

桔小实蝇、木瓜实蝇和番石榴实蝇耐热性的热动力学分析

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Thermal death kinetics of fruit flies *Bactrocera dorsalis*, *B. papayae* and *B. correcta* (Diptera: Tephritidae)

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摘要 果实蝇属是重要的检疫性有害生物之一, 其中桔小实蝇 *Bactrocera dorsalis* (Hendel)、木瓜实蝇 *B. papayae* Drew & Hancock 和番石榴实蝇 *B. correcta* (Bezzi) 近几年在口岸检出率居高。本研究利用热水浸泡处理法比较这3种实蝇的卵、1龄幼虫和3龄幼虫在44~47℃下的耐热性, 利用热动力学模型和活化能比较每种实蝇的耐热虫态以确定耐热种。结果表明: 在测定温度范围内, 3种实蝇卵、1龄幼虫和3龄幼虫的死亡率都与处理时间呈正相关。热动力学系数取0.5时, 最适合热动力学模型预测3种实蝇在各实验温度 $LT_{99.9968}$ 的致死时间。3种实蝇在44~47℃耐热性均为: 卵 > 1龄幼虫 > 3龄幼虫。番石榴实蝇在3种实蝇中最耐热。本研究结果为实蝇热处理指标的制定提供了实验依据。

关键词: 桔小实蝇; 木瓜实蝇; 番石榴实蝇; 耐热性; 热致死时间; 热动力学

Abstract: Fruit fly is one of the most serious quarantine pests. In recent years, *Bactrocera dorsalis* Hendel (oriental fruit fly), *B. papayae* Drew & Hancock (papaya fruit fly) and *B. correcta* (Bezzi) (guava fruit fly) were intercepted frequently in the port of entry. In this study, we detected and compared the heat tolerance of eggs, the 1st instar and 3rd instar larvae of the three fruit flies at temperatures ranging from 44°C to 47°C using a hot water immersion technique. The species with the highest heat tolerance were determined through thermal death kinetic model and activity energy. The results showed that there was a positive relation between the mortalities of eggs, the 1st and 3rd instar larvae of all the three species and the exposure time at the experimental temperature. The 0.5 order kinetic model fitted best to predict the $LT_{99.9968}$ lethal time at all the treatment temperatures. The order of heat tolerance stage for all the three species was egg > 1st instar larva > 3rd instar larva. The thermal death time (TDT) curves showed that the egg of *B. correcta* had the highest heat-resistance among all life stages of three species. This study provides an experimental basis for the development of heat quarantine treatment indicators of fruit flies.

Key words: *Bactrocera dorsalis* *Bactrocera papayae* *Bactrocera correcta* heat tolerance thermal death time (TDT) thermal kinetics

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