Acaricide efficiency of amitraz/cypermethrin and abamectin pour-on preparations in game

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ABSTRACT

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The efficacy of an amitraz/cypermethrin pour-on preparation (1 % w/v each) was tested against natural tick infestations of buffaloes, eland and blesbok in three separate trials. The eland were also treated with a 0.02 % abamectin (w/v) acaricidal pour-on preparation. The amitraz/cypermethrin pour-on was effective against *Amblyomma hebraeum*, *Rhipicephalus evertsi evertsi*, *Rhipicephalus appendiculatus* and *Hyalomma marginatum rufipes* on the buffaloes. Both acaricides were effective against *R. appendiculatus* and *Rhipicephalus* (*Boophilus) decoloratus* in the eland. The amitraz/cypermethrin acaricide was effective against *R*. (*Boophilus) decoloratus* in the blesbok.

Ticks can cause damage to the skins, secondary infections, abscesses, anaemia, loss of condition, tick toxicosis and act as vectors of infectious diseases. Introduction of hosts and/or ticks from endemic to non-endemic areas because of translocation of game, may lead to severe losses. The pour-on acaricides tested were effective against natural tick infestations and should always be used according to the manufacturer's instructions and efficacy claims.

Keywords: Abamectin, acaricides, African buffalo, amitraz, blesbok, cypermethrin, eland, game, pour-on, tick infestation

INTRODUCTION

Game ranching is becoming a lucrative industry in southern Africa, leading to a number of wildlife species being kept in areas other than their natural habitat. Management interventions such as the use of acaricides are required to maintain the health of these animals, to reduce stress levels, physical damage inflicted by ectoparasites and transmission of tick-borne diseases, especially when game are kept under semi-intensive conditions. Many game animals are often relocated to other game reserves for various reasons. The presence of tuberculosis and other diseases in African buffaloes in certain areas has led to their relocation to various game reserves to participate in disease-free breeding programmes. Translocation and export of game animals requires complete cleaning from tick infestations (Hamel & Van Amelsfoort 1985).

Three trials on various game species are discussed in this paper. A pour-on acaricide formulation consisting of amitraz and cypermethrin (both at 1 % m/v), was evaluated against naturally occurring infestations of ticks on eland (*Taurotragus oryx*), African buffaloes (*Syncerus caffer*) and blesbok (*Dam-*

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aliscus dorcas phillipsi). A second pour-on acaricide formulation, consisting of 0.002 % abamectin (m/v), was also tested on eland.

MATERIALS AND METHODS

Animals that appeared healthy and showed suitable visible infestations of external parasites were selected for the trials. No ectoparasite treatment was administered for at least 3 weeks prior to commencement of the study. The animals were not ranked and were not allocated according to any criteria, but were treated at random to reduce handling stress. The doses recommended were the same as recommended for domestic stock. The study animals were not destined to enter the food chain, therefore a withdrawal period was not applicable. At the end of each study the animals involved were relocated back to the game reserve. No statistical analysis was conducted during any of the trials. The efficacy of the acaricide(s) was calculated by using the formula:

$$\% \text{ control} = \frac{(C - T)}{C} \times 100$$

where: C = mean number of ticks on Day 0
T = mean number of ticks on Day 7

No adverse circumstances occurred during the study period to affect the quality or integrity of the data or study in any of the three trials.

Buffalo trial

The efficacy of a pour-on acaricide, containing 1 % (w/v) each of amitraz and cypermethrin, was evaluated against natural infestations of ectoparasites of African buffaloes located at the Mabalingwe Nature Reserve in the Limpopo Province of South Africa. Sixteen buffalo of either sex and older than 8 months were involved in this study. Natural infestations of *Amblyomma* spp., *Rhipicephalus* spp. and *Hyalomma* spp. were observed on the buffaloes. The study design is given in Table 1. The buffaloes were allocated to two groups, each consisting of eight animals. Group T1 was the treated group and received the pour-on acaricide along the dorsal midline area (or as near as possible) from the withers to the *tubae coxae* using plastic syringes at a dosage rate of 0.1 mℓ product per kg body mass. The dosage rate for domestic stock recommended by the manufacturer was used, as the same tick species occur on buffaloes and domestic stock. Group T2 was the untreated group. The body mass of the buffaloes in the trial varied between 140 and 350 kg. Animals were weighed by means of a weight band while being restrained in a handling crush. Ticks were counted on Day 0 (before treatment) and on Day 7 (after treatment), while the animals were restrained in the crush. The animals were housed in a boma consisting of two holding pens with dimensions of 100 m x 100 m. Individuals of the two groups were not in contact with each other.

Eland trial

This trial was conducted to evaluate the effectiveness of two pour-on formulations in the control of natural infestations of the following ectoparasites in eland: *Amblyomma hebraeum*, *Rhipicephalus evertsi evertsi*, *Rhipicephalus appendiculatus* and *Rhipicephalus (Boophilus) decoloratus.* The eland were relocated from a game farm to the Inkwenkwezi Game Park, both situated in the Eastern Cape Province. They were allowed to acclimatise for 7 days before commencement of the experimental phase. The 17 study animals, of either sex, were tranquillized during handling. They weighed between 155 and 471 kg, appeared healthy and had not received treatment against ectoparasites for at least 3 weeks prior to commencement of the trial. The study design is given in Table 2. The animals were divided into three groups, i.e. two treatment groups T1 and T2 consisting of six animals and a control group (untreated) consisting of five animals. Two pour-on acaricide formulations were evaluated. The first consisted of a mixture of amitraz and cypermethrin (both at 1 % m/v) and was applied at a dosage rate of 0.1 mℓ/kg body mass. The second consisted of abamectin (at 0.002 % m/v) and was applied at a dosage rate of 0.1 mg/kg body mass. The eland were weighed by means of a weight band after they had been tranquillized and their ticks counted. The required dose was applied along the dorsal midline area (or as near as possible) from the withers to the *tubae coxae* using plastic disposable syringes. The animals were treated on Day 0 after the ticks were counted. Ticks were again counted on Day 7.

The eland were housed in a boma consisting of two pens each with dimensions of 9 m x 9 m, the sides of the pens were covered with plastic sheeting to reduce stress levels. They were all contained in the same boma and were fed lucerne, guava leaves and grass hay. Water was available *ad libitum*.

Blesbok trial

The purpose of this trial was to evaluate the efficacy of an amitraz/cypermethrin acaricidal pour-on in blesbok rams naturally infested with field strains of ticks. Twelve animals, approximately 2 years of age, were captured over a period of 2 days. Ticks were counted prior to treatment and after treatment on Day 7. The first six animals captured were allocated to the untreated control group and the next six animals to the treatment group. The experimental design is given in Table 3. The animals were allowed to acquire a natural tick infestation in the game reserve. The area is regarded as a high tick environment. The blesbok were darted using an opioid agonist to tranquillize them. Tick counts were conducted, the animals were weighed and the treatment group received the treatment while they were still tranquillized. The treatment group (T1) received the same pour-on formulation as was used on the buffaloes at a dosage rate of 0.1 mℓ/kg body mass and was applied by means of a plastic syringe, in one line from the withers to the base of the tail. The control group (T2) was left untreated. The dosage rate is the same as recommended for cattle as similar tick populations occur on both blesbok and cattle. Ticks were counted macroscopically on individual animals and identified to species level.

The animals were kept in a boma consisting of two holding pens with dimensions of approximately 9 m x 9 m. A hinged gate between the two pens was available to allow animals to be removed from the sedated animals during tick counts. The boma and the gate were completely covered with plastic sheeting on the inside for protection against injury. The two groups of animals were maintained together in the boma for the duration of the study for practical reasons. The animals were fed a ration of guava leaves, grass and lucerne. Water was available *ad libitum*.

RESULTS

None of the animals involved in the trials showed any adverse effects to the acaricide(s) evaluated during the three trials.

Buffalo trial

The results obtained are given in Table 4. The amitraz/cypermethrin acaricide was 94.6 % effective against *A. hebraeum*, 100 % effective against *R. evertsi evertsi*, 99.9 % effective against *R. appendiculatus* and 100 % effective against *H. marginatum rufipes*. This pour-on acaricide is therefore regarded as effective against these tick species on buffaloes, because of the > 80 % efficacy.

Eland trial

The results obtained are given in Table 5. The amitraz/cypermethrin pour-on acaricide showed 86.11 % efficacy against *R. appendiculatus* and 98.1 % efficacy against *R.* (*Boophilus) decoloratus*. The abamectin pour-on was 87.48 % effective against *R. appendiculatus* and 88.1 % effective against *R.* (*Boophilus) decoloratus*. Lower than 80 % efficacy against *A. hebraeum* and *R. evertsi evertsi* was found for both acaricide pour-on formulations in the eland. These two acaricides can only be regarded

TABLE 1 Experimental design of the buffalo trial

Group	No. of animals	Treatment	Application route	Dose rate (mℓ/kg body mass)
T1	8	Amitraz/cypermethrin pour-on	Percutaneous	0.1
T2	8	Untreated control	Not applicable	Not applicable

TABLE 2 Experimental design of the eland trial

Group	No. of animals	Treatment	Application route	Dose rate (mℓ/kg body mass)
T1	6	Amitraz/cypermethrin pour-on	Percutaneous	0.1
T2	6	Abamectin pour-on	Percutaneous	0.1
T3	5	Untreated control	Not applicable	Not applicable

TABLE 3 Experimental design of the blesbok trial

Group	No. of animals	Treatment	Application route	Dose rate (mℓ/kg body mass)
T1	6	Amitraz/cypermethrin pour-on	Percutaneous	0.1
T2	6	Untreated control	Not applicable	Not applicable

TABLE 4 Percentage efficacy of a pour-on acaricide against ticks on the buffaloes

Type of tick	Amitraz/cypermethrin pour-on
Amblyomma hebraeum	94.6*
Rhipicephalus evertsi evertsi	100.0*
Rhipicephalus appendiculatus	99.9*
Hyalomma marginatum rufipes	100.0*

* More than 80 % efficacy = effective

TABLE 5 Percentage efficacies of two pour-on acaricides against ticks of eland

Type of tick	Amitraz/cypermethrin pour-on	Abamectin pour-on
Amblyomma hebraeum	60.23	38.12
Rhipicephalus evertsi evertsi	68.98	61.18
Rhipicephalus appendiculatus	86.11*	87.48*
Rhipicephalus (Boophilus) decoloratus	98.10*	88.10*

* More than 80 % efficacy = effective

TABLE 6 Percentage efficacy of a pour-on acaricide against ticks of blesbok

Type of tick	Amitraz/cypermethrin pour-on
Amblyomma hebraeum	17.00
Rhipicephalus evertsi evertsi	55.30
Rhipicephalus (Boophilus) decoloratus	83.40*

* More than 80 % efficacy = effective

TABLE 7 List of diseases and their vectors (adapted from Howell, Walker & Nevill 1983 to include only ticks relevant to this paper)

Disease and disease-causing organism	Susceptible animals	Vectors
Heartwater [*Ehrlichia (Cowdria) ruminantum*)]	Cattle, sheep, goats	*Amblyomma hebraeum*
Redwater (*Babesia bigemina*)	Cattle	*Rhipicephalus (Boophilus) decoloratus*
Gallsickness (*Anaplasma marginale*)	Cattle	*Rhipicephalus (Boophilus) decoloratus*
Corridor disease (*Theileria lawrencei*)	Cattle, buffalo	*Rhipicephalus appendiculatus*
Theileriosis (*Theileria* species)	Cattle	*Amblyomma hebraeum* *Rhipicephalus evertsi* *Rhipicephalus appendiculatus*
Biliary fever (*Babesia equi*)	Horses	*Rhipicephalus evertsi*
Spirochaetosis (*Borrelia theileri*)	Cattle, sheep, goats, horses, mules, donkeys	*Rhipicephalus (Boophilus) decoloratus* *Rhipicephalus evertsi*
Tick bite fever (*Rickettsia conori*)	Humans	*Amblyomma hebraeum* *Hyalomma marginatum rufipes* *Rhipicephalus evertsi*
Crimean-Congo haemorrhagic fever virus (CCHFV) (Rechav, Zeederberg & Zeller 1987)	Humans	Main vectors: *Hyalomma marginatum rufipes* *Hyalomma truncatum* CCHFV also found in: *Rhipicephalus evertsi evertsi*

TABLE 8 List of diseases caused by tick toxins and their vectors (adapted from Howell *et al.* 1983 to include ticks relevant to this paper)

Disease	Susceptible animal	Vectors
Spring lamb paralysis Tick toxicosis	Lambs, calves Cattle	*Rhipicephalus evertsi evertsi* *Rhipicephalus appendiculatus*

as effective against *R. appendiculatus* and *R.* (*Boophilus) decoloratus* in eland. A reduction in the tick numbers of the control animals was obtained, which can be ascribed to contamination with the acaricide from the treated animals as they were housed in the same pens.

Blesbok trial

An efficacy of 83.4 % was obtained against *R.* (*Boophilus) decoloratus*, 55.3 % against *R. evertsi evertsi* and 17 % against *A. hebraeum*. The results obtained are given in Table 6. The blesbok had very low tick infestations and the results are therefore inconclusive. An effective rating against *R.* (*Boophilus) decoloratus* is applicable because of the > 80 % efficacy shown.

DISCUSSION

Ticks are important in domesticated animals and game in South Africa. Problems can range from slight irritation, to lesions which cause damage to skins and hides, and to the fact that they act as vectors for certain infectious diseases, such as Corridor disease and heartwater. Some of the diseases and their vectors applicable to the tick populations relevant to this paper are given in Table 7. Diseases caused by tick toxins from ticks relevant to this paper are shown in Table 8. (Howell, Walker & Nevill 1983). In both cases the information was adapted to include only the tick species found on the game during the three studies discussed in this paper. The growth in the game industry in South Africa, combined with the translocation of game to areas where they do not normally occur and keeping of game under semi-intensive conditions have led to the role of ectoparasites, such as ticks, becoming more important. Ticks can cause direct and indirect damage in these animals. Blood loss, high tick burdens and toxicosis caused by certain ticks can bring about a decline in their health. The skin lesions caused by ticks can have implications for the game trophy, hunting tourism and taxidermy industries. Wounds can also lead to entry of secondary organisms that can cause abscesses or other infections. Tick bites can damage auricles and teats of animals. Tick infestations of game may lead to loss of production and even death, because of tick toxicosis, metabolic disturbances, anaemia, secondary infections of tick wounds and transfer of blood parasites by ticks (Horak 1980; Lightfoot & Norval 1981, as cited by Zieger, Horak, Cauldwell, Uys & Bothma 1998). Old, sick and young animals have a lower resistance and are therefore more susceptible to the above problems caused by ticks because of high tick burdens (Heyne, personal communication 2004). Studies conducted on various types of game indicate that a healthy animal is better able to withstand the effects of ticks than an injured or ill animal (Boomker & Horak 2002).

Hamel & Van Amelsfoort (1985) found an eland in an emaciated and anaemic condition associated with a high tick and eland-specific sucking lice (*Lignognathus taurotragus*) burden. The ticks they found were *R.* (*Boophilus) decoloratus*, *R. evertsi evertsi*, and *A. hebraeum*, which occurred on different sites of the body, according to species preferences.

Considerable risks are associated with translocation of wild ruminants from heartwater-endemic areas to heartwater-free areas, which have large populations of susceptible domestic and wild ruminant hosts and tick species capable of transmitting the disease (Peter, Anderson, Burridge & Mahan 1998). These authors demonstrated a carrier state for *Ehrlichia (Cowdria) ruminantium* in eland, giraffes (*Giraffa camelopardalis*), kudus *(Tragelaphus strepsiceros*) and blue wildebeest (*Connochaetes taurinus*). The vector used to transmit the organism to naive ruminants during their study was *A. hebraeum*. Wild ruminants seem to play an important role in the epidemiology of heartwater by acting as reservoirs of *E.* (*Cowdria) ruminantium* infection. Andrew & Norval (1989) have shown that sheep, cattle and African buffaloes remain carriers of heartwater for long periods after recovery from the disease. The possibility that other ruminants may also be carriers of heartwater exist and further research is required to elucidate this possibility.

Paralyses caused by the Karoo paralysis tick, *Ixodes rubicundus*, in gemsbok (*Oryx gazella*) was studied by Fourie & Vrahimis (1989). It would seem that gemsbok with a high tick burden are more likely to become paralysed than those with a low tick burden. This toxicosis seems to be age-related. Adult gemsbok are either more resistant to the toxin, or their tick burdens are not high enough to cause paralysis. High mortality rates in the subadult group suggest that mortalities induced by the Karoo paralysis tick can retard population growth. This may also be true of other conditions caused by ticks. The suitability of an area for the introduction of a new game species should not be determined only from a grazing perspective, but harmful host-parasite associations should also be considered (Fourie & Horak 1987, as cited by Fourie & Vrahimis 1989).

Game endemic to a specific region are normally not seriously affected by tick-borne parasites and diseases. If hosts and/or ticks are introduced through their translocation to non-endemic areas, severe losses may occur (Lightfoot & Norval 1981, as cited by Zieger *et al*. 1998). From the above it is clear that the presence of ticks on game species such as buffaloes, eland and blesbok can have severe implications. The use of management interventions such as acaricides to reduce tick burden is essential. The pour-on acaricides tested were both effective against natural infestations of ticks occurring in buffaloes, eland and blesbok and should be used according to the manufacturer's recommendations and efficacy claims.

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