Comunicação Científica

Pathogenicity of *Nosema locustae* Canning (Protozoa: Microspora) against *Rhammatocerus schistocercoides* Rehn (Orthoptera: Acrididae) and *Stiphra robusta* Mello-Leitão (Orthoptera: Proscopiidae)

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RESUMO - O efeito de *Nosema locustae* Canning contra os ortópteros *Rhammatocerus schistocercoides* Rehn e *Stiphra robusta* Mello-Leitão foi estudado em laboratório. O patógeno foi veiculado em dois tipos de iscas. Uma das iscas foi preparada manualmente pulverizando-se esporos do patógeno sobre flocos de aveia (10^8 esporos/g). A outra isca foi o produto comercial Nolo Bait® à base de farelo de trigo contendo 10^6 esporos/g e oferecido somente à *R. schistocercoides*. Os dois tipos de iscas foram oferecidos a ninfas de 2° e 3° ínstares durante 48h. *N. locustae*, formulado em laboratório, causou 10-15% de mortalidade e 35-40% de infecção confirmada. Entretanto, não houve infecção ou mortalidade nos insetos submetidos ao formulado comercial.

PALAVRAS-CHAVE: Insecta, controle biológico, gafanhoto, protozoário.

Rhammatocerus schistocercoides Rehn (Orthoptera: Acrididae) and *Stiphra robusta* Mello-Leitão (Orthoptera: Proscopiidae) are important pests in Central and Northeast Brazil (Duranton et al. 1987) and have been controlled with the use of chemical insecticides (Cosenza et al. 1990). However, this is not an appropriate strategy to control grasshoppers since insecticides used (malathion and fenitrothion) are expensive and risky to the environment (Greathead 1992).

A possible use of bioinsecticides based on entomopathogenic fungi (Johnson & Goettel 1993) and protozoan (Johnson & Henry 1987, MacVean & Capinera 1991) has been recently investigated. The microsporidian *Nosema locustae* Canning is an intracellular pathogen tested against more than 58 species of grasshoppers (Henry 1969). This pathogen has been as an insecticidal bait and tested against grasshopper populations in the USA, Africa (Nasseh et al. 1992) and Canada (Johnson 1989). Despite its wide geographical distribution, *N. locustae* was not found infecting grasshoppers in Brazil. Lange (1992) mentioned the long persistence of *N. locustae* (more than seven years) and recorded another species, *Perezia dichroplusae* Lange, infecting grasshoppers in Argentina.

In this study, we report on the pathogenicity of *N. locustae* against *R. schistocercoides* and *S. robusta* and on the efficacy of Nolo

Bait , a product from Evans BioControl (USA), a commercial producer *N. locustae*, against *R. schistocercoides*. The isolate of *N. locustae* used in this study was kindly provided by Dr. D. Johnson (Agriculture Ministry, Canada). The spore suspension (10^8 spores/ml) was maintained in sterile water in aliquots of 1 ml at -18°C. Bioassays were performed using 2nd/3rd instars (20 of each species) kept individually in plastic boxes (11 x 11 x 3,2 cm) at room temperature (20 - 25°C). Insects were transferred to plastic boxes three days before experiments were set up and fed with *Andropogon* sp., and guava leaves. After this period, insects were starved during 24h before fed to the same diet sprayed with spores of *N. locustae* during 48h. The visualization of the polar filament extrusion of the spores in the optical microscope indicated the viability of the material used. Finally, insects were offered the original diet. For the Nolo Bait assay, 30 insects from 2nd/5th instars, and adults were fed the formulation containing 10^6 spores/g. Mortality was recorded daily during 20 days. Dead insects were dissected to observe midgut, Malpighian tubules, fat tissues, brain, and feces. Smears were fixed with methanol (100%, 5 minutes), stained with Giemsa (10%, 20 minutes), and observed at a light microscope (400x).

Laboratory preparations of *N. locustae* caused 10-15% mortality and 35-40% confirmed infection on *R. schistocercoides* and *S. robusta* (Table 1). Examination of midgut showed the presence of *N. locustae* spores. However, Nolo Bait did not cause mortality or infection against *R. schistocercoides* as opposed to what was observed by MacVean & Capinera (1991) for other species of grasshoppers. Despite the low mortality caused by the laboratory preparation of *N. locustae*, studies with this pathogen should be intensified to exploit its potential as biocontrol agent against grasshoppers. This is important if we consider that observations lasted only 20 days. This period should be extended at least up to the next generation to check a possible vertical transmission as recorded by Ewen & Mukerji (1980).

Table 1. Mortality and infection caused by Nosema locustae against 2nd and 3rd instars of *Rhammatocerus schistocercoides* and *Stiphra robusta*.

Insect	N	Infected (%)		Mortality (%)	
R. schistocercoides	20	8	(40)	3	(15)
Control	20	1	(05)	1	(05)
S. robusta	20	9	(45)	4	(20)
Control	20	1	(05)	1	(05)

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Literature Cited

Cosenza, G.W., J.B. Curti & H. Paro. 1990. Comportamento do gafanhoto *Rhammatocerus schistocercoides* (Rehn, 1906) no Mato Grosso. Pesq. Agropec. Bras. 25: 173-180.

Duranton, J.F., M. Launois, M.H. Launois-Luong & M. Lecoq. 1987. Guia prático de luta contra os gafanhotos devastadores no Brasil. FAO, Rome, CIRAD/PRIFAS, Montpellier, 161p.

Ewen, A.B. & M.K. Mukerji. 1980. Evaluation of *Nosema locustae* (Microsporida) as a control agent of grasshopper populations in Saskatchewan. J. Invertebr. Pathol. 35: 295-303.

Greathead, D.J. 1992. Natural enemies of tropical locusts and grasshoppers: their impact and potential as biological control agents, p. 4-7. In C.J. Lomer & C. Prior (eds.). Biological control of locusts and grasshoppers. Bristol, CAB International, 354p.

Henry, J.E. 1969. Extension of the host range of *Nosema locustae* for control in Orthoptera. Ann. Entomol. Soc. Amer. 62: 452-453.

Johnson, D.L. 1989. The effects of timing and frequency of application of *Nosema locustae* (Microspora: Microsporida) on the infection rate and activity of grasshopper (Orthoptera: Acrididae). J. Intertebr. Pathol. 48: 232-238.

Johnson, D.L. & J.E. Henry. 1987. Low rates of insecticides and *Nosema locustae* (Microsporidia: Nosematidae) on baits applied to roadsides for grasshopper (Orthoptera: Acrididae) control. J. Econ. Entomol. 80: 685-689.

Johnson, D.L. & M.S. Goettel. 1993. Reduction of grasshopper population following field application of the fungus *Beauveria bassiana*. Biocontrol Sci. Technol. 3: 165-175.

Lange, C.E. 1992. Espectro hospedador natural y persistencia de *Perezia dichroplusae* Lange y *Nosema locustae* Canning (Protozoa: Microspora) em acridios argentinos (Orthoptera: Acrididae). Neotropica 38: 65-74.

MacVean, C.M. & J.L. Capinera. 1991. Pathogenicity and transmission potential of *Nosema locustae* and *Vairimorpha* n. sp. (Protozoa: Microsporida) in mormon crickets (*Anabrus simplex*; Orthoptera: Tettigonidae): A laboratory evaluation. J. Invertebr. Pathol. 57: 23-36.

Nasseh, O.M., T. Freres, J. Wilps, E. Kirklionis & S. Krall. 1992. Field cage trials on the effects of enriched neem oil, insect growth regulators and the pathogens *Beauveria bassiana* and *Nosema locustae* on desert locusts in the Republic of Niger. p. 311-320. In C.J. Lomer & C. Prior (eds.). Biological control of locusts and grasshoppers. Bristol, CAB International, 354p.

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