Comparative evaluation of traditional herb and conventional treatment of ovine foot rot

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Abstract

The study was conducted from May, 2009 to July, 2009 to evaluate the effect of traditional herb, *Amaranthus angustifolius* (Aluma) and combination of Aluma and lemon, and conventional drugs, antibiotic spray and formalin for the treatment of foot rot. Eighty three infected sheep were selected and identified from seven different flock affected by foot rot, and randomly divided into six groups by considering an equal distribution of foot rot lesion score for each group: These were (i) 14 affected animals which were treated with Aluma, (ii) 14 animals which were treated with Aluma without pairing (iii) 14 similarly affected animals which were treated with Aluma in combination with Lemmon, (iv) 10 sheep which were treated with antibiotic spray, (v) 15 sheep which were treated with formalin, and (vi) 16 sheep which were left untreated (control). All treatments were repeated every week for three month duration. Sheep feet were inspected and foot rot lesions were scored at the beginning and end of the treatments. In addition sheep were inspected three times 30 days apart on Days 30, 60 and 90, and response to treatments were recorded. On day-30 the least square mean comparison for treatment response revealed that antibiotic spray had the best result of all treatments ($p < 0.05$) and the combination of Aluma and lemon resulted in the second successful recovery which significantly differ from the rest ($P<0.05$). There were no significant differences ($P>0.05$) in lesion score of treatment groups before treatment. A significant ($p<0.0001$) effect on lesion score was seen at the end of treatment period and Least square mean comparison revealed that Antibiotic spray, the combination of Aluma and lemon and Aluma alone had low foot rot lesion score withno significant ($P>0.05$) difference among them but differ significantly from other treatment groups. In conclusion the combination of Aluma and lemon with 2:1 ratio appears to have similar effect with antibiotic and offer better approach for use in the field than formalin in the treatment of foot rot. The juicy preparation or ointments of indigenous medicinal plants especially Aluma may play a direct role in the sustainable treatment and control of foot rot infections.

Key words: Aluma, antibiotic, formalin, lemon, foot rot.

Introduction

Foot rot is a specific disease of sheep, which under suitable environmental conditions is highly contagious. The prevalence in highly susceptible sheep approaches 100% (Martin and

Aitkin, 2000). The on-farm sheep characterization study existing records in selected villages and model farmers around Chacha indicated that lameness, swelling between claws of sheep locally called 'Choqe' during wet season (July-September) following the rains is the major health problem reducing sheep productivity in the area. It is maintained in a flock in the feet of chronic carriers. According to the diagnostic survey carried out around Chacha the pair wise ranking of major sheep diseases on the basis of morbidity and mortality incidences showed 'Choqe' ranked second next to respiratory disease complex. The disease is contagious and transmitted from infected animal to healthy flock horizontally (through communal grazing, common housing etc). Out breaks of foot rot result from the occurrence of host, environmental and microbial factors. These predisposing factors are triggered due to poor housing management (muddy floor without regular cleaning regime), which is favorable for the direct transmission of bacterial infection in the flock.

Many farmers use treatment methods that are appropriate for resolving advanced cases of foot rot, rather than preventing early cases from becoming more severe (Wassink and Green, 2001; Wassink *et al*., 2003). Treatment programs have included vaccines, which provide some protection for approximately a 12-week period or less (Lambell, 1986; Schwartzkoff *et al*., 1993; Hunt *et al*., 1994), antibiotics, which provide temporary relief, foot bathing using zinc sulfate with a surfactant by walking or soaking for up to 60 min with and without paring (reviewed by Abbot and Lewis, 2005). Paring provides exposure of infected tissues to zinc sulfate and may improve the efficacy of a walk-through topical treatment (Skerman *et al*., 1983; Bagley *et al*., 1987).

In recent years, the cost of conventional medicines for use in animals has escalated and they have thus become unaffordable to most livestock raisers (Njoroge and Bussmann, 2006). Traditional remedies and practices, the ethno-veterinary medicines (EVMs), are now sometimes the only available alternative to expensive or unavailable modern forms of healthcare (Luseba and Van der Merwe, 2006). The World Health Organization (WHO, 2002 cited by Kiringe 2006) attributed the popular use of traditional medicine among rural communities to it being affordable, readily accessible and culturally acceptable.

The easiest and most rational solution to the problem is to develop acceptably effective drugs from reasonably inexpensive sources for use as supplements to commercial drugs. Veterinary traditional medicine provides a shortcut to this end, and is more readily accessible for scientific investigation than its counterpart, traditional human medicine. Therefore, the objectives of this study were: to evaluate the effectiveness of herbal medicine on treatment of foot rot, to determine the statues of foot rot with different treatment options, and to determine whether breed differences existed in response to exposure and treatment of foot rot.

Materials and methods

The study area

Chacha area is known for its livestock potential in general and sheep rearing in particular. The area is characterized for its large communal grazing throughout the year. The grazing area is marshy and water logged during the wet season. The soil is black vertisol, which is habitat for anaerobic microorganisms. Sheep husbandry practices are traditional like elsewhere in Ethiopia (mixed livestock species are grazing during daytime and housed at night, there is no regular veterinary service, no feed supplement and poor housing management).

Study animal

Foot rot infected sheep including all age groups, indigenous and Menz x Awassi breeds which are formerly distributed to the area.

Material and methods

A thorough ethical consideration like non-fatal nature of the disease, thus avoiding situations in which an animal's life is at risk as a result of faulty treatment were undertaken before the field validation of the treatments. The researchers and farmer also discussed the treatments and the farmer approved them for his sheep.

Eighty three infected sheep were selected and identified from seven different flock affected by foot rot, and randomly divided into six groups by considering an equal distribution of foot rot lesion score for each group: These were (i) 14 affected animals which were treated with Aluma, (ii) 14 animals which were treated with Aluma without pairing (iii) 14 similarly affected animals which were treated with Aluma in combination with Lemmon, (iv) 10 sheep which were treated with antibiotic spray, (v) 15 sheep which were treated with formalin, and (vi) 16 sheep which were left untreated (control). Foot trimming was combined with all treatments except treatment group (ii) so the impact of trimming on recovery was not elucidated.

All treatments were repeated every week for three month duration. The antibiotic spray was Cyclospray composed of chlortetracycline HCL. The dosage and application was upon instruction of the manufacturer (Farvet Laboratories B.V., The Netherlands). The juice of Aluma was applied over the treatment area until evenly coloured. The combination of Aluma and Lemmon were in 2:1 ratio. Formalin concentration of 5% was used for foot bathing. Sheep feet were inspected and foot rot lesions were scored on two occasions, at the beginning (before commencement of different treatments) and at the end (after completion of the treatments). A standard scoring system was used to grade the severity of foot rot lesions in this experiment. According to this system, Score 0= a normal foot Score 1= moisture, reddening of the skin, hair loss of the skin between the toes Score 2= mild inflammation and tissue damage of the soft horn of the inner wall Score 3 = under-running and moderate tissue damage of the inside wall and the sole Score 4= under-running and more severe tissue damage extending to the outer edge of the sole Score = very severe tissue damage with under running extending to deep layers of the outer wall and the toe (Morcombe, 2008).

In addition sheep were inspected three times 30 days apart on Days 30 (first treatment response), 60 (second treatment response) and 90 (third treatment response), and these response to treatments were recorded. Infection is defined as inflammation of the horny and laminar structures of the foot, which often included pus discharge, or the presence of lesions. Response to treatment was recorded and scored as 3-completely healed (no

inflammation or lesions observed), 2-recovered (some lesions were observed), 1-partially recovered (prevented from getting worsen and some sign of healing) and 0-no change at all (still infected). Lesion score and response to treatment were noted by a single observer along the whole period of experiment.

Plant material preparation

Herbaceous plant, *Amaranthus angustifolius* locally called 'Aluma', was used in this study. Identification was based on the available botanical literature (A Glossary of Ethiopian Plant Names by Wolde Michael Kelecha, 2nd edition, March 1977, Addis Ababa). The plant was collected from Debrebirhan research center and the study area. The leaf and stem part of the green plant before flowering was used to make juice. The juice was prepared mainly by soaking crushed plant material in water (infusion). Then the juice was applied as dressing for foot rot lesions.

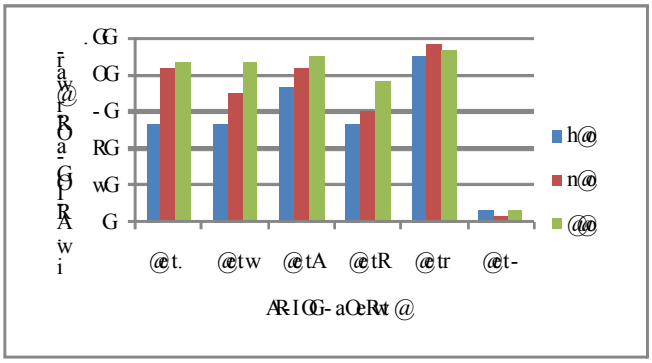
Statistical analysis

Data entry was performed in Microsoft office Excel 2007 and data were exported to SAS 9.0 (SAS institute, Inc., Cary, NC, USA) for analysis. The analysis was performed using GLM procedure and compared by Least square mean ($P<0.05$). Least squares means were separated by the PDIFF option which requests that P-values for differences of the LS-means be produced.

Results

Response to treatment

Fig. 1 shows mean percentage of treatment response after 30, 60 and 90 days of treatment, on Day 30 (FTR), 60 (STR) and 90 (TTR) of the study there were significant differences ($P < 0.0001$) among treatment groups in mean of treatment response.



TG-treatment group; FTR-first treatment response; STR-second treatment response and TTR-third treatment response

Fig. 1. Mean percentage of treatment response after 30, 60 and 90 days of treatment.

Referring Table 1, on day-30 the least square mean comparison for treatment response revealed that TG–5 had the best result of all treatments which is significantly different ($p<0.05$) and TG–3 resulted in the second successful recovery which significantly differed from the rest. TG-2, 1 and 4 had similar LS mean and better result than the control. Similarly on day-60 TG-5 had still best response which significantly differs ($p<0.05$) from the rest. TG-3 and 1 again had the second successful treatment response and were not significantly different ($p>0.05$) each other. TG-2 and 4 had similar treatment response ($p>0.05$). At the final phase of treatment, i.e., on day-90 of the experiment, TG-5 had only significant difference ($p<0.05$) from TG-4 and the control.

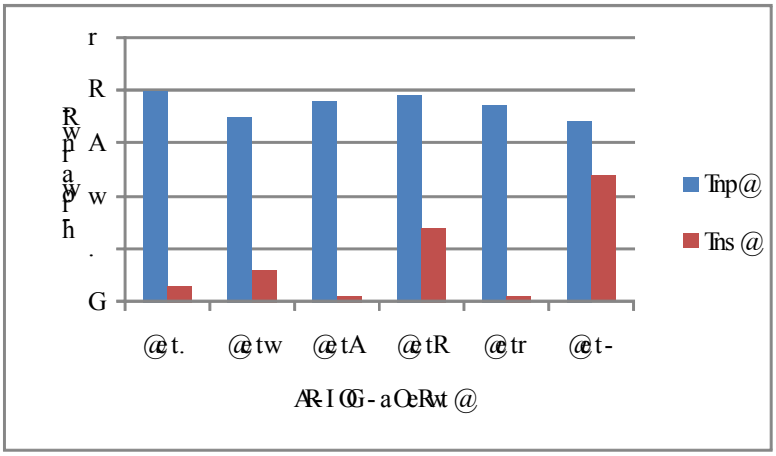
Table 1. Least square means (±SE) of treatment response of the TGs.

TG	FTR	STR	TTR
1	1.79 (0.13) c	2.57 (0.11) b	2.86 (0.09) a
2	1.79 (0.13) c	2.14 (0.11) c	2.79 (0.09) a b
3	2.29 (0.13) b	2.64 (0.11) b	2.86 (0.09) a
4	1.73 (0.12) c	1.87 (0.10) c	2.53 (0.09) b
5	2.90 (0.15) a	3.00 (0.13) a	3.00 (0.11) a
6	0.00 (0.12) d	0.00 (0.10) d	0.00 (0.09) c

Different letters denotes significant differences ($p<0.05$); TG-treatment group; FTR-first treatment response; STR-second treatment response and TTR-third treatment response.

Lesion score

Fig. 2 illustrates foot rot lesion score before & after treatment, there were no significant differences in lesion score of TG before treatment at P<0.05. A significant effect of TG on lesion score was seen at the end of treatment period (p<0.0001) and Least square mean comparison revealed that TG –5, 3 and 1 had low foot rot lesion score with no significant difference among them but differ significantly from other TG. TG-4 had higher lesion score compared to other TG except the control (Table 2).



LSBT-lesion score before treatment; LSAT-lesion score after treatment

Fig. 2. Foot rot lesion score before and after treatment.

Table 2. Least square means (± SE) of lesion score after treatments.

TG	Lesion score
1	0.36 (0.12) a
2	0.71 (0.12) b
3	0.14 (0.12) a
4	1.47 (0.11) c
5	0.00 (0.14) a
6	2.44 (0.12) d

Different letters denotes significant differences (p<0.05).

Effect of genotype, age and sex

There were no significant association ($p>0.05$) between breed, age & sex and recovery from foot rot. Foot score was also similar between different breeds, sex and age (Tables 3 and Table 4).

Table 3. ANOVA showing relation between age, sex, breed and treatment response.

Dependent variable	Source	DF	Mean Square	F Value	Pr > F
	TG	4	3.03670175	10.77	<.0001
FTR	Age	1	0.48555304	1.72	0.1946*
	sex	1	0.11601997	0.41	0.5237*
	Breed	1	0.08180623	0.29	0.5922*
	TG	4	2.42886628	12.16	<.0001
STR	Age	1	0.23883104	1.20	0.2787*
	sex	1	0.02456464	0.12	0.7271*
	Breed	1	0.01543718	0.08	0.7820*
	TG	4	0.37367669	2.49	0.0529*
TTR	Age	1	0.23624302	1.57	0.2147*
	sex	1	0.14635680	0.97	0.3276*
	Breed	1	0.17527496	1.17	0.2844*

**Not significant at $p<0.05$.*

Discussion

Medicinal plants have been used in the treatment of various ailments throughout human history. It is important to determine the appropriate use of medicinal plants through scientific validation. Testing should be performed on traditional treatments in order to confirm the effectiveness, as well as to determine the safety in live organisms (Matos, 1995).

Given that enormous number of variables that exist under field conditions and the fact that most of the farmers considered medicinal plants inferior to modern drugs that are produced in factories and are sold in pharmacies, formal controls were not possible up to the end of experiment, but, under this protocol of validation, the efficacy of different treatments on foot rot infected animals was being recorded.

Table 4. ANOVA showing relation between age, sex, breed and lesion score.

Dependent variable	Source	DF	Mean Square	F Value	Pr > F
	TG	4	0.44631855	1.42	0.2382*
LSBT	Age	1	0.35092762	1.12	0.2948*
	sex	1	0.06416339	0.20	0.6529*
	Breed	1	0.29663237	0.94	0.3351*
	TG	4	4.27317756	23.22	<.0001
LSAT	Age	1	0.60418224	3.28	0.0751*
	sex	1	0.01796694	0.10	0.7558*
	Breed	1	0.11773871	0.64	0.4270*

**not significant at P<0.05; LSBT-lesion score before treatment; LSAT-lesion score after treatment.*

Despite the study is still in its preliminary stages and the treatments have been tried on very few animals, there were significant differences among treatment groups in mean treatment response. Sheep received antibiotic spray with pairing showed best recovery of all and those treated with the combination of Aluma and Lemmon had better treatment response than others including the formalin group. When the day of treatment advances, effectiveness of the treatment with antibiotic spray, Aluma and lemmon and Aluma alone became closely similar. This shows that the need for repetition of treatments with Aluma to get better result. Sub-clinical infection of the inter-digital skin, persisting for a period of weeks, has been suspected in some studies and was, in one report, associated with treatment with a formalin footbath (Thomas, 1957). In our experiment, Aluma appears to offer better

approach for use in the field than formalin in the treatment of foot rot. In addition it had no detectable odour and without any sign of irritation.

Recovery or response rate to all treatments was similar among breeds and there was no significant association between lesion score and breed. This result is in agreement with conclusion of Burke and Parker (2006) which describes the response to foot rot eradication appeared to be similar among breeds examined.

Conclusions

While field trials are considered the best method for validation, (confidence had to be built up first in the local community for trying out the treatment in a prescribed manner and also to ensure detailed and exact documentation. In the present experiment, the combination of Aluma and lemon with 2:1 ratio appears to have similar effect with antibiotic and offer better approach for use in the field than formalin in the treatment of foot rot. There were no adverse effects found in the experimental sheep treated with Aluma against foot rot. Considering the above findings, it can be concluded that in the treatment of foot rot in sheep herbal preparation may be used especially in the form of juice or ointment. Herbal preparations are inexpensive, easily available, easy to prepare and so juicy/ointments of indigenous medicinal plants especially Aluma may play a direct role in the sustainable treatment and control of foot rot infections. The potential value of Aluma, supported by recent result, needs to be investigated and quantified further, taking into account the difficulties that have already been identified here. Furthermore, active compounds need to be identified and the mechanisms of its action understood, in order to achieve efficient regimes for its use in foot rot treatment and control.

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