

Full Length Research Paper

Assessment of herbal anthelmintics used by the farmers in Kirinyaga county, Kenya, for the treatment of helminthiosis in cattle

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The aim of this study was to assess and validate the herbal anthelmintic remedies used by farmers in Kirinyaga county, Kenya for the treatment of their cattle against gastrointestinal nematodes. The herbs used were identified via questionnaire surveys through focused group discussions. The aqueous extracts of plants used: *Aspillia pluriseta*, *Vernonia lasiopus*, *Entada leptostachya* and *Erythrina abyssinica* were prepared and using dosage between 10 and 30%, the viability of infective strongyle larvae were assessed for a period of 48 h. The results of the *in vitro* antihelmintic study indicated a high to moderate anthelmintic activity for the tested extracts. *E. leptostachya* exhibited the highest *in vitro* anthelmintic activity, while *E. abyssinica* had the lowest activity. The anthelmintic activity may have been due to the presence of saponins in the herbal remedies. There was a positive correlation between the saponin concentration and the anthelmintic activity of the extracts. In general, the *in vitro* anthelmintic activity increased with the extract concentration for the medicinal plants examined.

Key words: Anthelmintics, *in-vitro*, *Entada leptostachya*, dosage, husbandry.

INTRODUCTION

Livestock is an important prospective sector which may contribute to solve problems of marginal farmers. It plays an important role to promote human health by supplying animal protein of high caloric value in the form of meat and milk (Sujon et al., 2008). It is also important in earning substantial amount of foreign exchange by exporting leather, leather products and other products made from bones, horns and teeth per year (Alam, 1993). Helminths are recognized as a major constraint to livestock production throughout the tropics and elsewhere

(Waller, 1987). Parasitic diseases are considered important in causing enormous economic losses through morbidity and mortality in livestock. Among the parasitic diseases, gastro-intestinal (GI) nematodes such as *Haemonchus contortus*, *Trichostrongylus* species, *Cooperia* species, *Oesophagostomum columbianum*, *Trichuris* species and *Strongyloides papillosus* are most common (Waruiru et al., 2001). This group of gastrointestinal nematodes is also associated with anaemia and gastroenteritis resulting in loss of body

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weight, stunted growth and diarrhoea that greatly hamper the normal growth and production of cattle (Soulsby, 1982). Control of GI nematodes is mainly based on regular anthelmintic treatment (Waller, 1987). The plant kingdom is a rich source of botanicals, anthelmintics, antibiotics and insecticides (Satyavati et al., 1976). In this context, indigenous medicinal plants contribute effective but low-cost herbal anthelmintics. These are mostly used in crude forms and their pharmacological preparations, dosages and mode of actions are not based on strong scientific evidence.

Use of herbal plants in the treatment of animal and human diseases is quite common in most African countries. Some plants found in the traditional settings of Kenya have been used to treat a number of animal and human diseases (Wanyama, 2000; Kareru et al., 2007). Herbal medicines do offer treatment methods that are environmentally friendly and hence they are not toxic to the environment and they do not trigger anthelmintic chemoresistance (Sujon et al., 2008). The phytochemical analyses of naturally available plants and control anthelmintic trials along with contemporary knowledge of parasite control strategies may offer new opportunities for effective and economical control of parasitic diseases. Saponins and tannins present in medicinal plants have been reported to exhibit anthelmintic activity (Enwerem et al., 2001; Bishnu and Zeev, 2005; Watt and Brayer, 1962). The present study assessed the *in vitro* anthelmintic activity of herbal remedies used by farmers in Kirinyaga county to treat their cattle against helminthes infections.

MATERIALS AND METHODS

Survey and collection of medicinal plants used in treatment of helminthiasis

A survey was carried out to determine the commonest herbal alternatives in the treatment of helminthes in cattle (Table 1). *Vernonia lasiopus* (leaves), *Erythrina abyssinica* (bark), *Aspillia plurisetia* (aerial parts) and *Entada leptostachya* (roots) were collected from Kirinyaga county. The plant samples were then authenticated by a plant taxonomist from the East African Herbarium, National Museums of Kenya. The plant parts were cut into small pieces, dried under the shade, and ground into fine powders. The powders were stored in labeled airtight plastic containers and kept in a dark cupboard. Voucher specimens were kept in a laboratory in Chemistry Department, Jomo Kenyatta University of agriculture and Technology (JKUAT).

Extraction methods

The aqueous plant extracts were prepared by dissolving 10 g of pulverized plant material in 500 ml of distilled water in a glass percolator. It was allowed to macerate for 24 h at room temperature (24°C) and the brew was filtered using Whatman number one filter paper. The process of percolation was repeated three times (3x500 ml). The combined filtrate was then concentrated in a water bath to

ensure the complete evaporation of the solvent. The final crude aqueous extract was transferred to a vial, labeled for easy identification and kept in air tight containers; it was stored at 4°C until it was used.

Preparation of helminthes culture

Fecal samples from infected animals were collected. The eggs were examined using a microscope and confirmed to have a mixture of species: *Haemonchus*, *Mecistocirrus*, *Ostertagia*, *Trichostrongylus*, *Cooperia*, *Bunostomum* and *Oesophagostomum* strongyles eggs. The fecal material of each batch of animals which were positive for strongyle eggs were pooled and using a stirring rod, the faeces was broken into fine pieces. The faecal samples were placed in a culture jar and placed in an incubator (Sheffield, S30 2RR Carbolite- England) set at 27°C for 7 to 10 days. Water was added to the cultures regularly every 1 to 2 days. The gastro-intestinal nematode infective larvae (L₃) were harvested using Baermann technique. The L₃ were identified to generic level as described by Keith (1953) and MAFF manual (1986).

Evaluation of *in-vitro* anthelmintic activity of aqueous herbal extracts

The infective strongyle L₃ were used in this experiment. Ten strongyle L₃ larvae were placed into a sterile petri dish containing 10 ml of Goodwin's physiological solution (a mixture of 8.5 g NaCl and 1 g glucose in 100 ml distilled water). Five milliliters (10% v/v) of aqueous extract was added to the petri dish containing helminthes larvae. This was done for all the plant extracts and carried in duplicates. Distilled water was used as a control. The larvae mortality was evaluated every 24 h. Death or paralysis of worms was ascertained by absence of motility for an observation period of 5 to 6 s when the petri dish was disturbed by agitation (Rabel et al., 1994).

Quantitative determination of saponins in medicinal plants

Twenty grams of each plant sample powder was weighed and dispersed in 200 ml of 20% ethanol. The suspension was heated on a water bath at 55°C for 4 h with continuous stirring. After filtration, the residue was extracted with another 200 ml of 20% ethanol. The combined ethanol extracts were evaporated to 40 ml on a water bath at 90°C. The concentrate was transferred into a 250 ml separatory funnel, 20 ml of diethyl ether added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. The extraction process was repeated, and 60 ml of *n*-butanol was added. The combined *n*-butanol extracts for each sample were washed with 10 ml of 5% aqueous sodium chloride. The combined extracts were heated on a water bath (90°C). After evaporation, the samples were dried in an oven (at 105°C) to a constant weight. The saponin content was calculated as a percentage (Obadani and Ochuko, 2001).

RESULTS

Survey of medicinal plants used as herbal remedies for helminthiasis in cattle

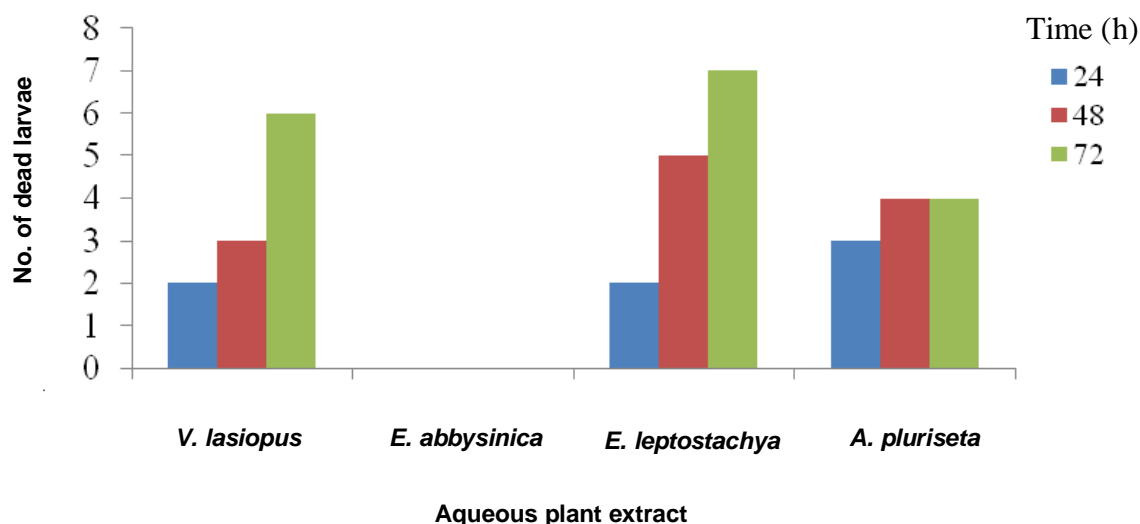
From focus group discussion and the data collected

Table 1. Medicinal plants used as herbal alternatives.

Local name	Scientific name	Frequency ranking	Comment
Muchatha	<i>Vernonia lasiopus</i> O Hoffm (Compositae).	2	Endemic in Kirinyaga county
Muhuti	<i>Erythrina abyssinica</i> Lam. Ex DC (Fabaceae)	3	Endemic in Kirinyaga county
Mucaritha	<i>Entada leptostachya</i> Harms (Mimosaceae)	1	Collected from Mbeere county
Muuti	<i>Aspilia pluriseta</i> Schweinf (Compositae).	4	Collected from Machakos county

Table 2. Concentration of saponins in medicinal plants (from Table 1).

Plant powder	Yield of crude saponins (g)	Saponins (%)
<i>Entada leptostachya</i>	1.77	8.86
<i>Vernonia lasiopus</i>	0.77	3.87
<i>Aspilia pluriseta</i>	0.11	1.05
<i>Erythrina abyssinica</i>	0.08	0.08

**Figure 1.** *In-vitro* anthelmintic activities of aqueous extracts at 10% (v/v) concentration.

during the questionnaire administration, a number of farmers indicated that herbal medications were used as an alternative antihelmintic remedy in Kirinyaga county, Kenya. Four plants consistently mentioned by the local names were recorded. They were identified as *V. lasiopus* Hoffm (Compositae), *E. abyssinica* Lam. Ex DC (Fabaceae), *E. leptostachya* Harms (Mimosaceae) and *A. pluriseta* Schweinf (Compositae), respectively. The plants were ranked on the basis of number of times mentioned by the respondents. Rank 1 represents the highest use, while 4 as the least use (Table 1).

From Table 2, *E. leptostachya* had the highest yield of saponin content while *E. abyssinica* had the lowest saponin content among the plants analyzed. *E. leptostachya*

extract had the highest *in vitro* antihelmintic activity, while *E. abyssinica* exhibited the lowest antihelmintic activity at 10% v/v concentration. The *in-vitro* anthelmintic activity was time and concentration dependent for all the medicinal plants tested (Figures 1 and 2).

When considering the titrated antihelmintic activity, Figure 2 shows that *E. abyssinica* exhibited antihelmintic activity when the concentration was increased at 30% v/v concentration. However, *A. pluriseta* had the highest antihelmintic activity, followed by *V. lasiopus*. In general, it was demonstrated that antihelmintic activity increased with the increase in concentration of the plant extracts. All extracts had a profound increase in activity at concentrations greater than or equal 30% v/v.

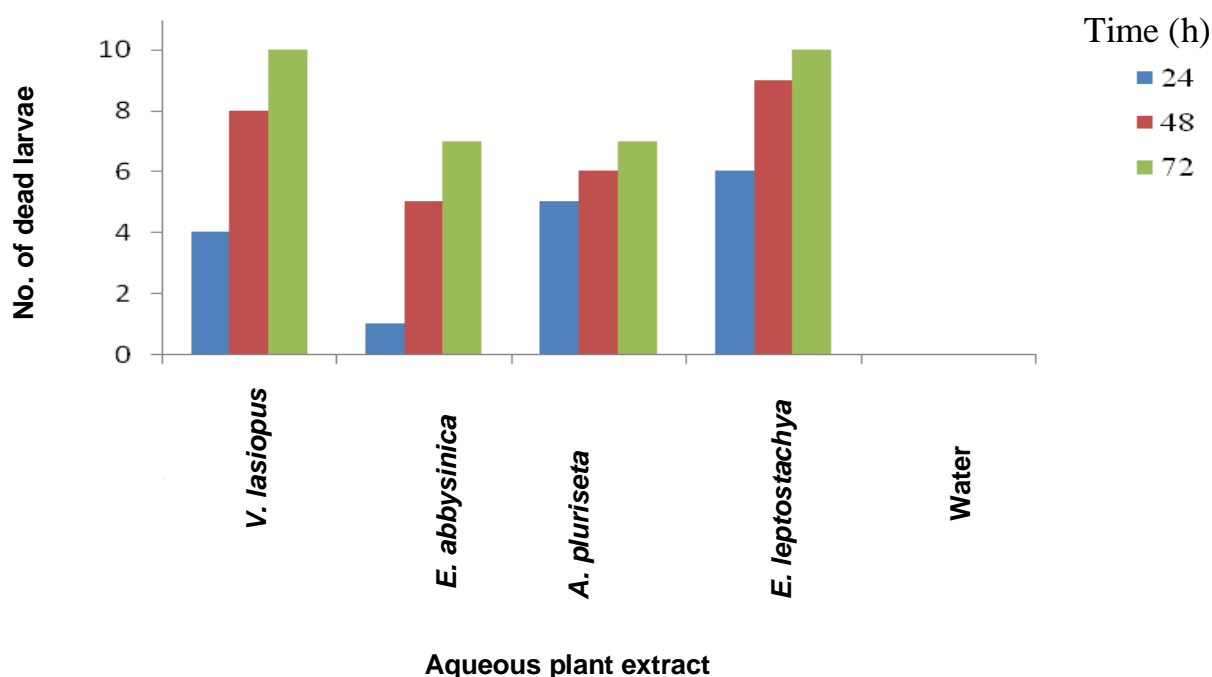


Figure 2. *In-vitro* anthelmintic activities of aqueous extracts at 30% (v/v) concentration.

DISCUSSION

Helminthes are usually controlled in ruminant animals using chemical drugs (Jorgen and Perry, 1994). However, use of herbal alternatives is common in African countries. An ideal anthelmintic drug has several characteristics among the broad spectrum activity against adult and larval parasites and a rapid metabolism within the host body. These drugs should also be of low toxicity to targeted species; have no side effect to the animal and the drug should be available at low costs. Due to their cost and having been in use for a long time, misuse and underdosing, the chemical anthelmintics may not be the most desirable in managing helminthes problems. An alternative treatment with herbal-based anti-helminthes may be a better option.

This study demonstrated that herbal remedies were used as alternatives to the conventional synthetic anthelmintics in Kirinyaga county. Use of ethnoveterinary knowledge in the treatment of livestock diseases earlier could have motivated the farmers to use available medicinal plants within their region (Abubakar, 1999; Wanyama, 2000).

The observed anthelmintic activities were thought to be due to saponins present in the evaluated medicinal plant extracts. The presence of saponins in these plants was consistent with some earlier observations (Kareru et al., 2007). However, tannins have also been reported (Hoste et al., 2009) to exhibit anthelmintic activity, and could have contributed to the activity synergistically. Nearly all

plants contain some tannins.

In this study, medicinal plants with the highest saponin content had correspondingly high anthelmintic activity. Watt and Brayer (1962) first reported anthelmintic effects of saponins. Further, other workers have reported anthelmintic effects of saponins (Enwerem et al., 2001; Bishnu and Zeev, 2005). It is thus most likely that saponins in the plants may have contributed to their observed *in vitro* anthelmintic effects.

Conclusions

The present study indicated that the screened medicinal plants (except *E. abyssinica*) exhibited moderate *in vitro* anthelmintic activity to be used as alternative remedies for nematodes in cattle. These findings supported the use of the selected medicinal plants as herbal alternatives in the treatment of helminthiasis in livestock.

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