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An Ethno -Veterinary Survey of Medicinal Plants Used in Treating Sheep Helminthiases in Koibatek and Mogotio Sub Counties, Baringo County, Kenya

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Original Research Article

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Abstract: Ethnobotanical documentation of medicinal plants use is generally an appropriate means of identifying potential sources of new drugs. The present study aimed to investigate and document the use of medicinal plants in the traditional management of sheep helminthiases in Koibatek and Mogotio sub-counties, Baringo County. Fifteen (15) plants were identified through preliminary field surveys in nine administrative units of the two sub-counties. Demographic information on age and sex of informants was collected to check the existing knowledge and attitude on the use of medicinal plants used in treating sheep helminthiases. The results indicated that out of 130 respondents interviewed, 49 out of 83 men and 23 out of 47 female had knowledge on the use of medicinal plants but there was no significant association in the knowledge of medicinal plant with the gender (X^2=63.33, d.f=48; P=0.068). The findings will offer a major and accessible source of information for livestock farmers and other actors in the livestock industry. It will also provide sustainable and easily affordable herbal medicine for helminthiases treatment.

Keywords: Helminthiases, medicinal plants, sheep, Baringo County, Kenya.

INTRODUCTION

Background information

The bulk of material used for medicinal purposes are collected from the natural vegetation stock that continues to shrink, with majority of claimed ethno-veterinary medicinal plants collected from natural habitat (wild) without cultivation.

The fact that the remedies are only found in the wild possesses a big threat to their existence as long as the mass destruction of their habitat continues [1] and the mode of transfer of indigenous knowledge is verbal from generation to generation. There is also an increase in threat to these medicinal plants due to frequent drought, agricultural expansion and cultivation of marginal land. The stock of vegetation of medicinal plants is shrinking rapidly and hence poses a big threat of their extinction due to combined effects of these factors [2].

Medicinal plants are cost-saving replacement of commercial drugs [3]. Not only the resource poor farmers, but intensive production units use the medicinal plants [4]. Market and public demand of medicinal plants has been increased and there is great risk that many medicinal plants today, face either extinction or loss of genetic diversity [41]. In European Union and other countries where the use of antibiotics and other drugs is increasingly restricted in food animals, plant medicines are gaining importance [5]. In developing countries, an interest in botanicals is reviving and different developmental organizations are supporting commercial or backyard cultivation. This is an established fact not only in developing countries, but even in the industrialized countries where medicinal plants will remain an integral part of veterinary therapeutics [6].

Different reports have shown that some plants used in helminthiases control are toxic to animals when used in high doses [7]. Efficacy studies carried out in different parts of Africa on different medicinal plants species and worm species have revealed varying efficacies [8, 9, 10] while others have revealed no activity at all. Plant secondary metabolites like alkaloids, tannins, flavonoids, glycosides, phenolic compounds, steroids and volatile oils are responsible for the physiological effects in the body. Studies conducted showed that herbal remedies possess' significant pharmacological activity and these have potential adverse effects, which may vary from relatively safe to potentially lethal [11].

Previous studies indicated several plants in Uganda are used in treatment of livestock helminthiases although some were considered more potent [12]. However, efficacies of the claimed potent plants have not been investigated to validate their traditional used as

anthelmintics. One such is *Euphorbia heterophylla Linn* (Euphorbiaceae), commonly called milk-weed [13]. The plant is native to Central and South America, but widely distributed throughout the tropics and sub- tropics and is a common crop weed across the world [14, 15]. Ugandan agro-pastoralists also use the plant to treat livestock and human constipation while the pigs feed on it [16]. In West Africa and India, *E. heterophylla* and a related species, *Euphorbia hirta* are traditionally used to treat constipation, bacterial and inflammatory disease conditions such as arthritis and rheumatism [17, 18, 19].

Ethnopharmacology and natural product drug discovery remains a significant hope in improving the poor livelihoods of rural communities. Many modern pharmaceuticals have their origin in ethnomedicine and ethnoveterinary medicine, which rely upon a local pharmacopoeia [20]. The ethnopharmacology knowledge is a holistic system approach that can serve as an innovative and powerful discovery engines for newer, safer and affordable medicines [21]. Cultural acceptability of traditional practices, along with perceptions of affordability, safety and efficiency play a role in stimulating scientific research and validation of traditional medicines [22]. Therefore, validation studies of selected herbal therapies for the treatment of sheep helminthiases can lead to the discovery of new alternative chemical ingredient for use.

MATERIALS AND METHODS

Study area

The study was carried out in Koibatek and Mogotio sub-counties, Baringo County which relies heavily on livestock production as a source of income. The area, being remote with inadequate modern veterinary health care facilities and diverse vegetation structures forms the criteria for selection of the study site. The study area is located approximately 250 km from Nairobi the Capital city of Kenya. The sub-counties have a total area of 2,306.4 Km^2 and a population of 138,168. The vegetation consists of thickets, bush lands, and area of about 512.4 km^2 is covered by forest. The study area is further divided into Mumberes, Torongo, Emining, Kisanana, Sirwa, Kimngorom, Esageri, Mogotio and Eldama Ravine administrative units/divisions (Figure 1).

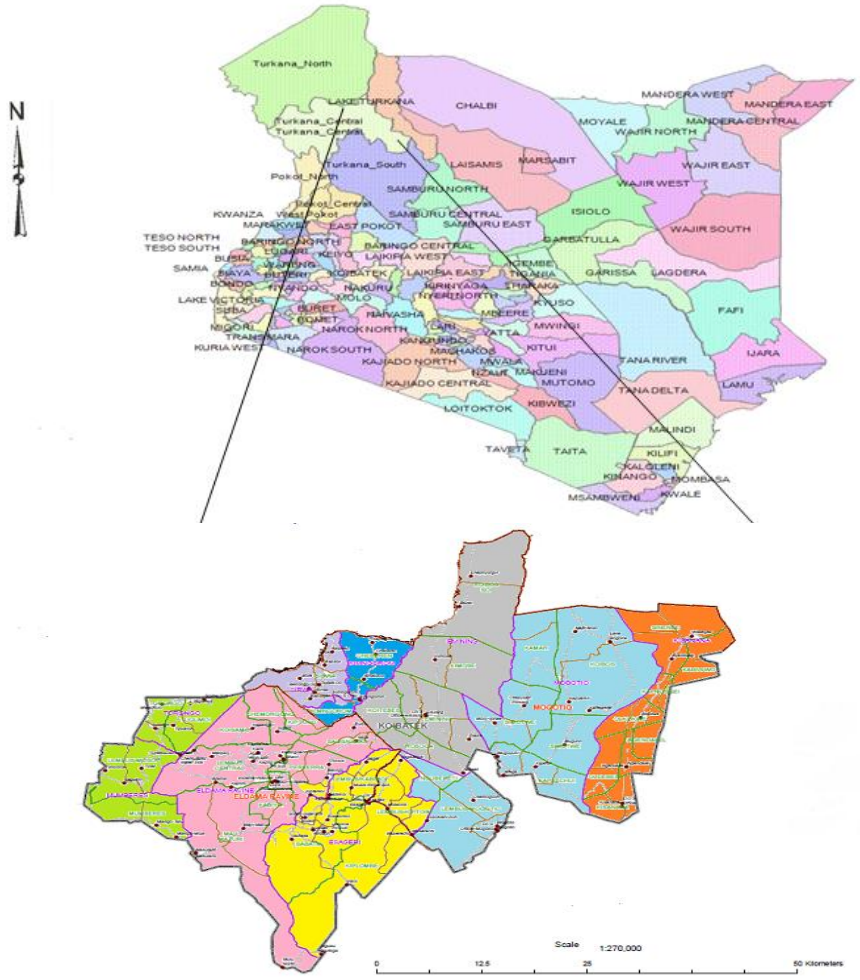

Fig-1: Map of study area. Top: Map of Kenya illustrating the geographic position of Southern Baringo County. Bottom: Koibatek and Mogotio sub-counties, Baringo County indicating the divisional boundaries. Source (Kenya Population & Housing Census, 2009)

Study design

The study design was questionnaire based cross-sectional study aimed at establishing knowledge levels on the use of medicinal plants for management and treatment of sheep helminthiases and documenting the plants used for treatment of sheep helminthiases. The nine administrative units in the two sub counties, namely Mumberes, Torongo, Emining, Kisanana, Sirwa, Kimngorom, Esageri, Mogotio and Eldama Ravine were purposively selected for the study and from the nine administrative units, 10 villages were selected of which five were from highland (Mumberes, Tugumoi, Sirwa, Kiplombe and Benonin) and five were from lowland (Radad, Molos, Kipsogon, Nyalilpuch and Saos). In each village 13 semi structured questionnaires were issued randomly to individuals, local village elders and herbalist giving a total of 130 informants to be able to establish levels of knowledge and the medicinal plants used traditionally in treating sheep helminthiases. Plants were collected at various localities mentioned by the informant with their guidance.

Identification of medicinal plants

Medicinal plants were identified in the Month of March to April 2013 to obtain an impression on vegetation characteristic (plants being leafy and flowery) of the study area using semi-structured questionnaires and interviews. A focused group discussion was held with the community members in each of the study villages namely Mumberes, Tugumoi, Radad, Molos, Sirwa, kiplombe, Kipsogon, Nyalilpuch, Saos and Benonin. This was supplemented with interviews and questionnaire surveys (guided open -and close- ended questionnaires). Discussions were conducted using structured questionnaires with individuals, local village elders and traditional medicine practitioners. The questionnaires included questions on demography like sex, age, tribe, religion, education, knowledge and attitudes about helminthic infections, plant used, practices for treating and preparations, place of plant harvest, any reported side effect, application and dosage of anthelmintic herbal medicine. The questionnaires were translated into Kalenjin; the principal language spoken in the study area. All plant materials mentioned by respondent in the study were identified in the field.

Plant collection

Collection of plants was undertaken with the help of farmers and traditional healers/herbalist. The part of the sub-county where plants were collected, the parts of the plant used as well as the dosage used in sheep was noted. All plant material mentioned by respondents in the study area were identified; voucher specimen of each plant species was collected and preserved by pressing and drying under the shade /indoor. Local names of the plants were noted and plants collected were transported to East African Herbarium at National Museums of Kenya (NMK) for identification.

Data analysis

Chi square test was used to determine the difference in knowledge of medicinal plants species known and used by female and male practitioners in the Koibatek and Mogotio sub-counties. Comparison of the knowledge levels among the gender of various ages was done using Mann-Whitney test

RESULTS

Farmers' knowledge on medicinal plants used in treating sheep helminthiases according to gender and age

Knowledge on medicinal plants used for treating sheep helminthiases amongst the farmers in Koibatek and Mogotio sub-counties was transmitted orally to individuals secretly. A great majority of respondents interviewed consisted of men totaling 83 (63.8%) as compared to women 47 (36.2%). Out of the 83 men interviewed, only 49 (59%) were aware of plants of medicinal value and 23 (48.9%) women interviewed knew the plants used in treating sheep helminthiases (Table 4.3). Thus, more men than women were conversant with the plants used. Also from the survey, young generation did not know or were not aware of traditional plants used for treating sheep helminthiases. When the knowledge of the males and the females were established using a chi square test, the results showed that there was no significant association in the knowledge of the medicinal plants to the gender ($\chi^2 = 63.33$, d.f=48; $P = 0.068$). A further comparison of the knowledge levels among the gender of various ages was done using Mann-Whitney test with an assumption that knowledge among the male to that among the female was equal. The results showed that the hypothesis could not be rejected at $P<0.05$, W=69, the test was significant at 0.9577 which implied that knowledge by the male to that by the female was the same. Male respondents knowledge levels were however slightly higher (mean 9.8%) than the females (mean 8.2%) (Table1).

Medicinal plants used by farmers in Koibatek and Mogotio sub-counties

A total of 15 plants from eleven families were recorded as useful in managing sheep helminthiases by the farmers in the two sub-counties. Out of eleven families encountered Oleaceae, Labiatae and Leguminosae had the highest frequency of species being used (Table 2).

Table-1: Knowledge of medicinal plants used to treat sheep helminthiases according to gender and age bracket

Age	No of male respondents		No of female respondent	
	With knowledge n=49/83 (59%)	Without knowledge n=34/83 (41%)	With knowledge n=23/47 (49%)	Without knowledge n=24/47 (42%)
80 – above	2 (4.1%)	0 (0%)	4 (17.4%)	0 (0%)
70-79	6 (12.2%)	0 (0%)	2 (8.7%)	0 (0%)
60-69	17 (34.7%)	6 (17.6%)	2 (8.7%)	0 (0%)
50-59	6 (12.2%)	6 (17.6%)	10 (43.5%)	0 (0%)
40-49	11 (22.4%)	3 (8.9%)	4 (17.4%)	4 (16.7%)
30-39	7 (14.2%)	8 (23.5%)	1 (4.34%)	8 (33.3%)
20-29	0 (0%)	7 (20.5%)	0 (0%)	11 (45.8%)
10-19	0 (0%)	4 (11.7%)	0 (0%)	1 (4.16%)
Total	49/130 (37.7%)	34/130 (26.2%)	23/130 (17.6%)	24/130 (18.5%)

Table 2: Medicinal plants used for management of sheep helminthiases in Koibatek and Mogotio Sub-Counties

Family name	Local name	Scientific name	Life form	Parts of the plant used	Mode of preparation	Dosage
Oleaceae	Masaita	*Olea capensis*	Tree	Bark	Bark soaked in water to make cold water extract	Bottle of soda (300ml) orally given in the morning
Oliniaceae	Nerkwe	*Olinia rochetiana*	Tree	Bark	Boiling the bark in water	Bottle of soda (300ml) given orally
Labiatae	Ngechebchat	*Leucas calostachys*	Shrub	Leaves	Leaves crushed and water added	Bottle of soda (300ml) given orally
Oleaceae	Emtit	*Olea europaea*	Tree	Bark	Boiling the bark in water	Bottle of soda (300ml) given orally
Oleaceae	Kiptere	*Jasminum floribundum*	Shrub	Leaves	Leaves bounded and mixed with water	Bottle of soda (300ml) given orally
Labiatae	Ngwanderet	*Ajuga integrifolia*	Herb	Leaves	Leaves bounded and water added	Bottle of soda (300ml) given orally
Compositae	Mororwet	*Vernonia lasiopus*	Shrub	Leaves	Bounding the leaves in water	Bottle of soda (300ml) given orally
Aspleniaceae	Sugumerie	*Asplenium aethiopicum*	Herb	Rhizome	Rhizome crushed then mixed with water	Bottle of soda (300ml) given orally
Myrsinaceae	Seketet	*Myrsine africana*	Shrub	Seeds	Seeds grounded and soaked in water	Bottle of soda (300ml) given orally

Family name	Local name	Scientific name	Life form	Parts of the plant used	Mode of preparation	Dosage
Canellaceae	Soket	*Warburgia ugandensis*	Tree	Leaves	Leaves bounded in water	Bottle of soda (300ml) given orally
Leguminosae	Senetwe	*Senna didymobotrya*	Shrub	Leaves	Leaves bounded and soaked in water	Bottle of soda (300ml) given orally
Meliaceae	Mwarubaini	*Melia azedarach*	Tree	Leaves	Leaves bounded and boiled in water	A third bottle of soda (100ml) given orally
Ebenaceae	Uswet	*Euclea divinorum*	Tree	Bark	Bark boiled in water and cooled	Quarter bottle of soda (70ml) given orally
Rutaceae	Kurionte	*Vepris simplicifolia*	Tree	Leaves	Leaves bounded and mixed with water	Bottle of soda (300ml) given orally at night
Leguminosaea	Barmukute	*Albizia anthelmintica*	Tree	Bark	Bark boiled in water	Half bottle of soda (150 ml) given orally

Medicinal plants used by farmers from different habitats

Four medicinal plants species were commonly used by the farmers, namely *Albizia anthelmintica* (14.66%), *Leucas calostachys* (12.93%), *Olea capensis* (12.07%) and *Olea europaea* (10.34%) and the least medicinal plants used were *Myrsine africana* (1.72%), *Senna didymobotrya* (1.72%), *Vernonia lasiopus* (1.72%) and *Melia azedarach* (0.86%). Out of the 15 plants recorded to be of value in treating sheep helminthiases, ten plants were from highland and five were from lowland (Table 3).

Table 3: Frequencies and percentages of medicinal plants mentioned for the treatment of helminthiases in the study area

Scientific name	Habitat	Number of times a plant was mentioned (frequency)	Percentage frequency (%)	Ranking of plants based on frequency of use
Leucas calostachys	Highland	15	12.93	2
Euclea divinorum	Highland	5	4.31	9
Olea europaea	Highland	12	10.34	4
Myrsine africana	Highland	2	1.72	12
Senna didymobotrya	Lowland	2	1.72	12
Vepris simplicifolia	Highland	7	6.03	7
Ajuga integrifolia	Highland	7	6.03	7
Olinia rochetiana	Highland	11	9.48	5
Warburgia ugandensis	Lowland	3	2.59	11
Asplenium aethiopicum	Highland	5	4.31	9
Jasminum floribundum	Lowland	11	9.48	5
Olea capensis	Highland	14	12.07	3
Vernonia lasiopus	Highland	2	1.72	12
Melia azedarach	Lowland	1	0.86	15
Albizia anthelmintica	Lowland	17	14.66	1

Growth life forms of the medicinal plants used

The majority of medicinal plants recorded were trees (53.3%) followed by shrubs (33.3%) and herbs (13.3%). The vegetation of the area was predominated by shrubs and trees as well as herbs. Local community knowledge of medicinal plants seemed to be generally influenced by nature of vegetation/flora in the surrounding environment because more medicinal plants were derived from highlands (66.67%) and few were from lowland (33.33%).

Medicinal plant parts used

Most of the plants parts used as source of medicine were leaves (53.33%). This was followed by the bark (33.33%). Seeds and rhizomes were least frequently used with only one plant for each that is *M. africana* and *A. aethiopicum* respectively. From the survey use of roots was 0%.

Traditional methods of processing herbal plants in the two sub counties

Main methods of processing herbal medicine by herbalist in Koibatek and Mogotio sub- counties were decoction and maceration. Decoction was used when working with tough and more fibrous plants parts such as the bark of the stem and rhizomes. Materials were boiled in the water for a long period of time to soften the material to release the active ingredients. Maceration was preferred for very soft/tender fresh plant material for example, leaves that tend to lose their active compounds upon heating. Seeds like *Myrsine africana (*seketet) were grounded to form powder and soaked in water to form concoction for oral formulation.

Medicinal plants extinction

Many plants in the study area are threatened by anthropogenic activities and natural factors. The majority of medicinal plants decline in number due to deforestation for timber used in construction, making of furniture, firewood, fodder, agricultural expansion, drought, overgrazing and bushfire. Majority of the local tradition healers preferred to collect medicinal plants solely to preserve their secrecy though sometimes accompanied by their chosen family members. Ethnobotanical knowledge is transferred to that trustworthy family member by a word of mouth rather than through a well-organized written script. Some traditional herbalists were reluctant to pass on their plant use knowledge even to their families and thus leading to the loss of indigenous knowledge and eventually the medicinal plants upon their death.

DISCUSSION

Knowledge of ethno veterinary plants

Knowledge on the use of indigenous medicinal plants was more bestowed on men than women, with young generation being unaware on the use of ethno veterinary medicinal plants. This is because knowledge was fundamentally rooted among men whose social responsibility traditionally was livestock keeping and management hence acquired more information on use of traditional medicinal plants for helminthiases treatment than women. Only a few women had medicinal plants knowledge because it is believed that some might have acquired the knowledge through observation as medicinal plants were being prepared by men to treat animal helminthiases. Due to western kind of culture currently, young generation is losing the knowledge rapidly This supports an earlier study by Kemonga [24] that nearly two times more males than females were knowledgeable about medicinal plants used for treating livestock helminthiases.

Despite the available veterinarians, farmers rely on their knowledge for prevention and treatment of helminthiases as reported elsewhere [25]. They acquire the knowledge of medicinal plants against helminths from parents and grandparents (ancestors), contemporary practitioners or from experience. This was analogous with studies carried out in Ethiopia [26], Pakistan [27] and Brazil [40]. The traditional knowledge was passed orally from generation to the next and sometimes within the family to constitute the basis for traditional bio prospect [28]. Traditional bio prospecting forms the foundations for ethnomedicine [29] and ethnoveterinary practices [30]. Further, according to Nanyingi [31] the average numbers of medicinal plants known and used by female and male practitioners were similar which disagree with the current study. The present study concurs with Nanyingi [32] observation that informants between 58 and 77 years old mentioned more species than younger informants and ethnobotanical knowledge was passed on by word of mouth.

Medicinal plants used

All the six plants selected and evaluated, namely: *Jasminum floribundum*, *Vepris simplicifolia*, *Asplenium aethiopicum, Leucas calostachys*, *Olea capensis* and *Olinia rochetiana* exhibited anthelmintic activity. The anthelmintic activity of the plants had different degree of action and this could be attributed to chemistry of the plants, place of collection and target parasite to exert anthelmintic effects [33]. The vegetation of the area was predominated by trees and shrubs as well as herbs. The majority of medicinal plants recorded were trees followed by shrubs and herbs. The present study disagrees with earlier findings in parts of Ethiopia [34, 35, 36] that herbaceous medicinal plants were widely used for treatment of helminthiases, followed by trees and shrubs. Leaves were predominantly used plant part for herbal preparation followed by bark. The findings from the current study were in conformity with previous study of Buuri District, Meru County, Kenya, where mostly trees constituted the largest category, followed by herbs and shrubs [37]. According to Nanyingi [38], analysis of growth forms partially differs with the current study in that, the largest form of medicinal plants used for treating animal helminthiasis constitute shrubs, followed by trees and herbs. Leaves were the most frequently used plant part constituting 40%, followed by roots (30%), stem (10%), seeds/fruits (18%) and whole plant (4%).

Extinction of medicinal plants is brought about by anthropogenic activities and natural factors according to the present findings. Also, transmission of knowledge from one generation to another by elderly to young contributes to loss of information when older generation dies before conveying the knowledge. This agrees with a similar study carried out [39], that medicinal plants remedies were found only in the wild possession and there is threat to their existence as long as there is mass destruction of their habitat continues and that the mode of transfer is from generation to generation.

CONCLUSIONS

Farmers knowledge on the use of medicinal plants for helminthiases treatment in the Sub County is limited to a clique of people and more so to the elderly generations. The percentage number of men surpasses that of women with the knowledge on medicinal plants used. Knowledge on the use of medicinal plants is confined to certain families and transfer of the same is done secretly by word mouth. Results obtained shows that there are medicinal plants of value in treating sheep helminthiases in the Sub County which need to be tested biologically to ascertain their validity to be used as anthelmintics. The plants that are being used include: *Olea capensis*, *Olinia rochetiana*, *Leucas calostachys*, *Olea europaea*, *Jasminum floribundum*, *Warburgia ugandensis*, *Ajuga integrifolia*, *Senna didymobotrya*, *Vernonia lasiopus*, *Asplenium aethiopicum*, *Myrsine africana*, *Melia azedarach*, *Euclea divinorum*, *Vepris simplicifolia* and *Albizia anthelmintica.*

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