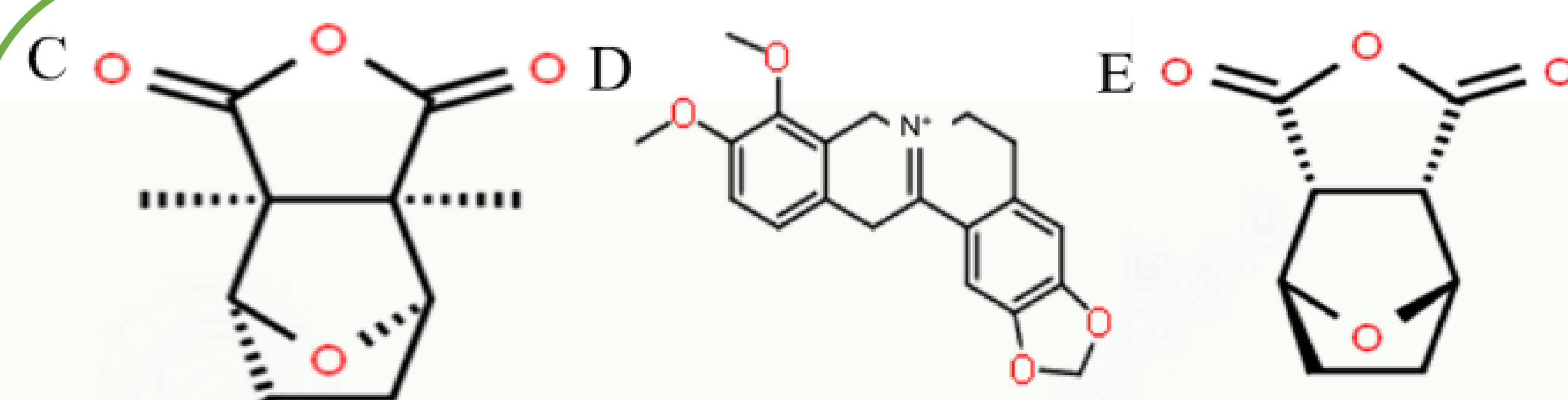
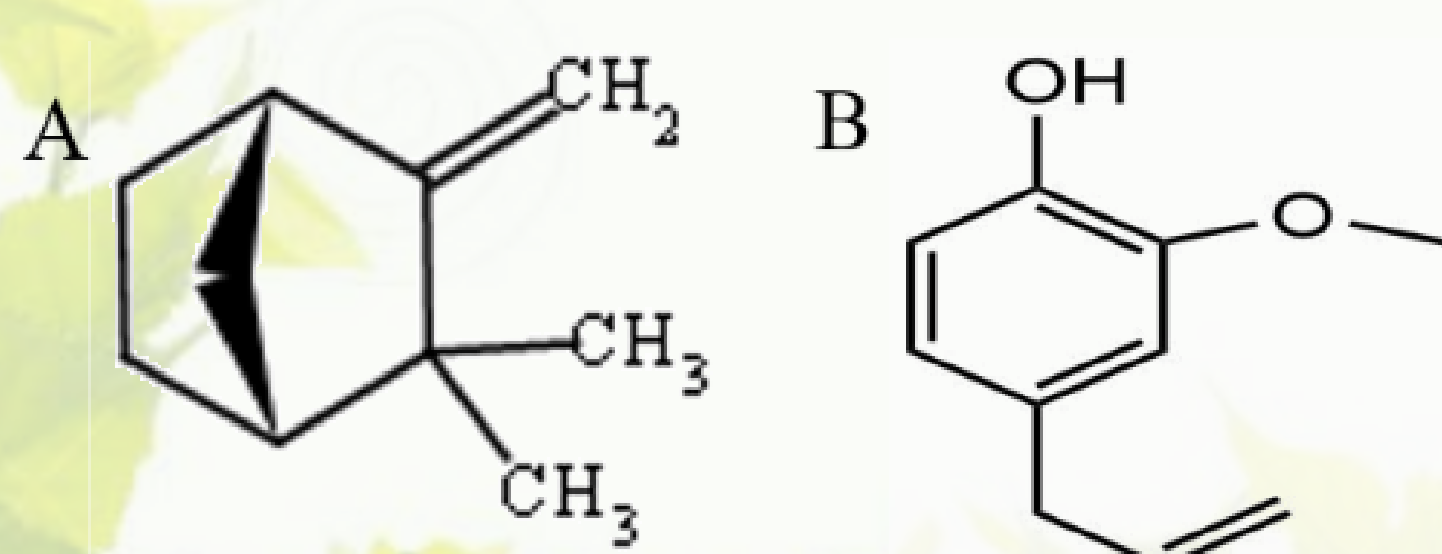


Fig.1 Structural formula of five compounds. (A)Camphene, (B) eugenol, (C) cantharidin, (D) berberine, (E) norcantharidin.

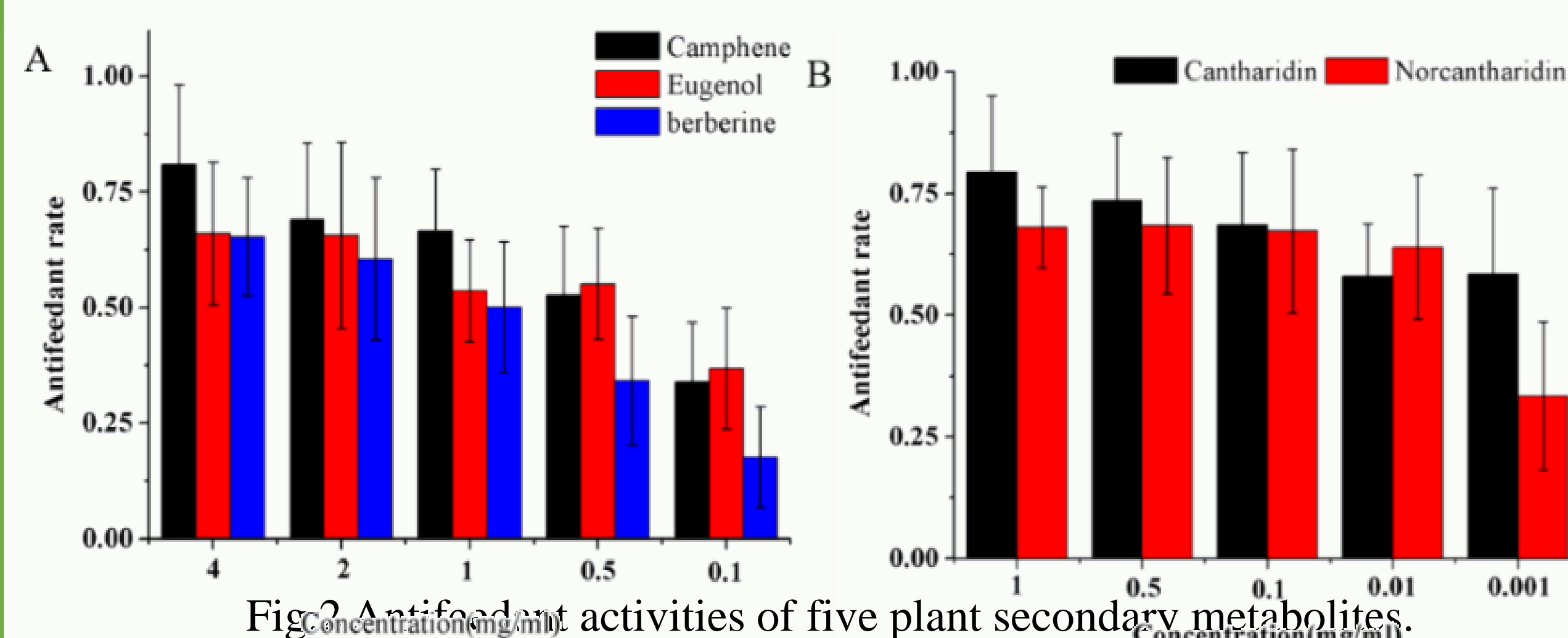


Fig.2 Antifeedant activities of five plant secondary metabolites. (A) Antifeeding rate of camphene, eugenol and berberine in different concentrations to *S. litura* larvae. (B) Antifeeding rate of cantharidin and norcantharidin to *S. litura* larvae at different concentrations.

Fig. 2A showed that the highest antifeeding rate of camphene was 79%, followed by eugenol and berberine, which were 68% and 66%, respectively, At a concentration of 4 mg/mL. It can be seen from the Fig. 2B that both cantharidin and norcantharidin have good antifeedant activity. The antifeedant activity of cantharidin at 0.001 mg/mL was still higher than 50%. At the same concentration, the concentration of norcantharidin was only 33%. And its antifeedant activity is higher than camphene, eugenol and berberine. Therefore, these five plant secondary substances can be used as antifeedants to control *S. litura*. Among the five compounds, cantharidin has the highest antifeedant activity, and its antifeedant activity is still higher than 60% at 0.001 mg/mL.

## CONCLUSION

In this experiment, we detected the antifeedant activity of five plant secondary substances against *Spodoptera litura*, and found that these substances have varying degrees of antifeedant effect. They may be a good potential antifeedant and also provide a kind of antifeedant. New integrated pest control methods. It can be used as a new type of green pesticide to adapt to the development trend of pesticides and people's needs.

## REFERENCES

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