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Entomopathogenic Fungus as A Biocontrol Agent Against The Cattle Tick *Boophilus annulatus* (Say) (Acari: Ixodidae)

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ABSTRACT

Boophilus annulatus (Say) fed females were collected from healthy cattle (*Bos indicus*) and the eggs from their pin ground. Both were found infected with hyphae of *Beauvaria bassiana*, penetrating tick cuticles and egg membranes. Ticks were observed immobile and gradually died within 3-4 days. Eggs were dried within 48 hrs. The same symptoms were observed after exposing uninfected ticks with infected *B. annulatus* fed females and eggs. Females died within 4 to 5 days, while the eggs dried and never hatched. Results indicate that fungi can be used as an important biological control agent against the cattle ticks, *B. annulatus.*

KEY WORDS: Acari, Ixodidae, *Boophilus annulatus* (Say), ticks, entomophathogenic fungus, biological control, Egypt.

INTRODUCTION

Among the 840 known tick species in the world, the *Boophilus* species are the most important ticks affecting the economics of the cattle production in tropical and subtropical areas of the world. Each *Boophilus* species is a vector of *Babesia bigemina*, *Anaplasma marginale* Theiler, 1910, *Borrelia theileri* and probably transmit *Babesia bovis*. Heavy *Boophilus* infestation loads produce severe anemia, enervation and loss of weight in hosts. These ticks affect about 800 million cattle heads throughout the world. (Hoogstraal 1985 and Pegram *et al.* 1993).

In Egypt, the estimated number of cattle yearly exceeds 6.5 million heads (2002–2003, personal communication, Ministry of Agriculture, Animal Production Dept.), with a loss of meat protein estimated about 1200 tons annually, if only 50% of the cattle were infested. To control these ticks, chemical insecticides are extensively used which raise the cost of production plus the negative effects on health and environment.

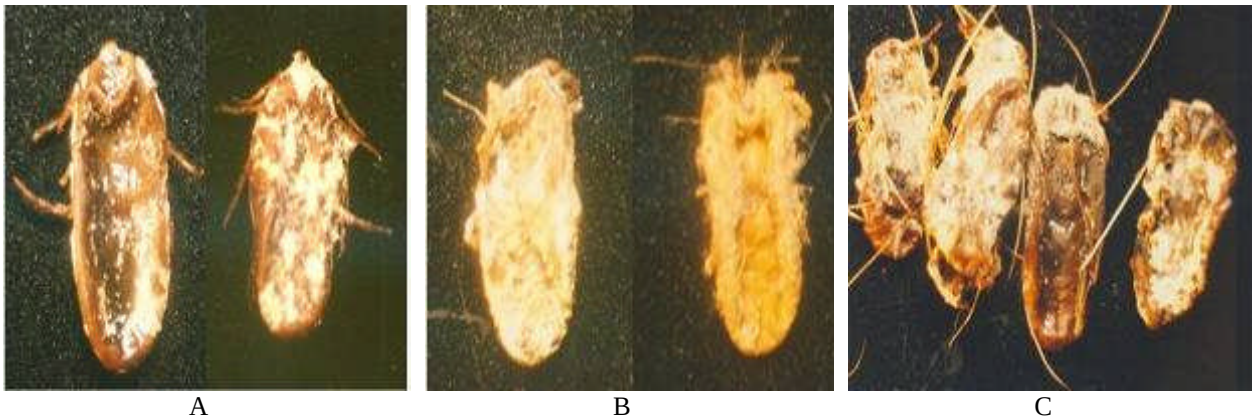
Entomophathogenic fungi were repo-rted as biocontrol agents against ticks (Mwangi *et al.*, 1995; Kaaya *et al*.1996). The present work was undertaken to study the impact of the fungus *Beauveria bassiana* naturally found in the Egyptian fauna as biocontrol agent against cattle ticks, *Boophilus annulatus* (Say in Egypt).

MATERIALS AND METHODS

Boophilus annulatus ticks were collected from cattle (*Bos indicus*) grazing on the Faculty of Agriculture Farm, Cairo University, Giza, Egypt. The eggs were collected from soil and debris in the same cattle pin ground. All ticks and eggs were found infected with fungus. Samples of colonized clean ticks and eggs were mixed in autoclaved tubes with the infected samples for investigating the possibility of infection. All treated and untreated ticks and eggs were observed daily for survival and viability.

RESULTS AND DISCUSSION

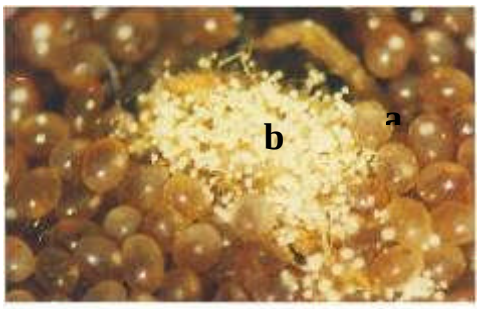
Thirty field collected engorged *B. annulatus* females and 5 batches of eggs (±0.1gm) were found



A B C

Fig. 1: A- Collected *B. annulatus* ticks infected with *B. bassiana* B- Gradual symptoms of illness, (2-3 days) C- Dead infected females (4 days

A



B

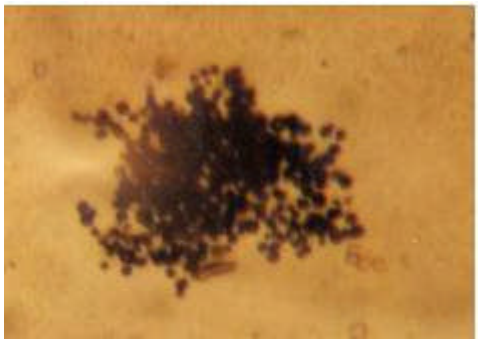


Fig. 2: A-Infected field collected *B. annulatus* eggs (a) with *B. bassiana* (b) B- Dried eggs after 48 hr

A

B

C

Fig. 3: A- Infected and uninfected *B. annulatus* females B-2-3 days post infection C- Dead females (4 days)

naturally infected with *Beauveria bassiana.* The observed fungus penetrated the tick cuticle and egg membranes to obtain nutrients. The fungus was developing clearly while the ticks became weaker, then immobile, until 100% died within 3-4 days (Fig.1). The eggs shrank until no fluid could be seen through their membranes in 24 hrs. The eggs looked non-vital and did not hatch, (Fig. 2). The same symptoms were observed on experimentally infected females and eggs, (Fig. 3). The host cattle remained as healthy as when they were infected with the ticks.

Tick control has been attempted through different techniques:

Acaricides: several methods have been, and still are in use. However, all of them lead to different difficulties, such as tick resistance and residual concentration in meat and/or other animal products such as milk or butter, which may reach human consumption.

Biological control: the use of pest/vector species, hormonal disruption, pheromone-baited devices and also molecular methods such as the vaccination of tick antigen are applied in limited areas and probably under experimental conditions, (Abdel Wahab *et. al.* 2000, Sayed *et. al.* 2001, and EL Kammah and Abdel Wahab, 2003).

Entomopathogenic fungi are used for tick biocontrol in different African countries,(Mwangi *et. al*. 1995 and Kaaya *et. al*. 1996). Studies in this area in Egypt are very limited, (Habeeb and Sewify 2002). Observing the present infection of *B. annulatus* ticks by fungus should encourage the evaluation of fungi as a biological control agent against ticks in Egypt. It caused death to females in few days and to embryo within 24hr., which within cleavage developmental period as found by EL Kammah *et. al.* 1987.

Using *B. bassiana* as a biological control agent against the cattle tick *B. annulatus* seems to be fast, safe and successful (Table 1). Further studies are needed to clarify the efficiency of several fungus species against other tick species infesting farm animals. It is advised to use fungal culture found naturally in the Egyptian fauna to avoid external contamination.

Table 1: Effects of *Beauvaria bassiana* on the viability of the cattle tick *Boophilus annulatus*

B. bassiana infection	30 Fed females		Five Egg batches (± 0.1gm)	
	Survival Days (%)	Oviposition (%)	Viability (days)	Hatching (%)
Field Infected	2-3 (4)	-	2	-
Control (Clean)	21 (100)	100	15-20	100

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