

## 4 种植物源杀虫剂对扶桑绵粉蚧毒力及龟纹瓢虫安全评价

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**摘要:** 扶桑绵粉蚧 *Phenacoccus solenopsis* (半翅目: 粉蚧科) 最早于 2008 年 6 月传入中国广州, 10 多年间已扩散至中国 18 个省区, 共记录有 166 种寄主植物, 其中棉花受害最严重。化学防治和生物防治是该虫的重要防控手段。本研究旨在探索 4 种植物源农药对入侵害虫扶桑绵粉蚧的毒力, 评价其对龟纹瓢虫卵及成虫的安全性, 为扶桑绵粉蚧的绿色防控提供理想药剂和理论依据。采用喷雾法测定 4 种植物源杀虫剂对 3 龄扶桑绵粉蚧的毒力和龟纹瓢虫卵孵化率的影响, 采用滤纸接触法测定 2 种对扶桑绵粉蚧高效的植物源杀虫剂对天敌龟纹瓢虫成虫的毒力, 并评价其对龟纹瓢虫的安全性。结果表明: 4 种植物源杀虫剂处理扶桑绵粉蚧 3 龄幼虫 24 h 后的毒力由高到低依次为 1.3% (质量分数, 下同) 苦参碱水剂 (AS) ( $LC_{50}$  为  $81.2831 \text{ mg} \cdot \text{L}^{-1}$ )、0.5% 藜芦碱可溶液剂 (SL) ( $LC_{50}$  为  $112.8811 \text{ mg} \cdot \text{L}^{-1}$ )、2.5% 鱼藤酮乳油 (EC) ( $LC_{50}$  为  $208.9296 \text{ mg} \cdot \text{L}^{-1}$ )、5% 桉精油 SL ( $LC_{50}$  为  $343.0920 \text{ mg} \cdot \text{L}^{-1}$ ); 与化学对照药剂 22.4% 螺虫乙酯 EC 相比, 相对毒力指数由高到低依次为 1.3% 苦参碱 AS (3.3025)、0.5% 藜芦碱 SL (2.3780)、2.5% 鱼藤酮 EC (1.2048)、5% 桉精油 SL (0.7824); 用几种杀虫剂的田间最大推荐剂量和对扶桑绵粉蚧的  $LC_{50}$  剂量处理龟纹瓢虫卵后, 孵化率差异不显著; 苦参碱 AS 和藜芦碱 SL 对龟纹瓢虫成虫的  $LC_{50}$  高于对扶桑绵粉蚧的  $LC_{50}$ ; 结合益害毒性比和安全系数, 2 种药剂对龟纹瓢虫卵和成虫安全。综上, 1.3% 苦参碱 AS 和 0.5% 藜芦碱 SL 对扶桑绵粉蚧有明显的控害作用, 且对龟纹瓢虫卵和成虫的毒性较低、安全性较高, 可作为扶桑绵粉蚧绿色防控的理想药剂。

**关键词:** 植物源杀虫剂; 扶桑绵粉蚧; 龟纹瓢虫; 毒力; 安全性评价

## Toxicity of four botanical insecticides to *Phenacoccus solenopsis* and safety evaluation to predator *Propylaea japonica*

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**Abstract:** *Phenacoccus solenopsis* (Hemiptera: Pseudococcidae) was first introduced to Guangzhou, China in June 2008. It has spread to 18 provinces and regions in China in more than 10 years. A total of 166 host plants species of *Phenacoccus solenopsis* were recorded, among which cotton is the most severely affected. Chemical and biological control are important prevention and control method to insect. The study explored the toxicity of 4 kinds of botanical insecticides to the invasive pest *Phenacoccus solenopsis*, and evaluated their safety to the eggs and adults of *Propylaea japonica*, aiming to provide ideal agents and a theoretical basis for the green control of *Phenacoccus solenopsis*. The toxicity of the 4 kinds of botanical insecticides to the 3<sup>rd</sup> instar larvae of *Phenacoccus solenopsis* and the eggs hatching rate of *Propylaea japonica* were determined by spray method. The evaluation of 2 kinds of highly effective botanical insecticides against adults of *Propylaea japonica* was tested by the filter paper contact method. The result showed that the toxicity of the 4 kinds of botanical insecticides to the 3<sup>rd</sup> instar larvae of *Phenacoccus solenopsis* treated for 24 hours was as follows: matrine 1.3% (mass fraction the same as below) aqueous solution (AS) ( $LC_{50}$

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81.283 1 mg·L<sup>-1</sup>) > veratrine 0.5% soluble concentrate (SL) ( $LC_{50}$  112.881 1 mg·L<sup>-1</sup>) > rotenone 2.5% emulsifiable concentrate (EC) ( $LC_{50}$  208.929 6 mg·L<sup>-1</sup>) > cineole 5% SL ( $LC_{50}$  343.092 0 mg·L<sup>-1</sup>). Compared with the chemical control agent of 22.4% spirochete ethyl ester EC, the relative toxicity index was as follows: matrine 1.3% AS (3.302 5) > veratrine 0.5% SL (2.378 0) > rotenone 2.5% EC (1.204 8) > cineole 5% SL (0.782 4). There was no significant difference of hatching rate between the maximum recommended dose of the insecticides in the field and the  $LC_{50}$  dose to *Phenacoccus solenopsis*. The  $LC_{50}$  of matrine AS and veratrine SL to the adults of *Propylaea japonica* was higher than that to *Phenacoccus solenopsis*. Combining the benefit toxicity ratio with safety factor, the two insecticides were safe for eggs and adults of *Propylaea japonica*. Therefore, matrine 1.3% AS and veratrine 0.5% SL had high toxicity to *Phenacoccus solenopsis* and low ecological risk against *Propylaea japonica*, so the two insecticides were recommended as ideal agents to control *Phenacoccus solenopsis*.

**Keywords:** botanical insecticides; *Phenacoccus solenopsis*; *Propylaea japonica*; toxicity; safety evaluation