EVALUATION STUDIES ON THE EFFICACY OF PYRETHRUM BASED INSECTICIDE (TYRAX®) IN THE CONTROL OF MANGE IN GOATS

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ABSTRACT

Two studies were conducted in assessing the efficacy of a pyrethrum based insecticide (Tyrax®) as a control for mange in West African Dwarf (WAD) goats. In the first study, an on-station trial, four goats infested with mange at the neck, sternum and scrotum were treated with tyrax solution (1:20 dilution) by surface application at 3 day interval for four weeks. Mange had completely disappeared in two of the four goats while the efficacy was 70% in the others at 4 weeks of treatment. In the second study, an on-farm trial, 41 goats in 17 households were treated with tyrax (1:20 and 1:40 dilution rates) and ivermectin (ivomec), injected subcutaneously (1ml/50kg body weight). Infested areas of goats included various parts of the body and the entire body. Observations were made at two periods after treatments (2 and 4 weeks). The efficacy was very high for all the treatments at 2 weeks but this was apparent at 4 weeks ($P<0.05$). Significant difference ($P<0.05$) was noticed only with ivomec® treatment between the two periods. Based on this work, tyrax® can be used in the treatment of localized mange infestation.

Keywords: Efficacy, Goats, Mange, Prethrum

INTRODUCTION

The incidence of diseases is one of the major factors limiting goat production and productivity in Nigeria. Mange is a contagious and debilitating skin disease common among

goats. Mange infestation in goats is caused mainly by *Sarcoptes caprae* and to a lesser extent by *Psorepts communis* var *caprae* and both *Sarcoptes caprae* and *Chroriotes caprae* (Akinboade, 1982). The condition results in hair loss, ruffled and shriveled skin, reduced productivity and devaluation of its market value (Ademosun, 1985). This ultimately lowers animal productivity thereby reducing the output of meat protein for human consumption.

Many drugs have been used for the treatment of mange in goats including benzene hexachloride (Gammatox® and organophosphate (Asuntol® (Opasina, 1985). However, gamma benzene hexachloride or Y hexachloro cyclohexane is not recommended at present because of the danger of accumulation of organochloride residues (Ortega-Mora *et al.*, 1998). Systemic drugs such as ivermectin have shown effectiveness against mange (Meleney, 1982), but they are very expensive. Moxidectin is also an effective drug used in the control of mange in sheep (Ortega-Mora, 1998), however, it is not yet available in Nigeria. Mixture of sulphur and engine oil/palm oil has been used as a local recipe for treating early infestation of mange with the danger of lead poisoning when engine oil is used.

Tyrax® has been suggested as a possible drug for the control of mange. It is a contact insecticide containing pyrethrum extracts from the flowers of *Crysanthemum cinerarefolium*. It

is selectively toxic to insects and not to man. This is because pyrethrum is rapidly degraded by the body enzymes which therefore renders it non-toxic to man and other warm blooded animals. The insecticide works by causing spastic paralysis through the nervous systems of insects and other cold blooded animals. It has been used for the control of crop, veterinary and domestic pests in Britain, United State of America and Kenya. However there is paucity of information on its use in the control of mange in goats. Thus the objective of this study was to examine the efficacy of tyrax® in the control of mange in goats.

MATERIALS AND METHODS

Two studies were conducted in assessing the efficacy of pyrethrum based insecticide (tyrax®) as a control for mange infestation in West African Dwarf (WAD) goats. The first study was carried out on-station and the second one was conducted on-farm.

Pyrethrum based insecticide (tyrax®)

Tyrax® is a contact insecticide containing pyrethrum extracts from the flowers of the plant *Crysanthemum cinerarefolium*. The insecticide was supplied by Dacom International Limited, Lagos, Nigeria. Among its components are the following: natural pyrethrum (1.56%), permethrin (3.42%), biollertirin (1.15%) and piperronyl butoxide (synergist) (5.09%). The recommended manufacturer's dosage is 25ml of formulation to 475ml of water; equivalent to 1 part of formulation to 20 parts of water (1:20).

Experiment 1: On-Station Study

Four West African Dwarf (WAD) goats infested with mange were used for the experiment. The infested parts included the neck, sternum and scrotum of the goats. The animals were obtained from the Institute of Agricultural Research and Training goats' herd. The experiment was conducted at the Institute's Southern Farm in 1994. The infested goats were separated from the herd and housed individually. They were fed on

grass (*Panicum maximum*) and browse leaves (*Glyricidia sepium*) mixture. Supplementary brewers' wet grain was also given to them. They had free access to water and salt lick. Tyrax® solution was prepared and applied according to the manufacturer's directives as stated above. This was rubbed on the scrapped mange infested parts of the goats. The drug application at three-day intervals, lasted for four weeks. The efficacy of the drug in clearing off mange infestation was estimated by noting the disappearance/clearance rate of the lesion and the regrowth of lustre hair on the affected parts.

Experiment 2: On Farm Study

The evaluation of tyrax (R) was carried out on-farm in 17 households in Ibadan. Ibadan is located in the forest agro-ecological zone of Southwest Nigeria. Most of the households covered in this study were situated in Iwo Road/Leyland area in the outskirts/surburb of Ibadan. The study was conducted in November and December 1995.

A total of 41 mange infested goats were initially used for the study. Follow up records could be obtained from 32 of them giving 78% recovery. The daily management (i.e. feeding, housing etc.) of the goats was carried out by their owners. The system of management mostly used was the semi-intensive system. Goats browsed around the neighbourhood for their feed and were usually offered supplementary feeds (e.g. maize fermented residue, "eri", kitchen wastes, dried cassava peels, cowpea offals etc.) The goats were housed at night in the backyard and at times in local kitchen to keep warm near the fire place. The number of mange infested goats per household used for the study varied from 1 to 5 with a mean of about 2 (Table 1). Mange infestation was either localized in some areas of the body or generalized all over the body. Areas of the body infested with mange included: sternum, midrib, neck, rump, nose, abdomen (navel cord), legs, ear, udder, dewlap, arm, chest, forehead, face, mouth,

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TABLE 1: NUMBER OF MANGE INFESTED GOATS PER HOUSEHOLD AND TYPES OF MANGE INFESTATION RECORDED

No. of mange infested goats/household			No. of Households	Total No. of Goats
Range	Mean	Standard deviation		
1-5	1.88	1.23	17	32
No. of goats with different types of mange infestation			Total No. of goats	
Localized mange		Generalized mange	Unclassified	
20 (62.50%)		10 (31.25%)	2 (6.25%)	32

testicles (scrotum) and all over the body (Table 2-4). The proportion of goats with localized infestation was about sixty three percent of those treated while the about thirty one percent had generalized infestation with about six percent unclassified (Table 1).

The infested goats varied in age from 3 months to 2 years. Sixty-three percent (63%) of the goats (12) that were estimated for age were between 3-6 months old while the remaining thirty seven percent (37%) (seven in number) were one year old and above. Infested goats also varied in physiological states: male, female, pregnant, lactating or kids.

Treatments: There were three experimental treatments. These were 25ml tyrax formulation made up to 500ml with water (1:20 dilution) (manufacturer's recommendation) and 25ml tyrax formulation made up to 1000ml with water (1:40 dilution) and the third treatment was ivermectin (ivomec ®) used as a standard or check. Twelve goats consisting of eleven females and one male were used for treatment 1 (Table 2). Seven goats comprising six females and one male were used for the second treatment (Table 3). Goats with localized mange infestation were used for treatments 1 and 2. Eight male and five female goats were used for the third treatment. Goats with generalized/advanced mange infestation were mainly used (Table 4).

Mode of application: The affected skin parts were scrapped and sprayed with tyrax solution

employing a small hand operated plastic sprayer (500ml capacity). In addition, the solution was rubbed on the affected parts with cotton wool. Tyrax® was applied twice at two-three week intervals. The effects of tyrax treatments were monitored over a period of 4 weeks divided into two observation periods of 2-weeks intervals. Ivomec® injection was given once subcutaneously at the rate of 1ml per 50 kg body weight in advanced and generalized mange infestation.

The efficacy of the treatments was estimated by visual assessment/observation by comparing area infested with mange before treatment with the same area after treatment over the observation period. This was estimated by noting the disappearance/clearance rate of the lesion and the regrowth of lustre hair on the affected parts.

Statistical Methods: The efficacy of each treatment for the two observation periods were compared by the T-test method. The analysis of variance technique was used to compare the efficacy among the three treatments (Steel and Torrie, 1980). Significant means were separated by Least Significant Difference (LSD) method. The statistical analyses were carried out only on Experiment 2.

RESULTS

Experiment 1

Mange infestation had completely disappeared in two of the four affected goats after four weeks of tyrax(R) application. The efficacy was about 70% in the other two goats.

Experiment 2

The efficacies of the treatments against mange infestation in goats are presented in Tables 2-4. The overall efficacy for the treatments against the disease was very high with a mean value of $85.6\% \pm 10.5$. The efficacy of the treatments generally increased from the first to the second observation period (2nd and 4th week respectively). In treatment 1 the efficacy rate improved from 84% at the first observation period to 93% at the second observation period. The efficacy rate was highest with treatment two at both observation periods with values of 90.7% and 98.3% respectively. It was only in the case of ivomec(R) treatment that a decrease (from 84.2 to 73.3%) was recorded. There was no

difference ($P>0.05$) in efficacy among the treatments in period 1 (Table 5.) However significant difference ($P<0.05$) occurred at the second observation period (4 weeks after treatment) between ivomec and the tyrax treatments.

In comparing the efficacy between the two periods for each treatment, only that of ivomec® treatment was significantly different ($P<0.05$). Application of tyrax treatment caused serious itching and irritation in the goats. This was most pronounced at 1:20 dilution of tyrax with about 75% of the goats treated exhibiting irritation. However only 57% of goats on 1:40 dilution of tyrax displayed this phenomenon.

DISCUSSION

The results showed that tyrax application is good for treating goats infested with mange. In the first experiment, there was the case of a mature buck that could not be used for breeding or mating as a result of serious

TABLE 2: TREATMENT 1: EFFICACY OF TYRAX SOLUTION AGAINST MANGE INFESTED GOATS (25ml TYRAX IN 475ml WATER)

Goat No.	Sex and special features of goat	Estimated age	Part(s) of the body infested	Reaction to tyrax	Efficacy rate (at 2 weeks)	Efficacy rate at 4 weeks
1.	Female	-	Sternum & midrib	NR	100	100
2.	Female	-	Sternum & neck	NR	100	100
3.	Female	3 months	Sternum	RX	90	90
4.	Female	-	both ears	NR	100	100
5.	Female	3 months	Neck & nose	RX	75	75
6.	Female	3 months	left arm	RX	80	100
7.	Female, pregnant	-	Ears & udder	RX	80	-
8.	Female, pregnant	2 years	neck, chest & nose	RX	93	100
9.	Female, pregnant	2 years	ears, & nose, ear	RX	80	-
10.	Male	6 months	chest, nose, ears	RX	80	90
11.	Female, pregnant	1.5 years	chest, mouth, ears	RX	60	-
12.	Female, pregnant	2 years	neck, chest	RX	70	90
11 females & male				75%	84%	93.9%
					(mean)	(mean)

Note: = Not available, NR = no reaction to tyrax, RX = itching reaction noticed.

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TABLE 3: TREATMENT 2: EFFICACY OF TYRAX SOLUTION AGAINST MANGE INFESTED GOATS (25ml TYRAX IN 975ML WATER)

Goat No.	Sex and special features of goat	Estimated age	Part(s) of the body infested	Reaction to tyrax	Efficacy rate (at 2 weeks)	Efficacy rate (at 4 weeks)
1	Female	-	rump & nose	RX	90	100
2	Female	-	Abdomen	NR	100	100
3	Female, kid	4 months	sternum, midrib	NR	95	-
4	Female, pregnant	2.5 years	Abdomen, ear, arm	NR	90	-
5	Female	6 months	Chest	RX	90	95
6	Male	6 months	testicles, nose	RX	90	-
7	Female	6 months	nose, chest	RX	80	-
	6 female, 1 male			57%	90.7% (mean)	98.3% (mean)

Note: = Not available, NR = no reaction to tyrax, RX = itching reaction noticed.

TABLE 4: TREATMENT 3: EFFICACY OF IVOMEC® ON MANGE INFESTED GOATS

Goat No.	Sex and special features of goat	Estimated age	Efficacy rate (at 2 weeks)	Efficacy rate (at 4 weeks)
1	Male	-	75	-
2	Male	6 months	80	-
3	Female	-	100	-
4	Female	-	80	-
5	Female	-	80	-
6	Male	-	100	-
7	Male	3 months	90	-
8	Male	6 months	90	-
9	Male	1 year plus	85	-
10	female, pregnant	2 years	70	90
11	Male	6 months	70	70
12	Male	-	80	60
13	Female	-	95	-
	8 males, 5 females		84.2% (mean)	73.3% (mean)

(-) Not available

mange infestation. However with Tyrax® application, the buck recovered and could readily mount does due to the complete disappearance of the disease condition. The mode of action of tyrax® appeared to be by spastic paralysis of the mites. Then there was

the sloughing off of the affected skin. This allowed for the regrowth of new lustre skin and hair cover which was lacking when the goats were affected with mange. Infact it compared favourably better than ivomec® injection in the treatment of mange. However, the lower efficacy recorded did not suggest that ivomec® is less effective. Rather, it reflected the state of disease infestation of goats under each treatment. Most of the infested goats under ivomec® treatment had advanced or generalized mange condition all over the body compared to localized infestation for Tyrax® treatments. This was so because ivomec® was used mainly as a check. It could also be observed that there was a decrease in efficacy with ivomec® treatment with the periods. This is probably due to the low number of animals that could be monitored at the second observation period. Only three goats of the 13 in the previous period could be monitored. This is due to the non availability of their owners and/or, animals not being at home and difficulty in catching the animals for monitoring. The itching noticed with Tyrax® treatments can be related to the nature and the concentration of the active ingredients, thus there was decrease in itching with the higher dilution rate.

The higher prevalence of mange in young goats (3-6 months) is similar to the reported observation for young goats (Opasina, 1985) and pigs (Oduye *et al.*, 1980). This suggests that young goats are more susceptible to mange infestation than older ones.

Based on the high efficacy of Tyrax® recorded in this study, the drug can be used in the treatment of localized mange infestation. However further studies would be required to assess its efficacy in treating goats with advanced and generalized mange infestations.

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TABLE 5: STATISTICAL ANALYSIS OF EFFICACY OF TYRAX® AND IVOMECC® TREATMENTS ON MANGE INFESTED GOATS.

Period of observation (weeks)	Treatment 1: Tyrax (1:20 dilution)					Treatment 2: Tyrax (1:40 dilution)					Treatment 3: Ivomec.					Significance
	No. of goats used)					(No. of goats used).					(No. of goats used)					
	Mean	SD	Male	Female	Total	Mean	SD	Male	Female	Total	Mean	SD	Male	Female	Total	
2 (period 1)	84.0	12.3	1	12	13	90.7	5.6	1	6	7	84.2 ^A	9.8	8	5	13	
4 (period 2)	93.9 ^a	8.1	1	9	10	98.3 ^a	2.4	0	3	3	73.3 ^{bB}	12.5	0	0	5	
Significance	P>0.05					P>0.05					P>0.05					P<0.05

a, b: Means within rows with different superscripts differ (P<0.05)

A, B: Means within columns with different superscripts differ (P<0.05)