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Management of the American cockroach's oothecae: the potential of entomopathogenic fungi control

Mariah Valente Baggio-Deibler^{1,2}, Marcelo da Costa Ferreira¹, Antonio Carlos Monteiro³, Andressa de Souza-Pollo⁴,
Manoel Victor Franco Lemos⁵

¹Department of Plant Protection, UNESP, Jaboticabal, SP, Brazil. ²mariahbdeibler@gmail.com, +1 (407) 574-0879,

³Department of Plant Production, UNESP, Jaboticabal, SP, Brazil. ⁴ Department of Preventive Veterinary Medicine and Animal Reproduction, UNESP, Jaboticabal, SP, Brazil. ⁵Department of Applied Biology, UNESP, Jaboticabal, SP, Brazil.

ABSTRACT:

The *Periplaneta americana* species is an annoyance to man, causing allergies and damage to clothes and documents. It has the ability to spread pathogens and requires control measures. Control with natural enemies is less aggressive and can currently be applied with less risk than other techniques, such as chemical control, which is the main method used worldwide to control its post-embryonic stages. The potential microbial control of nymphs and adults of this pest has been shown, but little is known about its oothecae. There are isolates of fungal species that can be used to achieve this aim, but they may have innate differences in their virulence and ability to spread. This study aimed to identify fungal isolates JAB 68 and IBCB 35 through genetic sequencing of the ITS1-5.8S-ITS2 region, analyze their ability to synthesize chitinase, and investigate and compare their aggressiveness against *P. americana* oothecae and their influence on nymph eclosion. Fungal suspensions were inoculated into minimal medium containing glucose (control) as the sole carbon source and 1% colloidal chitin to determine the chitinolytic activity on the 4th, 7th and 10th days and sporulation on the 10th day. To obtain mortality, extrusion and the compiled number of hatched nymphs, oothecae were sprayed with suspensions of the isolates as follows: T1 - no application; T2 - aqueous solution of Tween 80[®] 0.1% (vehicle suspension for treatments T3 to T8); T3 - 2×10^9 conidia/mL of the JAB 68 isolate; T4 - 2×10^8 con./mL of the JAB 68 isolate; T5 - 2×10^7 con./mL of the JAB 68 isolate; T6 - 2×10^9 con./mL of the IBCB 35 isolate; T7 - 2×10^8 con./mL of the IBCB 35 isolate; T8 - 2×10^7 con./mL of the IBCB 35 isolate. The JAB 68 and IBCB 35 isolates were identified as belonging to the species *Metarhizium anisopliae* and *Beauveria bassiana*, respectively. Chitinolytic activity and extrusion were good parameters for evaluating the fungi's action on oothecal control. The most aggressive entomopathogen was *M. anisopliae* isolate JAB 68, with shorter time for fungus extrusion at a concentration of 2×10^7 con./mL. *B. bassiana* reduced the number of hatched nymphs at a concentration of 2×10^8 con./mL. Both fungi are capable of infecting and killing *P. americana*'s oothecae and reducing the number of nymphs hatched.

KEYWORDS: Biocontrol, *Periplaneta americana*, ovicide, ootheca, extrusion

1. INTRODUCTION

Periplaneta americana (Linnaeus, 1785) (Blattodea: Blattidae) are cosmopolitan cockroaches that occur frequently in urban sewage galleries and transit in anthropic environments, spreading pathogens; they are considered hazardous organisms to humans causing serious health problems such as allergies, asthma, and others (Thyssen et al. 2004; Pinto et al. 2007; Kassiri and Kazemi, 2012). These insects have oviparous reproduction with sets of 7-16 eggs inside of ovate capsules named oothecae. Females can lay approximately 27 oothecae per year, and 32 days is the

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