OVIPOSITIONAL PATTERN IN AMIDINE-RESISTANT *BOOPHILUS MICROPLUS* CANESTRINI, 1887 (ACARI: IXODIDAE) AFTER TREATMENT WITH AMITRAZ.

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SUMMARY: Amidine-resistant *Boophilus microplus* engorged females showed a delay in the beginning of the oviposition period after treated with amitraz at doses of 178 and 200 ppm. Mean preoviposition period lasted two days in the untreated group, whereas it was five days in those treated ones. Total number of eggs laid in experimental groups (9,886 and 8,216) was lower than those yield in untreated ticks (65,959 eggs); however the daily cumulative oviposition percentages were similar in both treated and untreated groups. Amitraz showed an effectiveness against this strain of *B. microplus* lower than 90% (85.01 and 87.54 in treated groups) compatible with a resistance condition. An increase in metabolic degradation rate of amitraz could explain the reversibility of the toxic effect observed in this tropical cattle tick strain used in this work. Delay in egg laying would be responsible for an increasing in *Babesia* spp. infected offspring.

KEY WORDS: *Boophilus microplus*, ovipositional pattern, amitraz, resistance.

INTRODUCTION

Boophilus microplus, the common cattle tick, is the most important ectoparasite of cattle in the tropics due to its hematophagous feeding habits and the transmission of pathogens to bovine herds, mainly *Babesia bovis* and *Babesia bigemina*. In Venezuela, tick control in farms relies on acaricide treatments applied either sporadic or frequently; however, empirical use of tickicide compounds has provoked an increase in acaricide-*B. microplus* resistant strains (CORONADO, 1996).

Amitraz was introduced to the Venezuelan market in the seventies but very soon it was replaced by synthetic pyrethroids due to the great effectiveness of the last compounds on both ticks and flies control. However, after the establishment of *B. microplus* resistant strains to organophosphorous and synthetic pyrethroids in Venezuela, an intensive use of amidine compound for *B. microplus* control was started in the last years. Consequently, more than 50% of acaricide treatments applied in Venezuela during 1995 were performed with 12.5% amitraz at dosage of 178 ppm, according to manufacturer' recommended concentration (SILVESTRI, 1996).

Continuous monitoring of acaricide resistance levels in *B. microplus* engorged females collected at farms from the Western Central region of Venezuela has shown an increasing of therapeutic failures in tick control effectiveness. Thus, amitraz effectiveness, formerly up to 100%, has been reduced to 85% in some cases (CORONADO and MUJICA, 1997).

Ovipositional pattern in *B. microplus* engorged females has been monitored at laboratory level by several authors, showing a characteristic curve (BENNETT, 1974a; DAVEY *et alii*, 1980; GLORIA *et alii*, 1993a; CORONADO *et alii*, 1997). In *B. microplus* resistant strains, no changes were observed in the reproductive efficiency index (BENNETT, 1974b; GLORIA *et alii*, 1993b).

The aim of the present work was to evaluate the pattern changes during the ovipositional period of amidine resistant-*B. microplus* engorged females, after being treated with amitraz at concentration of 178 and 200 ppm.

MATERIALS AND METHODS

Boophilus microplus engorged females were collected from infected dairy cows located in a dairy herd with a known decreasing susceptibility to amitraz. Ticks were washed and dried with towel paper and weighed individually. Only those ticks whose body weight was between 180 and 300 mg were chosen to form three groups (30 ticks per group; mean tick body weight 224.7 mg).

Adult immersion test (DRUMMOND *et alii*, 1973) was performed as follows: First, immersion of ticks during five minutes in distilled water (group A); second, immersion in amitraz solution of 178 ppm (group B) and third, immersion in amitraz solution of 200 ppm (group C). Ticks were weighed individually again and fixed by their dorsal surface on adhesive tape which was glued to a glass plate and incubated for three weeks under 27+1°C and 85% relative humidity. Daily observations were carried out and any result was recorded. In order to know the individual ovipositional pattern, the laid eggs were pick up daily. Each egg mass was weighed and put in a glass tube sealed with a cotton plug. Eggs were kept under the above conditions during the whole incubation period; in this way, it was possible to determinate the hatching percentage for each egg mass.

RESULTS AND DISCUSSION

Both, daily ovipositional pattern for control and experimental groups are shown in Fig. 1. These curve's shapes are very similar because the daily oviposition percentages are similar for the three groups; however, both the preovipositional period and the total number of eggs laid are quite different. In fact, in the control group, first eggs were laid two days after detachment, whereas, the experimental groups showed a delay in laying the first eggs, beginning the oviposition at fifth day after detachment. Regarding the daily total number of eggs laid , the control group reached the highest value of laid eggs at fourth day (11,512 eggs); on the contrary, experimental groups had the highest values at ninth or eighth day, laying just 1,732 or 1,202 eggs (groups B and C respectively).

Efficacy of amitraz on *B. microplus* in this work was below 90%, reaching 85.01% and 87.54% in groups B and C. Results obtained are compatible with an incipient resistant condition.

Recently dropped *B. microplus* engorged females lack mature ovaries, and by this reason, they need time for developing them, therefore the delay in both production and maturity of eggs. These processes must occur during the first days after detachment, that is, during the preovipositional period.

Evidences have been presented suggesting that oviposition is regulated through biogenic amines and it can be blocked by octopaminergic agonists such as octopamine, clonidine, tolazoline and naphazoline. The main effect of octopamine may be inhibition of peristaltic contraction of the oviduct, which blocks the oviposition in an irreversible way (BOOTH, 1989).

Amitraz, a formamidine, is an agonist of the octopamine receptors. It shows a potent knockdown effect on ticks, whereas sub-lethal effects are increased motor activity, mainly in legs, and dis-coordination. Oviposition in *B. microplus* is arrested by a sub-lethal dose of amitraz of 10 µg per tick, showing no damage at both ovaries and oviducts level (BOOTH, 1989). This fact is irreversible, and agrees with an oviduct paralysis.

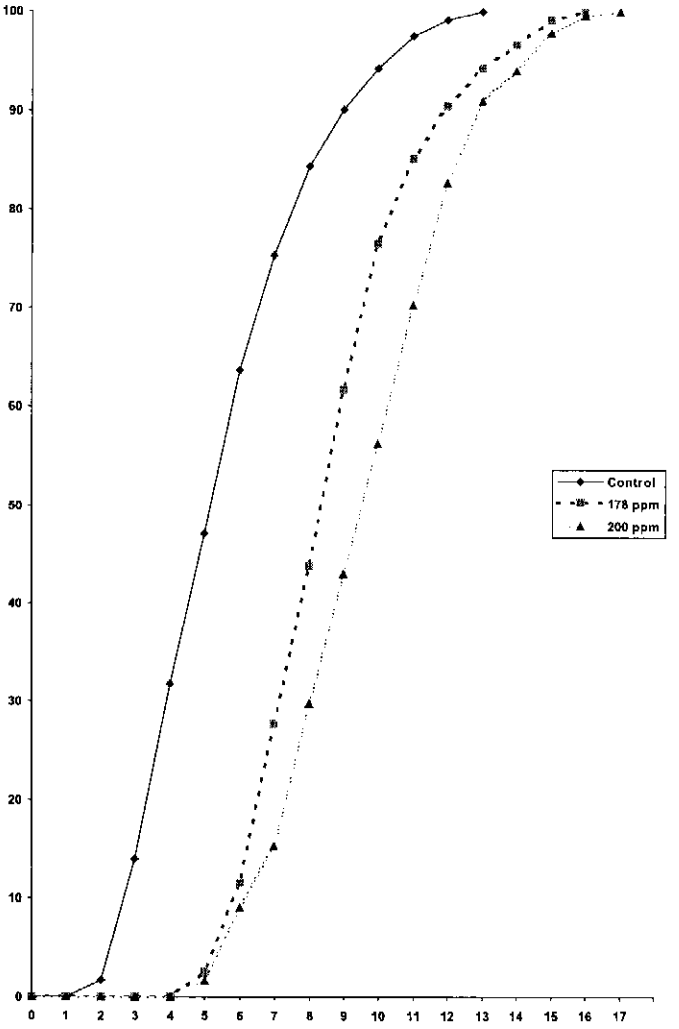

Fig. 1 - Daily cumulative ovipositional percentages in amitraz treated-*Boophilus microplus* engorged females.

Our results show that amitraz- treated *B. microplus* engorged females suffered a delaying in starting the egg laying, probably due to paralysis by blockage in neurotransmission functions. This fact seems to be reversible in amidine-resistant *B. microplus* strain because females were capable of laying eggs five days after the initial toxicosis. An increasing in the metabolic degradation rate of amitraz could explain the reversibility of the initial toxic effects observed in the *B. microplus* strain used in this work.

Regarding hemoparasites transmission, it is known that egg masses laid by *B. microplus* engorged females in the first five days are either negative or very low infected by *Babesia bovis* (MAHONEY and MIRRE, 1977); perhaps delay in the beginning of egg laying in amitraz treated- *B. microplus* females could be responsible for an increasing in the *Babesia* spp.-infected offspring, which would help largely in the biological transmission of these pathogenic hemoparasites by *B. microplus*, the unique biological vector in Venezuela.

SUMÁRIO

Fêmeas ingurgitadas de *Boophilus microplus* tratadas com amitraz nas concentrações de 178 e 200 ppm, mostraram alongamento do período de pré-postura. No grupo controle, a média desse período foi de dois dias, enquanto que nos grupos tratados foi de cinco dias. O número total de ovos produzidos pelos grupos tratados foi de 9.886 e 8.216 e de 65.959 para o grupo controle, entretanto as percentagens diárias de oviposição acumulada foram similares em ambos os grupos tratados e controle. O controle parasitário do amitraz foi de 85,01 e 87,54% nos grupos tratados, compatível com uma situacão de resistência. Um incremento na taxa de degradação metabólica do amitraz poderia explicar o fato da reversibilidade do efeito tóxico observado no presente experimento e o alongamento do período de pré-postura poderia ser responsável num incremento da taxa de infecção por *Babesia* spp. na progênie de *B. microplus*.
PALAVRAS-CHAVE: *Boophilus microplus*, oviposição, amitraz, resistência.

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