The efficacy of used engine oil against ticks on cattle

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ABSTRACT

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The study was conducted in a peri-urban agricultural system at Botshabelo, a city in the south-eastern Free State. A questionnaire survey revealed that 88,5% of cattle farmers in the area experienced problems related to ticks and tick-borne diseases. Because of the cost of commercial acaricides the Botshabelo farmers use alternative, cheaper methods of tick control, including the application of used engine oil. The specific aim of the study was to determine whether used engine oil can effectively control ticks on cattle. From March to August 1996 the tick burdens of ten control animals and six animals treated by their owner with used engine oil were compared. The total tick burdens for the 6 month period differed significantly between the two experimental groups. The efficacy of the used engine oil on the treated group varied between 15,1% and 64,8% with a mean of 38,1%. Although commercial acaricides can be more cost-effective, the application of used engine oil can be useful to reduce tick numbers on cattle during periods of peak abundance. Another advantage is that the use of the oil will not influence existing endemic stability to *Anaplasma marginale* and *Babesia bigemina* infections because of the residual tick burdens after treatment.

Keywords: Cattle, tick control, used engine oil

INTRODUCTION

Cattle, which are an important source of milk, fuel and meat in the resource-poor, peri-urban agricultural systems of small scale farmers in South Africa, are periodically subjected to heavy tick infestations. In a questionnaire study done at Botshabelo, a city located in the south-eastern highveld area of the Free State Province, a total of 88,5% of peri-urban farmers ($n = 200$) regarded ticks and tick-borne diseases as a serious problem in the area, either because of tick worry, abscesses induced by tick bites or the transmission of *Anaplasma marginale* causing anaplasmosis (Dreyer 1997).

Results from an extensive tick study on cattle in the area over a 12 month period indicated high mean adult tick burdens (411,68 ± 23,24) per bovine ($n = 50$) and the presence of 11 tick species. In June 1996, *Boophilus decoloratus* peaked at an average of 1 133,06 ± 138,20 adult ticks per animal ($n = 50$) (Dreyer 1997). A serological survey confirmed the presence of two tick-borne diseases, caused by *Babesia bigemina* and *Anaplasma marginale* in the region.

Because of the cost of commercial acaricides the small-scale cattle farmers in Botshabelo and elsewhere use alternative, cheaper methods to control the high tick burdens on their cattle. These include the application of used engine oil as an acaricide (Dreyer 1997; Masika, Sonandi & Averbeke 1997). The farmers are of the opinion that the used engine oil kills ticks on their cattle. The effectiveness of used engine oil has, however, not been scientifically assessed (Masika *et al.* 1997). The specific aim of this study was to determine whether used engine oil effectively controls ticks on cattle.

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MATERIALS AND METHODS

From March to August 1996 ticks were collected at four-weekly intervals from two groups of cattle. The survey animals consisted of 18–48 month old Friesian or Brown Swiss crosses owned by urban, small-scale farmers. These cattle grazed on the peri-urban commonage of Botshabelo. Six of the animals were treated with used engine oil and ten animals served as an untreated control group. The two groups were herded by three farmers and allowed to graze in the same area.

A volume of 300–500 mℓ of used oil was used on each animal in the treated group ($n = 6$) and this was applied by the owner according to his standard practice. The oil was poured into a shallow bowl and an old cloth was used to rub it over the animal's body. The farmer concentrated on those areas of the body on which he observed large numbers of ticks. Seven to ten days after each treatment both groups of cattle were assembled in order to determine their half-body tick burdens (Mattioli, Bah, Faye, Kora & Cassama 1993). The animals were restrained in a mobile handling facility consisting of a race, crush and neck clamp. Adult ticks in all stages of engorgement were removed from the cattle with forceps and placed in labelled plastic containers filled with 70% ethanol for later identification and quantification. Dead ticks present on the treated animals were not included in the counts. The data sets were analyzed statistically using the appropriate analysis of variance techniques. Logarithmic transformations (logarithms of base 10) of the ticks burdens were performed in order to achieve normality and equality of variances. Data on *Boophilus decoloratus* and *Hyalomma marginatum rufipes* burdens were specifically analyzed, because of the detrimental effects they were observed to have on the hosts (Dreyer 1997). An unpaired, two-tailed Student *t*-test was used to determine any significant differences between the total tick burdens and also the *B. decoloratus* and *H. marginatum rufipes* burdens of the two groups. A significance level of $P < 0,05$ was used throughout. The efficacy of the used engine oil as an acaricide was calculated using the following formula:

If

C = mean monthly tick burden on the control group and

T = mean monthly tick burden on the treated group, then

$$\text{Monthly difference (D)} = C - T$$

$$\text{Efficacy (\%)} = \frac{D}{C} \times \frac{100}{1}$$

$$= \frac{C - T}{C} \times \frac{100}{1}$$

The minimum and maximum costs of used engine oil per Large Stock Unit (LSU) were calculated and compared to the minimum costs of commercially available acaricides (H. Haveman, Hoechst Roussel Vet, personal communication 1998).

RESULTS

The group of cattle treated with used engine oil had lower total tick burdens throughout the six months observation period (Table 1). Similar seasonal fluctuations occurred in the tick burdens of both groups. The total tick burdens (six months combined) of the two groups differed significantly ($t = 4,8$; $P = 0,005$), with the treated group having significantly lower total tick numbers. A comparison of the monthly mean total tick burdens yielded significant differences between the two groups for March and for July. Significant differences between the monthly mean burdens of *B. decoloratus* for the two groups of cattle were seen in March and in March and June for *H. marginatum rufipes* (Table 1).

The differences in mean tick burden varied from an average of 33,0 fewer adult ticks on the treated group in August to 651,8 fewer adult ticks in March (Table 1). This was expressed in terms of efficacy to indicate the success of used engine oil as an acaricide on cattle (Table 2). The efficacy of the engine oil varied from 15,1% in June to 64,8% which was recorded in March. The average efficacy of the used engine oil over the six month period was 38,1%.

Farmers either collect or buy the used engine oil from friends with informal, one-man car repair works alongside the roads in Botshabelo. Thus, the cost of the engine oil varies from either getting it free, or paying up to R10,00 per container of 5 ℓ. The costs of the various commercial acaricides available to farmers in the Botshabelo area are compared to that of the used engine oil in Table 3.

DISCUSSION

Tick numbers can be reduced on cattle by the application of used engine oil as an acaricide. The oil most probably acts as a physical acaricide clogging the spiracles and causing the ticks to suffocate. Direct contact between the oil and the tick is therefore necessary for effective results. No residual effect is present, and farmers need to apply the oil specifically when and where they observe large numbers of ticks.

Only 12,5% of livestock owners in Botshabelo and Thaba Nchu have permanent employment and a constant income (Dreyer 1997), and 30% of the population in Botshabelo earn less than R500 per month (Krige 1996). Commercial acaricides are expensive, with costs varying from R0,56 per LSU for hand sprayed preparations to at least R2,42 per LSU for

TABLE 1 Monthly mean (± S.E.) total tick burdens, and *B. decoloratus* and *H. marginatum rufipes* burdens on the treated and control groups of cattle

Month	Tick species	Mean tick burdens for groups		
		Treated ($n = 6$) ± S.E.	Controls ($n = 10$) ± S.E.	*P*-value
March	Total ticks	354,5 ± 90,4	1 006,3 ± 239,2	0,03
	B. decoloratus	331,8 ± 87,7	952,8 ± 235,7	0,04
	H. m. rufipes	3,0 ± 1,7	10,5 ± 3,1	0,04
April	Total ticks	417,2 ± 165,2	682,1 ± 168,4	NS
	B. decoloratus	376,5 ± 164,3	626,6 ± 158,3	NS
	H. m. rufipes	6,0 ± 0,9	8,5 ± 1,8	NS
May	Total ticks	618,7 ± 327,9	1 050,2 ± 234,0	NS
	B. decoloratus	580,0 ± 321,9	992,5 ± 228,9	NS
	H. m. rufipes	5,2 ± 2,4	5,5 ± 1,2	NS
June	Total ticks	1 174,3 ± 590,7	1 383,4 ± 364,8	NS
	B. decoloratus	1 162,7 ± 587,1	1 358,9 ± 363,8	NS
	H. m. rufipes	0,2 ± 0,2	2,7 ± 0,8	0,03
July	Total ticks	241,3 ± 85,4	408,7 ± 70,9	0,04
	B. decoloratus	238,8 ± 85,2	399,2 ± 69,9	NS
	H. m. rufipes	0,3 ± 0,3	0,8 ± 0,4	NS
August	Total ticks	44,5 ± 12,9	77,5 ± 13,3	NS
	B. decoloratus	40,0 ± 13,3	73,5 ± 13,1	NS
	H. m. rufipes	0	0,2 ± 0,1	NS
March to August	Mean total burden	475,1 ± 159,9	768,0 ± 193,9	0,005

NS = not significant

TABLE 2 The monthly differences in mean tick numbers between the treated group and the control group, with reduced tick numbers being expressed as efficacy (%) of the engine oil as acaricide

Month	Difference (D) in tick numbers (controls—treated)	Efficacy (%) (D/controls x 100)
March	651,8	64,8
April	264,9	38,8
May	431,5	41,1
June	209,1	15,1
July	167,4	41,0
August	33,0	42,6
Total	1 757,7	38,1

TABLE 3 Costs of acaricides per large stock unit per application

Acaricidal application	Cost (R)
Used engine oil	R0,00–R1,00
Handspray	R0,56 minimum[a]
Handspray and tick grease	R0,86 minimum[b]
Pour-on	R2,42 minimum

[a] Application of 5 ℓ of spray per animal
[b] Application of 5 ℓ of spray per animal and 200 g of grease

pour-on formulations. The financial means to buy acaricides are consequently non-existent for most of the livestock owners.

The costs of acaricides per LSU varies greatly. Depending on the price farmers pay for used engine oil this is potentially the cheapest acaricide followed by spray formulations, combinations of spray formulations and tick grease, and pour-on formulations. An advantage when using engine oil is that no special equipment is required, the oil is easy to acquire and can also be purchased in small volumes or obtained free of charge. Commercially available acaricides must be purchased at a farmer's cooperative store and then in specific quantities which may be too expensive for individual farmers to purchase. If farmers were, however, willing to pool their financial resources, commercially available acaricides could be acquired. The added cost when using a handspray application method would be the initial investment to buy a suitable spray-gun. Problems that have been observed when handspraying is used by small-scale farmers are the improper wetting of animals, and the application of insufficient pressure and inadequate concentrations of the preparation (Kiwanuka, Stewart, Bryson, De Waal, Tice, Schoeman & Pettey 1995; Dreyer 1997). No extra facilities nor expenses are necessary when pour-on remedies are used. Costs could be reduced if large volumes of a preparation

are purchased which are then shared among several farmers.

The greatest disadvantage of using used engine oil is the low (38,1%) average efficacy. This does not compare well with that of commercial acaricides which have an efficacy of > 80% (Fourie, unpublished data). Besides their superior efficacy many commercial acaricides have residual effects. The synthetic pyrethroids, for example, have residual effects lasting for 7–14 d (E. Boelema, Bayer Pty Ltd, personal communication 1997). Considering the high tick burdens on cattle in the study area, the use of engine oil would not necessarily be sufficiently effective as the sole means of tick control, excepting perhaps if it is applied more regularly. An advantage in the use of engine oil is that it will not influence the existing situation of endemic stability to *Anaplasma marginale* and *Babesia bigemina* infections since a number of ticks will still be feeding (Dreyer 1997).

Engine oil is a mineral oil, and the possibility exists that if used for prolonged periods, it or some of the impurities it contains (such as lead), could be absorbed through the skin resulting in toxicity in cattle and possible toxic residues in meat or milk (Masika *et al.* 1997). This aspect needs investigation since no work has been done in this regard.

Various suggestions on ways to address tick-related problems in Africa have been made in the literature. These include controlled treatments such as 'planned', or 'threshold' and 'strategic' applications of acaricides, pasture spelling, modified pasture spelling, vaccination against the major tick-borne diseases and anti-tick vaccines (Harley & Wilkinson 1971; Sutherst 1981; Fasanmi & Onyima 1992; Wamukoya 1992; Fivaz & De Waal 1993; Luguru 1994). However, many of these suggestions will be difficult to implement in a typical African small-farmer situation (rural or urban), mainly because of the following reasons (Young *et al.* 1988; Alghali 1992; Fasanmi & Onyima 1992; Kaaya 1992):

- The costs (and unavailability) of acaricides and vaccines
- The socio-economic conditions and education level of the livestock producers (Nari 1995)
- The traditional habits and customs of the community
- The occurrence of 3-host tick species
- The absence of fences for pasture spelling on the commonage

To the resource-poor Botshabelo farmers, in terms of availability, expense and applicability, engine oil compares favourably with commercial products, even if the impact on tick numbers is limited and even if there is a slight possibility of residues in meat or milk. It also permits the resource-poor, small-scale farmers to feel that they are in control of the ectoparasite problem on their cattle.

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