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EFFICACY OF FLUMETHRIN POUR-ON AGAINST TICKS ON N'DAMA/ BROWN CROSS CATTLE UNDER FIELD CONDITIONS

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ABSTRACT

The efficacy of a commercially available synthetic pyrethroid, 1% flumethrin (Bayticol(R) pour-on), in the control of ticks found on N'Dama/Brown cross cattle was studied. Ten (10) adult N'Dama/Brown crosses were used. Prior to the treatment, the animals were examined for the presence of ticks. The developmental stages and the species of ticks detected were determined. The species of ticks seen on the cattle were *Boophilus decoloratus, Hyalomma rufipes and Amblyomma variegatum.* There was 99% and 100% reduction in ticks count at 48hours and 7 days respectively post treatment. There was a low rate of reinfestation up till 42 days post treatment. This study therefore indicated that 1% flumethrin pour-on can control tick infestation and prevent heavy reinfestation of N' Dama / Brown cross cattle for up to five to six weeks post treatment.

Keywords: Cattle, Flumethrin, Pour-on, Ticks.

INTRODUCTION

Livestock production is a source of employment and livelihood in Nigerian agriculture. A large percentage of the rural people of Nigeria satisfy their subsistence needs through livestock production (*Adekunle et al.*, 2002). Livestock production is faced with a number of constraints which on the long run results into low productivity and reduced profitability. Prominent among these constraints is disease. Animal diseases constitute a major obstacle to economic development as well as posing health risk to the human populace of the tropical Africa (*Oluwafemi, 2009*). Animal production is almost impossible in the hot and wetter parts of Africa due to diseases such as trypanosomosis and the pressure of parasites such as ticks, worms and flies. During the nineteeth century, as cattle population was increased to feed the human populations of recently industrialized nations, there was a growing awareness of the relationship between infestation of cattle with ticks and disastrous epizootics of disease in herds of cattle (George *et al., 2004*). Ticks have an important impact on the production of cattle because apart from the damages done to the hides and skins, they can also cause extensive damages to some organs such as the udder, scrotum and the ears. Tick worry due to irritation caused by tick bites have suppressive effect

on appetite of the animals consequently affecting growth rate and production negatively (*Pamela, 2004*). Some tick species are responsible for the transmission of diseases such as heartwater, babesiosis, anaplasmosis and tick toxicosis. Ticks also facilitate the establishment and spread of dermatophylosis.

The ectoparasites on animals are controlled by using various synthetic arsenical compounds, chlorinated hydrocarbons, organophosphorous compounds and pyrethroids (Arvind *et al.*, 2010). The effectiveness of an acaricide applied to cattle for the control of ticks depends on the quality, quantity and degree of dispersal of active ingredient deposited on cattle or delivered internally (George *et al., 2004*).

Pyrethroids have a history of evolution that began in 1949, but the third generation chemicals, permethrin and fenvalerate, were the first of these materials available for the control of ticks on cattle (Davey & Ahrens, 1984; Ware, 2000). Flumethrin, an α-cyano-substituted pyrethroid, was designed for application to cattle as a pour-on, but there is also an emulsifiable concentrate formulation that can be applied as a dip or spray. The active ingredient in the pour-on has a remarkable capacity for spreading rapidly on the skin and hair from points of application along the dorsal line of an animal to all areas of the body. The residual effect of treatment with flumethrin is extended if the pour-on formulation is applied. For the control of both one-host and multi-host tick species on cattle, flumethrin is effective at relatively low concentrations compared to other pyrethroids (Stendel, 1985).

In view of the impact of ticks and tick-borne diseases on the individual and national economies, this work was designed to study the efficacy of a commercially available synthetic pyrethrin, Flumethrin (Bayticol® Pour-on), on ticks on N'Dama/ Brown Cross cattle. The aim is to contribute to the effort being made on the effective control of ectoparasites, particularly ticks.

MATERIALS AND METHODS

Source of Animals

The animals used in this work were part of the cattle herd of the University of Ibadan Teaching and Research Farm. Ten randomly selected adult N' Dama / Brown cross were used for this experiment. The study location was the cattle unit of the University of Ibadan Teaching and Research Farm, Ibadan.

Animal Identification and Weighing

Each of the animals was neck tagged. The live weight of each of the animals was estimated using the Johnson-Minnesota formula as modified by Ross (1958). The formula for N' dama is $W = [G^2 \times L / 260]/2.2$ kg, where:

W = Estimated live weight of the cattle in kilogram

G = Heart girth i.e. the diameter of the area around the chest immediately behind the elbow and the shoulder.

L = Length of the animal which is measured from the highest point of withers to the tail root.

Drug and Method of application

The drug used in this study was Bayticol® pour-on produced by Bayer Agrochemical Industry, Nigeria. It contains 1% flumethrin as the active ingredient. A 20ml syringe was used to topically apply the drug evenly along the midline of the back from the front of the shoulder to the tail setting at the recommended dose of 1 ml / 10 kg body weight.

Study on duration of protection by 1% Flumethrin pour-on

The first treatment (T1) was carried out on day zero (0). The level of tick infestation was monitored on weekly basis for six weeks. The second treatment (T2) took place 42 days after the first treatment and tick infestation was again monitored for another five weeks.

Study on rapidity of tickicidal action of 1% Flumethrin pour-on

The level of tick infestation was determined on day zero (0) and thereafter monitored at 24 and 48 hours post treatment to measure the rapidity of action of the drug.

Counting, Sampling and Preservation of Ticks

Each of the animals was examined for presence of ticks before the application of the drug. The counting started from the head of the animal to the tail and the number of the live ticks found was recorded. Samples of various species and developmental stages of live ticks detected were manually harvested and preserved in a labeled universal bottle with 10% formalin. The remaining ticks on the cattle were treated with the drug.

Laboratory Examination

The developmental stages of the ticks sampled were identified under a dissecting microscope at x50 magnification in the laboratory.

RESULTS

The live weight of experimental animals

The estimated live weight of the cattle used in this experiment ranged from 113.1 to 287.9kg. Therefore, the volume of 1% flumethrin applied on the cattle varied from 12ml to 29ml.

Tick burdens of experimental cattle

The mean number of ticks found on the cattle before the first treatment with 1% flumethrin (Bayticol®) was 131.8±176.3. At 7 days post treatment, no tick was seen on any of the treated cattle. Also no tick was found on any of the treated cattle at 14 days. At 21 days post treatment, ticks were seen on four of the treated cattle. The number of ticks seen on the cattle at 42 days post treatment ranged from 1 to 47 (Table 1).

Following the second treatment with 1% flumethrin, no tick was seen on any of the treated cattle 7 days post treatment. However, at 14 days post treatment, one tick was found on one of the cattle while the other treated cattle had no ticks on them. At day 21, two ticks were seen on the same animal while the other treated cattle had no ticks on them. At day 28, four of the treated cattle had re-acquired various degrees of tick burden ranging from 1 to 37 ticks. At day 35, the tick burden on the cattle was still relatively low compared to day 35 after the first treatment (Table 1).

Mean efficacy of treatment

The mean efficacy of 1% flumethrin pour-on (Bayticol^{R}) was 100% at 7 days post treatment for both treatments 1 and 2 (Table 1).

Table 1: Population of ticks on cattle following treatment with 1% Flumethrin Pour-on

Days post treatment	Number of ticks in T1*		Number of ticks in T2**	
	Mean±sd	Range	mean±sd	Range
0	131.8±176.30	1-347	15.0± 18.40	1-47
7	0	0	0	0
14	0	0	0.2± 0.45	0-1
21	3.2± 4.50	0-11	0.4± 0.90	0-2
28	3.0± 5.66	0-13	8.4± 16.02	0-37
35	4.2±4.38	0-10	4.4± 4.83	0-11
42	15.0± 18.40	1-47		

T1*: First treatment of cattle with 1% Flumethrin
T2**: Second treatment of cattle with 1% Flumethrin

Rapidity of action of bayticol

Table 2 shows the variation in the tick burden on cattle during the first 48 hours of treatment with 1% flumethrin pour-on. At 24 hour after treatment, 81 of 101 ticks (80.2%) had either died or fallen off the treated cattle. Hence, the efficiency of treatment at 24 hours and 48 hours after treatment was 80.2% and 99% respectively. There was 100% reduction in tick burden 7 days post treatment.

Table 2: Rapidity of acaricidal action of 1% Flumethrin Pour-on on Cattle

Days post treatment	Number of ticks on cattle		Percentage of dead ticks (%)
	Mean±sd	Range	
0	20.20 ± 34.70	2-82	0
1	3.80 ± 5.85	0-14	80.2
2	0.20 ±0.45	0-1	99
7	0	0	100

DISCUSSION

The species of ticks seen on the cattle both before and after treatment were *Boophilus decoloratus, Hyalomma rufipes and Amblyomma variegatum* confirming the findings of Dipeolu (1975) that these are the three major genera of ticks parasitizing cattle in Nigeria. Tick infestations are of great economic importance in animal production. In addition to their role as vectors for various agents of disease in both man and livestock, heavy infestations can cause direct losses, death from anaemia and some species cause tick paralysis. Tick borne diseases especially theileriosis, babesiosis, dermatophylosis and cowdriosis seriously limit livestock improvement and production. Also, presence of ticks inhibit animal's ability to develop immunity and recover from dermatophylosis (Koney *et al.,* 1996). The fact that all these species was successfully controlled indicated that they were sensitive to 1% flumethrin. A successful control of these tick species will likely result in a successful control of the blood parasitic diseases which they transmit to their hosts.

The study on the rapidity of action of flumethrin pour-on showed 99% efficacy at 48hours after treatment. This result indicates that virtually all the ticks died within the first 48 hours after treatment. This observation is close to Mekonnen's (2000) observation that there was rapid killing of ticks 24 hours post treatment.

In this study, there was 100% reduction in tick population at 7 days after treatment of N'dama/Brown crosses with 1% flumethrin (Bayticol® pour-on). This finding is in agreement with that of Hamel (1987) who claimed that all ticks were eliminated within one week of treatment of sheep with 1% flumethrin pour-on but it disagrees with that of Mekonnen (2000) who recorded 100% control as early as 4th day post treatment of cattle with 1% flumethrin pour-on. This implies that 1% flumethrin pour-on applied at dosage of 1mg/kg can control any existing tick infestation provided ticks on the farm have not developed resistance to the drug.

The level of reinfestation at 21 days after the second treatment was lower than the level of reinfestation 21 days after the first treatment. This observation suggests the possible cumulative/residual effect of the drug.

There was a low overall rate of re-infestation up till between 28-42 days after treatment of Ndama/Brown crosses (Table 1). This favourably compared with the result obtained from an extensive field trial in cattle conducted in Ethiopia in which there was a rapid kill after 24 hours post treatment, and from day four onward 100% control was achieved and maintained for a further 29 days (*Mekonnen, 2000*).

This study showed that Flumethrin pour-on can achieve about 100% tick control within the first 48 hours of application. It can also be inferred from the outcome of this work, that 1% flumethrin may not achieve 100% tick control until the 7th day after treatment. This study equally showed that effective tick control can be achieved if cattle are treated at intervals of five to six weeks with Bayticol® pour-on. However, this treatment interval may depend on the tick pressure in the place where the treatment is taking place.

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