

松褐天牛肿腿蜂对寄主松褐天牛三龄幼虫的功能反应

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Functional response of the parasitoid *Sclerodermus* sp. (Hymenoptera: Bethyilidae) to the third instar larvae host *Monochamus alternatus* (Coleoptera: Cerambycidae)

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摘要 为评估松褐天牛肿腿蜂 *Sclerodermus* sp. (膜翅目: 肿腿蜂科) 对其寄主松褐天牛 *Monochamus alternatus* 3 龄幼虫的控制作用, 通过功能反应试验, 研究了松褐天牛肿腿蜂对松褐天牛 3 龄幼虫补充营养时期的捕食功能反应和补充营养后的寄生功能反应以及肿腿蜂的密度效应。结果表明: 当松褐天牛肿腿蜂密度固定为 1 头/缸时, 肿腿蜂因补充营养对松褐天牛 3 龄幼虫的捕食功能反应符合 Holling II 型方程, 1 头松褐天牛肿腿蜂雌蜂对松褐天牛 3 龄幼虫的最大致死量为 9.48 头, 平均为 3.75 头; 寄生作用的功能反应符合 Holling I 型方程, 可知肿腿蜂的寄主密度阈限为 4 头就能满足补充营养和寄生的需要; 在捕食和寄生两个阶段其对松褐天牛幼虫的寻找效应随着寄主密度的增加呈线性减弱。当松褐天牛幼虫密度固定为 30 头/缸时, 随着肿腿蜂的密度增加, 其补充营养阶段的捕食作用和之后的寄生作用均呈线性升高, 寻找效应则呈线性减弱; 由蜂虫比和致死总量的模型可得肿腿蜂与天牛幼虫比例为 0.9805 (近 1:1) 时, 可使松褐天牛幼虫死亡总数最大。这些结果表明, 松褐天牛肿腿蜂是松褐天牛幼虫的有效天敌。本研究为评价松褐天牛肿腿蜂对寄主的控制能力提供了基础数据和方法, 并为其在野外的释放量提供了依据。

关键词: 松褐天牛肿腿蜂 松褐天牛 捕食 寄生 功能反应 寻找效应 密度效应

Abstract: In order to evaluate the control effects of *Sclerodermus* sp. (Hymenoptera: Bethyilidae) on the 3rd instar larvae of *Monochamus alternatus* (Coleoptera: Cerambycidae), a method of functional response was used to test the effects of preying on hosts and parasitization, and the density effect of *Sclerodermus* sp. was also studied. The results showed that when the density of the bethylid wasps was 1 per cylinder, the functional response of *Sclerodermus* sp. preying on the 3rd instar larvae of *M. alternatus* could be described by Holling II model. The maximum quantity of hosts killed by preying on hosts by one bethylid wasp was 9.48, and the average value was 3.75. The functional response of parasitization fitted Holling I model, in which the threshold limit of the number of hosts is 4. The searching effects of preying on hosts and parasitization attenuated linearly with the increase of host density. When the density of *M. alternatus* larvae was 30 per cylinder, with the density of wasps increasing, the functional response of parasitization and preying on hosts increased linearly while the searching effect attenuated. A model between ratio of bethylids to beetle larvae and total lethality showed that when the ratio of the bethylids to larvae was 0.9805 (approximately 1:1), the mortality of *M. alternatus* larvae was the maximal. The results suggest that *Sclerodermus* sp. is an effective natural enemy to *M. alternatus* larvae. This study provides essential data and methods for evaluating control ability of *Sclerodermus* sp. on *M. alternatus*, and also supplies theoretical basis for its release amount in the field.

Key words: *Sclerodermus* sp. *Monochamus alternatus* preying parasitization functional response searching effect density effect

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