

## 三种杀虫剂对褐飞虱海藻糖含量和海藻糖酶活性的影响

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Effects of three insecticides on trehalose content and trehalase activity in the brown planthopper, *Nilaparvata lugens* (Stål) (Homoptera: Delphacidae)

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**摘要** 为了解农药处理导致褐飞虱 *Nilaparvata lugens* (Stål) 飞行能力增强的生理机制, 本文采用萘酮法和酶促反应终止法, 研究了吡虫啉、三唑磷和溴氰菊酯3种杀虫剂亚致死剂量对褐飞虱3龄、5龄若虫及长、短翅型雌雄成虫体内海藻糖含量和海藻糖酶活性的影响。结果表明: 杀虫剂处理的褐飞虱3龄若虫海藻糖含量和海藻糖酶活性与对照相比没有显著差异 ( $P>0.05$ )。40 mg/L 三唑磷处理的褐飞虱5龄若虫体内海藻糖含量显著低于对照 ( $P<0.05$ ), 比对照降低了24%; 而20和40 mg/L三唑磷处理的褐飞虱5龄若虫海藻糖酶活性显著高于对照 ( $P<0.05$ ), 分别比对照高出了100%和129%。10 mg/L吡虫啉, 20和40 mg/L三唑磷以及3和6 mg/L溴氰菊酯处理的褐飞虱短翅雌成虫和雄成虫体内海藻糖含量显著低于对照 ( $P<0.05$ ), 雌成虫体内海藻糖含量比对照分别降低了36%, 53%, 67%, 58%和69%, 雄成虫体内海藻糖含量比对照分别降低了59%, 71%, 65%, 70%和77%; 而40 mg/L三唑磷以及3和6 mg/L溴氰菊酯处理的褐飞虱短翅型雌成虫和雄成虫体内海藻糖酶活性显著高于对照 ( $P<0.05$ ), 雌成虫体内海藻糖酶活性比对照分别高出了124%, 100%和88%, 雄成虫体内海藻糖酶活性比对照分别高出了146%, 132%和118%。10 mg/L吡虫啉, 40 mg/L三唑磷和3 mg/L溴氰菊酯处理的褐飞虱长翅型雌成虫和雄成虫海藻糖含量显著低于对照 ( $P<0.05$ ), 雌成虫海藻糖含量比对照分别降低了44%, 34%和37%, 雄成虫体内海藻糖含量比对照降低了48%, 54%和43%; 而5和10 mg/L吡虫啉处理的长翅型雌成虫和雄成虫海藻糖酶活性显著高于对照 ( $P<0.05$ ), 雌成虫体内海藻糖酶活性比对照分别高出了317%和300%, 雄成虫体内海藻糖酶活性比对照分别高出了170%和97%。这些结果说明这3种杀虫剂亚致死剂量处理可以增强褐飞虱体内海藻糖酶活性, 并导致海藻糖含量下降。本研究结果对深入阐明农药诱导褐飞虱再猖獗及杀虫剂处理增强其飞行能力的生理机制具有一定的科学价值。

**关键词:** 褐飞虱 杀虫剂 亚致死剂量 海藻糖 海藻糖酶 能量物质 飞行能力

**Abstract:** To understand the physiological mechanism of insecticide-induced enhancement of flight capacity of the brown planthopper, *Nilaparvata lugens* (Stål), we examined the changes of trehalose content and the trehalase activity in the 3rd and 5th instar nymphs and the adults of *N. lugens* under the stress of sublethal dose of three insecticides (imidacloprid, triazophos and deltamethrin). The results showed that the trehalose content and the trehalase activity in the 3rd instar nymphs treated with three insecticides were not significantly different from those of the control ( $P>0.05$ ). The trehalose content in the 5th instar nymphs treated with 40 mg/L triazophos was significantly lower than that in the control ( $P<0.05$ ), decreased by 24%, while the trehalase activity in the 5th instar nymphs treated with 20 and 40 mg/L triazophos was significantly higher than that in the control ( $P<0.05$ ), increased by 100% and 129%, respectively. Compared to the controls, the trehalose content in brachypterous female and male adults was significantly reduced in treatments of 10 mg/L imidacloprid, 20 and 40 mg/L triazophos, and 3 and 6 mg/L deltamethrin ( $P<0.05$ ), decreased by 36%, 53%, 67%, 58% and 69% in female adults, and 59%, 71%, 65%, 70% and 77% in male adults, respectively. However, the trehalase activity in brachypterous female and male adults was significantly increased in treatments of 40 mg/L triazophos and 3 and 6 mg/L deltamethrin, compared to the controls ( $P<0.05$ ), increased by 124%, 100% and 88% in female adults, and 146%, 132% and 118% in male adults, respectively. The trehalose content in macropterous female and male adults treated with 10 mg/L imidacloprid, 40 mg/L triazophos and 3 mg/L deltamethrin was significantly lower than that in the control ( $P<0.05$ ), decreased by 44%, 34% and 37% in female adults, and 48%, 54% and 43% in male adults, respectively. However, the trehalase activity in macropterous female and male adults treated with 5 and 10 mg/L imidacloprid, was significantly higher than that in the control ( $P<0.05$ ), increased by 170% and 97% in female adults, and 317% and 300% in male adults, respectively. The results suggest that the trehalase activity of *N. lugens* is increased by treatments of sublethal dose of the three insecticides, while the

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trehalose content is reduced. The present work provides some valuable clues for understanding the mechanism of insecticide-induced enhancement of flight capacity of the *N. lugens*.

Key words: *Nilaparvata lugens* insecticide sublethal dose trehalose trehalase energy substance flight capacity

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