

EFFICACY OF IVERMECTIN, MOXIDECTIN AND ECTOMIN AGAINST *BOOPHILUS ANNULATUS* INFESTED CATTLE

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SUMMARY

The effectiveness of a single treatment with ivermectin or moxidectin or ectomin was determined. Forty four Friesian cattle naturally infested with *Boophilus annulatus* ticks, were used to asses the acaricidal efficacy of ivermectin, moxidectin and ectomin. Animals were allocated into 4 treated and control groups, each consists of 11 animals. At day (0), before treatment , ticks of more than 4.5 mm in length attached to treated and control animals were counted an every week thereafter. The average number of ticks on treated and control animals were counted and the efficacy percentage of acaricides used was determined. The average tick weight, the number of ticks laid eggs and the hatchability percentage of eggs were calculated. The percentage of reduction in the number of ticks that reached repletion following treatment (outright kill) was 99.4, 98.23 and 94.47% for ivermectin., moxidectin and ectomin, respectively. In addition, the reproductive capacity of the females that did survive to repletion was reduced . regardless of the endectocide. Engorged females recovered from treated groups weighed approximately 3-times less than untreated females, and the egg number produced by treated females weight approximately 2-3 times less than egg number produced by untreated females. Also the hatchability was reduced.

INTRODUCTION

Boophilus annulatus ticks represent the most dangerous pest infesting cattle and it is one of the major problems affecting health and impairing the profitable productivity of the livestock in the tropical and subtropical countries. They invade animals causing annoyance, depriving them of some blood as well as transmitting some bacterial , viral and rickettsial diseases and acting as vectors of certain protozoal diseases such as thaileriosis, babesiasis and

anaplasmosis (Hoogstraal, 1956; Yeoman and Walker, 1967 and Kettle, 1995).

Control strategies against cattle tick depend essentially on the use of acaricides on average every 3-4 weeks, by spray or cattle dip (Norton et al., 1983), and this will remain so in the foreseeable future. However many tick species have developed resistance to organophosphates carbamates, chlorinated hydrocarbons and amidines during the many years that they had been exposed to these acaricides. For this reason, tick strains resistant to some or virtually all known tickicides have been found in many countries. This in turn increasingly jeopardizes the effect of tick control measures (Nolan et al., 1979).

The *actinomycece streptomyces avermitilis* which was first isolated from soil by kitasato Institute in Japan in the mid-1970, produce a series of compounds called ivermectin" ivermectin" (Leaning, 1981 and Campbell et al., 1983). Chemically the ivermectin are oleandrose disaccharide derivatives of pentacyclic lactones and the name reflects their activity against worms (averm) and ectoparasites (ectin).

With the introduction of the synthetic pyrethroid into ectoparasites control of cattle , the veterinarian has now a new acaricides which posses a number of advantages. The most important is a wide range of activity against arthropods combined with a relatively long period of action (Ruigh, 1984). In addition, the pyrethroids also possess the advantage of a very low mammalian toxicity and the property of not accumulation in the milk and in edible tissue , and their use entails no withdrawal periods.

From the currently know pyrethroids in veterinary medicine, flumethrin is a highly effective member of pyrethroid group for tick control and initially for

use by spray or dip method in warm countries. (Dorn, etal. 1982 ; Hopkins and Woody, 1982 Hamel and Van Amelsfoort,1985; Stendel,1985; Liebisch, 1986 and Kalaf-Allah, 1996)

Another macrocyclic lactone endectocide moxidectin, was evaluated in separate trial on cattle infested with *Boophilus* genus (Remington et al., 1997, Davey and George 2002 Davey etal.,2005). The aim of this study was to evaluate the use of ivermectin, moxidectin and ectomin against cattle tick *Boophilus annulatus*.

MATERIALS AND METHODS

1-Animals and Location

A field trials with ivermectin, moxidectin and ectomin was conducted on Friesian cows , naturally infested with *Boophilus annulatus* ticks and located in Wady EL-Hyat governorate, Libya.

2-Acaricides

- Ivermectin (Ivomic Sharp and Dome-Holand)
- Moxidectin (Cydectin Cynamid U.S.E)
- Ectomin (Cypermethrin high cis, Ciba Giegy, Switzerland)

3-Experimental design

Forty- four animals infested with *Boophilus annulatus* were divided into four group, each of eleven animals. The first and second groups were administered a single subcutaneous injection (200 ug/ kg body weight) of ivermectin and moxidectin , respectively . the third group was treated with ectomin® , while the fourth group was right untreated as control. Ectomin ® was applied to

infested cattle by spraying using a motor sprayer and the sprayer's nozzle was held at 20cm distance from the animal's body , starting on one side and continued to the other side from above downwards. Attention should be paid to the hidden parts of animal's body.

At day (0) before treatment, engorged tick of more than 4.5 mm in length attached to the left side of each animal were counted and multiplied by two to estimate the total number of ticks on each animal (Nolan et al., 1981). The number of ticks on infested animals was counted regularly every week after treatment in all groups (7-week trials). The average number of ticks on treated and control animals were taken to calculate the percentage (%) of ticks surviving treatment and accordingly to asses the efficacy percentage (%) of acaricides.

Ticks from treated and control animal were collected , incubated at 37°Cand 95% relative humidity to evaluate the effect of ivermectin, moxidectin and ectomin ® on oviposition and hatchability of eggs, as well as the weight of ticks.

RESULTS

The data displayed in Table (1) indicate that ivermectin , moxidectin and ectomin are highly effective for control of *Boophilus annulatus* ticks in infested cattle. No ticks could be observed on the treated animals by the 7th day post-treatment for the ivermectin and moxidectin and by the 14th day post-treatment for ectomin providing 100% efficacy of the acaricides. This maximum efficacy was sustained for about 6 weeks post-treatment after which

Efficacy of Ivermectin...

the efficacy slightly decreased on the 7th week and reached 99.4%, 98.23% and 94.47% for ivermectin, moxidectin and ectomin, respectively, where the average tick number in treated cattle were 5.18, 15.18 and 47.54 ticks/ animal, respectively. This may explained by reinfestation of treated animals by infective larvae from the contaminated environment.

The obtained data in Table (2) demonstrate that mean weight of adult ticks collected from treated animals were 141.15mg, 151.12mg and 175.25mg for ivermectin, moxidectin and ectomin, respectively, while the mean weight of adult tick for control animals was 257.40mg. The reduction % in the mean tick weight were 45.16%, 41.29% and 31.92 for ivermectin, moxidectin and ectomin, respectively.

Also the results presented in Table (2) show that the acaricidal treatment of animals had a noticeable effect on oviposition of ticks. The overall mean number of eggs laid was 552.35, 712.14, 851.17 and 1815.21 per tick collected from ivermectin moxidectin, ectomin and control animals, respectively. This constitute about 69.57%, 60.76% and 53.11% reduction of egg laying capacity. The overall means number of larvae that hatched from animals eggs of ticks collected from treated were 231.17, 245.80 and 382.21 for ivermectin, moxidectin and ectomin, respectively, as compared to 1571.17 larvae that hatched from eggs of ticks collected from control animals. The reduction % in egg hatchability was 85.29%, 84.36% and 75.67% respectively.

DISCUSSION

The foregoing results indicate that ivermectin, moxidectin, and ectomin applied at the recommended dose to cattle naturally infested with *Boophilus annulatus* ticks, has an efficient killing effect on ticks 7 days post-treatment. A high

degree of efficacy was obtained, although the acaricides used does not demonstrate a rapid detaching effect as the maximum effect was attained at the 7th day after treatment for ivermectin and moxidectin and at the 14th day for ectomin. Similar results were obtained in controlled and field trials carried out in some countries with ivermectin and moxidectin (Davey and George, 2002; Aguilar-Tipacamu and Rodriquez – Vivas, 2003, George and Davey 2004 and Davey et al., 2005). Also similar results were obtained with flumethrin on *Boophilus microplus* ticks (Dorn et al., 1982) and on *Boophilus annulatus* (Khalaf-Allah 1996).

Ticks collected from treated cattle were lighter in weight than those collected from controls. This indicate that some reactions had been developed by the host which cause damage to the ticks gut , and this damage prevents the ticks from feeding properly. This is an important consideration because by the inhibition of feeding, the transmission of pathogens during blood suckling can be prevented.

The percentage reduction in the number of ticks that reached repletion following treatment (outright kill) was 99.4%, 98.23% and 94.47% for ivermectin , moxidectin and ectomin, respectively. In addition , the reproductive capacity of the females that did survive to repletion was reduced by >60%, regardless of the endectocide. These results were nearly coincided with that reported by (Davey et al., 2005) who found that the percentage reduction in the number of females that reached repletion following treatment was 94.8 and 91.1% for ivermectin and moxidectin, respectively.

A sterilizing effect of acaricides used was obtained for up to 42 days after treatment . the results of our field trial proved the excellent efficacy of ivermectin, moxidectin and ectomin. Besides the control of the existing tick infestation on cattle at the time of treatment , an additional feature is a prolonged residual action , which minimizes reinfestation of cattle with infective larvae for up to several weeks after treatment.

By this pronounced residual effect of ivermectin, moxidectin and ectomin, retreatment intervals can be extended and the number of treatment required for a complete tick control during the tick season can thus be reduced considerably. This means that after killing all tick stages attached to infested animals, the larvicidal concentration of used acaricides can remain in the hair coat of animals minimizing reinfestation by the infective larvae.

Besides the higher and prolonged effect of acaricides used on *Boophilus annulatus* ticks, it has a pronounced inhibition action on the oviposition of eggs by female ticks collected from treated animals and also on the hatchability of the laid eggs. This was confirmed in the laboratory and field trials conducted by Stendel and Fuchs (1982) ,Stendel (1985), Kalaf-Allah (1996), Davey and Georgy (2002) and Davey et al., (2005).

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فاعلية الأيفرمكتين ، الموكسيديكتين والأكتومين ضد قراد البوفيلس
انيولاتس فى الماشية

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أجريت هذه الدراسة على عدد 44 من الماشية للمصابة بقراد البوفيلس انيولاتس لدراسة تأثير الأيفرمكتين ، الموكسيديكتين والأكتومين على هذا القراد. تم تقسيم هذه الحيوانات إلى أربعة مجموعات حيث عولجت المجموعة الأولى بالايفرمكتين، المجموعة الثانية بالموكسيديكتين والثالثة بالاكتومين، أما المجموعة الرابعة فقد تركت بدون علاج كمجموعة ضابطة. تم حساب وزن القراد بالميلجرام ، عدد إناث القراد التى تبيض ونسبة فقس البيض .

أظهرت نتائج الدراسة أن فاعلية الأيفرمكتين ، الموكسيديكتين والأكتومين فى القضاء على قراد البوفيلس انيولاتس كانت 99.4% ، 98.23% ، 94.47% على التوالى ، بالإضافة إلى أن الكفاءة التناسلية للقراد التى تقاوم العلاج قد انخفضت. أيضا أظهرت النتائج أن وزن القراد على المجموعات المعالجة كان اقل بثلاثة مرات عن القراد الموجود على المجموعة الضابطة ، كما قل عدد البيض الذى تم وضعة بواسطة القراد المتواجد على المجموعات المعالجة.