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Herbal usage and informant consensus in ethnoveterinary management of cattle diseases among the Kikuyus (Central Kenya)

Grace N. Njoroge [a,*], Rainer W. Bussmann [b,1]

[a] *Jomo Kenyatta University of Agriculture and Technology, Botany Department, P.O. Box 62000, Nairobi, Kenya*
[b] *Lyon Arboretum, University of Hawaii, 3860 Manoa Rd., Honolulu, Hawaii 96822, USA*

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Abstract

For most smallholder farmers in Kenya conventional veterinary drugs have become very expensive and therefore unaffordable, causing them to seek low cost alternatives that are rarely documented in most ethnobiological studies. This study surveyed the utilisation of traditional herbal preparations in managing cattle ailments in Central Kenya with the aim of providing a comprehensive ethnobotanical profile and the most important plant species that may warrant scientific validation for efficacy and commercial utilisation.

Using semi-structured questionnaires and detailed discussions with smallholder farmers, a total of 40 plant species in 26 families were found to be useful in traditional management of various cattle ailments in this region. Two plant families were particularly frequent in usage: Asteraceae and Lamiaceae, while the most utilised plant species were found to be *Synadenium compactum* N.E.Br. (Euphorbiaceae), *Solanecio manii* (Hook.f.) C. Jeffrey (Asteraceae) and *Senna didymobotrya* (Fresen.) Irwin and Barneby (Caesalpinaceae). Informant consensus was particularly high in managing anaplasmosis, East coast fever and ectoparasites. Such plant species become key target in efficacy tests and for development of commercial veterinary botanicals. The usage of some of the species is unfortunately unsustainable as some of the species are rare or endangered hence the need for conservation strategies to be undertaken.
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Keywords: Ethnoveterinary; Traditional medicines; Rare and endangered plants; Conservation

1. Introduction

For many years stockraising has been an important part of livelihood and culture in Sub-Saharan Africa especially (Ghirotti, 1996). Livestock diseases play a major role in African countries in particular because unlike in other continents all five most important livestock diseases occur here (Van Veen, 1996), with anaplasmosis and Theileriosis being endemic in sub-humid Africa (Msellati and Tachers, 1991). It has been established that animal diseases are a major constraint to livestock production in Kenya (Delehanty, 1996; Keengwe and Bekalo, 1996; Githiori, 2004). Prevention and control of animal diseases therefore have been of critical concern in Kenya like in other African countries. Although the Livestock industry in Kenya contributes only about 10% to the GDP there is potential for improved production if appropriate measures are taken in disease control. Just like in human health care the cost of conventional veterinary medicines has escalated in the recent past and has become unaffordable to most stock raisers in most African countries, causing smallholder farmers to turn to low cost alternatives. In Zimbabwe for example, ethnoveterinary medicine is gaining recognition at the expense of conventional drugs especially because of its greater accessibility, lower costs and apparent effectiveness (Mwale et al., 2005).

The use of traditional plants for management of diseases both in animals and humans is not haphazard. In Kenya for example, at Kaloleni division, a correspondence has been established between ethnoveterinary data and laboratory serological data regarding Theileriosis in calves (Delehanty, 1996). Among the Samburu and Turkana research has shown that 35 diseases, including Streptothricosis, mange, cough and diarrhoea are treatable using local remedies (Wanyama, 1997). In Trindad and

* Corresponding author. Tel.: +254 67 52711; fax: +254 67 52164.
E-mail addresses: gnjerinjoroge@hotmail.com/, gnjoroge@jkuat.ac.ke (G.N. Njoroge), bussmann@hawaii.edu (R.W. Bussmann).
[1] Tel.: +1 808 988 0457; fax: +1 808 988 0462.

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Tabago *Momordica charantia* L. (Cucurbitaceae), when put in drinking water improves productivity and profitability of broilers (Wanyama, 1997) while *Carica papaya* L.(Caricaceae) latex is a successful anthelmintic in goats (Satrija et al., 1995).

Researchers and pharmaceutical entrepreneurs agree that ethobotanically derived compounds have greater activity than compounds derived from random screening and therefore a greater potential for novel products developed (Cox and Balick, 1996; Flaster, 1996). Plants that are employed in traditional medicines worldwide are two to five times more likely to test out as pharmacologically active than those randomly sampled (Mathias et al., 1996; Natarajan and Iyer, 2000). Consequently there is a growing interest in traditional uses of plants for health care among different communities especially in the developing countries.

Some of these discoveries have begun to generate research in the area of ethnoveterinary in the eastern African region (Delehanty, 1996; Heffernan et al., 1996; Wanyama, 1997; Githiori et al., 2002; Waihenya et al., 2002a,b; Githiori et al., 2003; Tabuti et al., 2003; Githiori, 2004). Such research in Kenya however, is limited and has focused on ethnoveterinary practices among pastoral and farming communities in marginal areas. Farming communities in high potential areas such as Central Kenya, where many farmers have relied on cash crops such as coffee, have now turned to alternative means of livelihood such as cattle keeping due to reduced prices for their crops. The study of ethnoveterinary phytotherapy in this region is important especially because half of the 2.9 million Kenyans living within 5 km of forests, are in Central Kenya (Wass, 1995), where most deforestation occurs. For this reason some of plants used in ethnomedicine may be experiencing pressure due to habitat destruction.

In view of the rising costs of conventional veterinary drugs, herbal ethnoveterinary remedies are likely to gain importance in the management of livestock diseases in Kenya and other African countries, because most traditional healers do not charge for their services, relying mainly on the good will of their clients. Perhaps of more importance is the fact that herbal remedies are known to be broad spectrum and therefore may be a future answer to the development of resistance of pathogens to conventional drugs (Mwale et al., 2005). In Kenya adulteration of commercial livestock drugs such as synthetic anthelmintics has been established to be a common practice leading to resistance of some disease causing organisms in livestock (Githiori, 2004). Many small-scale farmers are known to use herbal remedies for controlling or treating cattle diseases. These plants and their conservation status has not been documented specifically in Central Kenya. Such documentation is likely to lead to a more directed research for novel products in veterinary medicine.

Ethnoveterinary information like other forms of traditional knowledge is transmitted orally from generation to generation and hence in danger of extinction as older people die and younger generations fail to learn the traditional way of life. The situation is worsened by rapid socio economic, technological and environmental changes (Tabuti et al., 2003). The medicinal plant diversity is also threatened due to high deforestation rates, urbanisation and overexploitation. Documentation of plants used in ethnoveterinary practices is urgent so that the knowledge can be preserved, plants conserved and sustainably managed and utilised for the control of livestock diseases. Although some of this information has been documented in some parts of Kenya, it has been shown that knowledge on ethnoveterinary medicine varies from region to region as well as within and among communities (Matekaire and Bwakura, 2004).

This paper presents ethnoveterinary medical practices in Central Kenya with special emphasis on herbal usage in managing cattle diseases. For the main cattle ailments informant consensus is reported with the aim of presenting key ethnoveterinary medicinal plants that can be targeted for pharmacological studies and development of novel products. The conservation status of the most frequently utilised plants is reported.

2. Materials and methods

2.1. Study site and subjects

The Kikuyus are the largest single ethnic group in Kenya and account for 21% of the country's population (Sindiga et al., 1995). In the recent past new interest in traditional herbal medicines has grown in this community. This may be attributed to high cost of modern drugs, inaccessibility of clinics and the fact that traditional medicine is regarded as effective and usually is the preferred mode of treatment for many illnesses especially in rural areas (Githae, 1995).

The study was conducted among smallholder farmers who play a major role in food production. Although the young people have absorbed large quantities of western culture, among the older people the remembrance of the past is alive. The values, attitudes and behaviours typical of the traditional life are in many cases still carefully and scrupulously followed (Bottignole, 1984).

2.2. Data collection

The resource group included males and females who depended on plant resources for managing cattle illnesses in seven districts—Thika, Murang'a, Kiambu, Maragwa, Nyandarua, Kirinyaga and Nyeri (Fig. 1). This was part of a larger ethnobotanical survey in this region involving 119 respondents. However the data presented in this paper involves responses of 46 smallholder farmers who kept cattle and used traditional herbal preparations in managing ailments for their animals. Information on local names of the plants, ailments treated, mode of administration and preparation were recorded.

Knowledge on ethnoveterinary practices was gathered using questionnaires, semi-structured interviews, informal interviews and discussions. Interviews were also supplemented by participant observations and "walk-in-the-woods" to identify plants and collect ethnobotanical specimens (Cunningham, 2000). The informant consensus factor has been viewed as an important indicator for important medicinal plant species for a given ailment (Heinrich, 2000). The informant consensus factor for each of the main ailments was worked out to give an indication of agreement in the kind of plant species utilised for each disease.

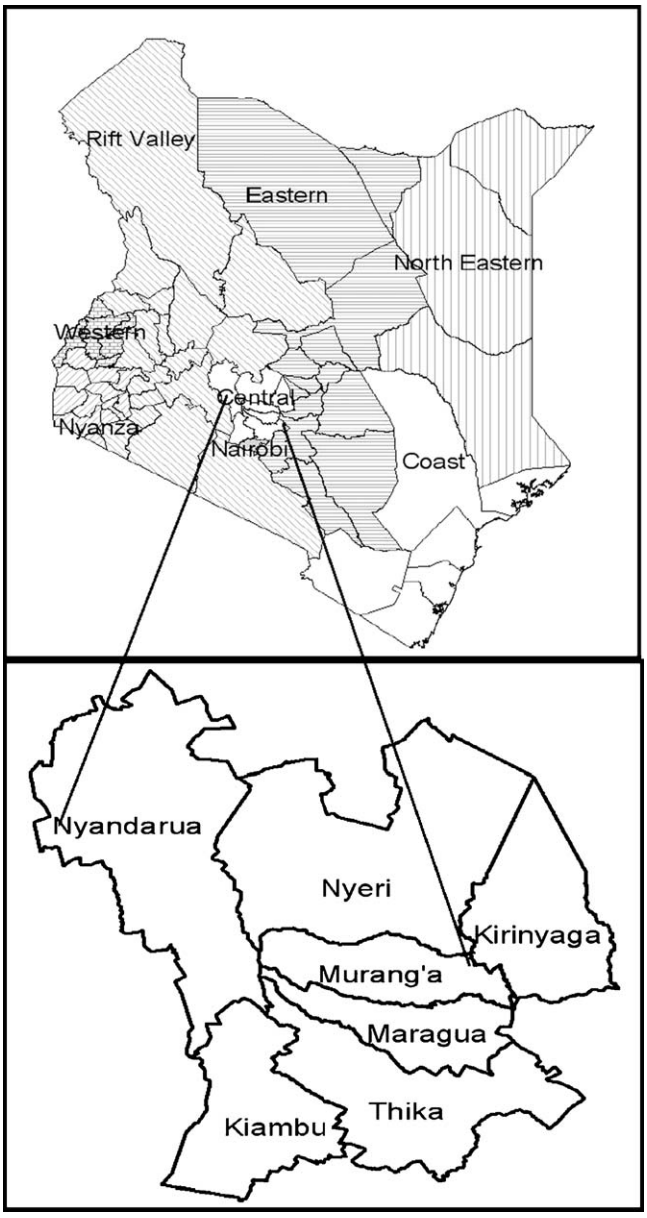

Fig. 1. Map of Kenya showing the eight provinces and the seven districts in Central Province where fieldwork was done.

2.3. Plant collection and identification

Plants said to be useful in managing various ailments in cattle during the interviews were visually identified in the filed by the respondents. Voucher specimens were collected in duplicates using standard taxonomic/ethnobotanical procedures particularly recording important features for identification in the herbarium. Each specimen included vital parts such as leaves, stems, flowers and fruits were available. For small herbaceous plants, whole plants were usually collected. For every specimen collected the vernacular names were also recorded. The specimens were dried in the herbarium and then mounted on sheets.

At the Jomo Kenyatta University herbarium, the collected plant materials were identified using the relevant Flora of Tropical East Africa family fascicles and other local taxonomic literature. Identified specimens were then compared with species descriptions to ensure that there was reasonable agreement between the characters observed on the specimen and those provided by the descriptions of the plant it is presumed to be. Assistance in identification was sought from an experienced botanist (Mr. Simeon Mathenge) of the University of Nairobi herbarium. The preserved collection at Nairobi University herbarium as well as Jomo Kenyatta University herbarium were used to make comparisons with the identified specimens.

Only plant species mentioned by at least two people were considered in the analysis. Plant species like for example *Azadirachta indica* A. Juss. (Meliaceae) and *Allium sativum* L. (Liliaceae) for which knowledge on use most probably came from their popularization on the media were excluded in this report. For all the plant species, direct observations, local literature (Agnew, 1994; Beentje, 1994) as well as the IUCN data base (IUCN, 2000) were consulted to reveal plants that are endangered, rare or overexploited. Voucher specimens were deposited at the Jomo Kenyatta University herbarium as ethnobotanical reference collection.

3. Results and discussion

This study recorded 40 plant species in 26 families as useful in traditionally managing various diseases of cattle in Central Kenya (Table 1). Of these Asteraceae and Lamiaceae had the highest number of species. The highly utilised species in this pharmacopoeia include: *Synadenium compactum*, *Solanecio manii* and *Senna didymobotrya* (Fig. 2). The plants commonly used in ethnoveterinary in this region include some indigenous rare, vulnerable or overexploited trees in Kenya (Beentje, 1994). Of importance are *Synadenium compactum* and *Warburgia ugandensis* Sprague (Canellaceae). This calls for conservation measures particularly for the plant species with high use

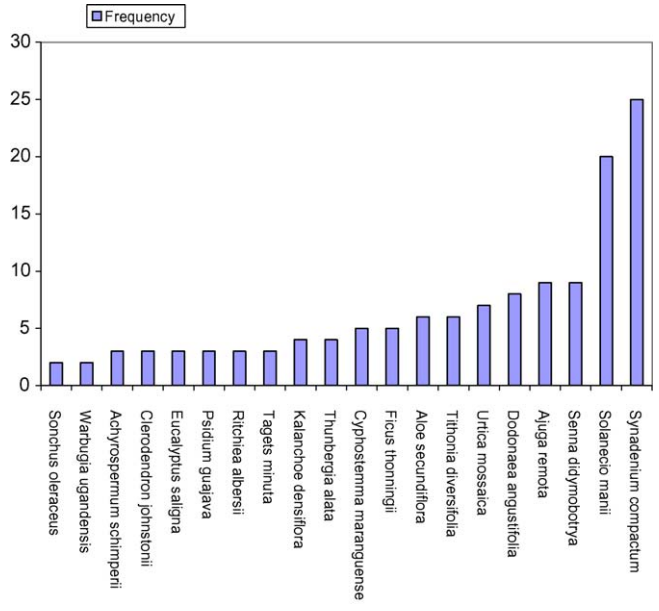

Fig. 2. Plant species frequently utilised in ethnoveterinary among cattle farmers (Central Kenya).

Table 1
Plant species, parts used and method of preparation of ethnoveterinary remedies in Central Kenya

Disease/symptom	Species name	Family	Local name	Voucher number	Part used	Method of preparation
Ectoparasitism	*Caesalpinia volkensii* Harms	Ceasalpiniaceae	Mûbûthi	817	Leaves	Boil
	Synadenium compactum N.E.Br. [a]	Euphorbiaceae	Watha	31	Bark	Soaking
Apetite improvement	*Tagetes minuta* L.	Asteraceae	Bangi	154	Leaves	Boil
	Tithonia diversifolia (Hemsl.) Gray	Asteraceae	Marûrû	196	Galls	Boil
	Warburgia ugandensis Sprague[b]	Canellaceae	Mûthîga	719	Leaves	Boiling
	Ajuga remota Benth	Lamiaceae	Wanjirû warûriî	821	Leaves	Boiling
	Melia volkensii Gürke	Meliaceae	Mwarombaini	851	Leaves	Boiling
	Schkuria pinnata (Lam.) Thell.	Asteraceae	Gakwinini	161	Latex	Direct
	Tithonia diversifolia (Hemsl.) Gray	Asteraceae	Marûrû	196	Latex	Boiling
Arbotion	*Ekebergia capensis* Sparrm.	Meliaceae	Mûnjuga iria	743	Galls	Boil
Diarhoea	*Acacia polyacantha* Willd.	Mimosaceae	Mûcemei	176	Leaves	Boiling
	Aloe secundiflora Engl.[c]	Aloaceae	Mûgwanûgû	268	Leaves	Boil
	Ficus thonningii Bl.	Moraceae	Mûgûmo	778	Leaves	Boiling
	Pinus patula Schlect. & Charm.	Pinaceae	Mûcinda		Leaves	Boil
	Psidium guajava L.	Myrtaceae	Mûbera	879	Leaves	Boil
	Sphaeranthus gomphrenoides O. Hoffm.	Asteraceae	Mûconjoiya	128	Leaves	Boiling
	Zea mays L.	Poaceae	Mûcakwe		Dry cob	Boil
General weakness	*Urtica massaica* Mildbr.	Urticaceae	Thabai		Leaves	Boil
Anaplasmosis	*Acacia mearnsii* De Wild.	Mimosaceae	Mûthandûkû	764	Bark	
	Ajuga remota Benth	Lamiaceae	Wanjirû	821	Leaves	Boil
	Aloe secundiflora Engl.[c]	Aloaceae	Mûgwanûgû	268	Whole plant	Boil
	Basella alba L.	Basellaceae	Mûrerema	896	Leaves	Boil
	Cayratia ibuensis (Hook.f.) Suesseng.	Balanophoraceae	Mûnyanyange	853	Leaves	Boil
	Clerodendrum johnstonii Oliv.	Verbenaceae	Mûrigono	850	Leaves	Boil
	Cucumis aculeatus Cogn	Cucurbitaceae	Gakûngûi	306	Leaves	Boil
	Cyphostemma maranguense (Gilg) Desc.	Vitaceae	Mûthonjoro	267	Latex	Direct
	Dodonaea angustifolia L.f.	Sapindaceae	Mûrema	240	Latex	Direct
	Euclea divinorum Hiern	Ebenaceae	Mûkinyai	134	Fruit	Boil
	Ficus thonningii Bl.	Moraceae	Mûgumo	778	Leaves	Boiling
	Helichrysum odoratissimum (L.) Less.	Asteraceae	Mataa/mûtaa		Leaves	Boil
	Kalanchoe densiflora Rolfe	Crassulaceae	Mûgwanûgû	699	Leaves	Crush, apply directly
	Ritchiea albersii Gilg	Capparaceae	Mûnunga mai	260	Leaves	Boil
	Senna didymobotrya (Fresen.) Irwin & Barneby	Caesalpiniaceae	Mwînû	173	Leaves	Boil
	Solanecio mannii (Hook.f.) C. Jeffrey	Asteraceae	Mûthakwa wathi	772	Leaves	Boiling
	Sonchus oleraceus L.	Asteraceae	Mahiû	155	Leaves	Boil
	Synadenium compactum N.E.Br. [a]	Euphorbiaceae	Watha	31	Leaves	Boil
	Thunbergia alata Sims	Acanthaceae	Kanyanja		Leaves	Boil
	Solanecio mannii (Hook.f.) C. Jeffrey	Asteraceae	Mûthakwa	772	Leaves	Boiling

Table 1 (*Continued*)

Disease/symptom	Species name	Family	Local name	Voucher number	Part used	Method of preparation
	Achyrospermum schimperi (Hochst.) Perkins	Lamiaceae	Gacûgûna	837	Leaves	Boil
Upper respiratory infections	*Dodonaea angustifolia* L.f.	Sapindaceae	Murema mûthûa	240	Leaves	Boil
	Eucalyptus saligna Smith	Myrtaceae	Mûbaû		Leaves	Boil
	Senna didymobotrya (Fresen.) Irwin & Barneby	Caesalpiniaceae	Mwînû	173	Leaves	Boil
	Solanecio mannii (Hook.f.) C. Jeffrey	Asteraceae	Mûthakwa wathi	772	Leaves	Boil
Weakening of bones	*Urtica massaica* Mildbr.	Urticaceae	Thabai		Leaves	Boil
	Synadenium compactum N.E.Br. [a]	Euphorbiaceae	Watha	31	Leaves	Boiling
	Aloe secundiflora Engl.[c]	Aloaceae	Mûgwanûgû	268	Leaves	Boil
	Cyathula polycephala Bak.	Amaranthaceae	Maramata	897	Leaves	Boil
Theileriosis	*Dodonaea angustifolia* L.f.	Sapindaceae	Mûrema mûthûa	240	Leaves	Boil
	Kalanchoe densiflora Rolfe	Crassulaceae	Mûkondori	699	Leaves	Boil
	Plectranthus barbatus Andr.	Lamiaceae	Mûigoya	831	Leaves	Boil
	Ricinus communis L.	Euphorbiaceae	Mwarîki	199	Leaves	Boil
	Solanecio mannii (Hook.f.) C. Jeffrey	Asteraceae	Mûthakwa warûamba	772	Leaves	Boil
	Sonchus oleraceus L.	Asteraceae	Mahiû	155	Stem	Boil
	Synadenium compactum N.E.Br. [a]	Euphorbiaceae	Watha	31	Roots	Boiling
	Thunbergia alata Sims	Acanthaceae	Kanyanja		Leaves	Boil
	Ajuga remota Benth	Lamiaceae	Wanjirû	821	Leaves	Boil
	Ipomoea batatas (L.) Lam.	Convolvulaceae	Mîrîyo		Whole plant	Boil
Dietary deficiencies	*Plectranthus barbatus* Andr.	Lamiaceae	Maigoya	831	Leaves	Boil
	Urtica massaica Mildbr.	Urticaceae	Thabai		Leaves	Boil
	Warburgia ugandensis Sprague[b]	Canellaceae	Mûthîga	719	Leaves	
	Senna didymobotrya (Fresen.) Irwin & Barneby	Caesalpiniaceae	Mwenû	173	Leaves	Boil
Endoparasitism	*Cucurbita maxima* Lam.	Cucurbitaceae	Marenge		Shoot	Beat up, put in water
	Olea europaea L.	Oleaceae	Mûcarage	735	Bark	Boil

[a] Cited as rare in Kenya.
[b] Over-utilised.
[c] Listed on CITES Appendix II.

frequency. The main cattle diseases managed using traditional herbal preparations are discussed below.

3.1. Ectoparasistism

Ethnoveterinary management of ectoparasites in cattle was found to involve external spraying of the animal with crude plant concoctions, extracts or infusions from plants. Commercial hand sprayers or locally improvised ones were used for dispensing the crude extracts. A few cattle dips were observed in the study area but most were not functional and none of the dips were used for traditional management of ectoparasitism in cattle.

Ticks were the main cattle ectoparasites that the local people controlled using traditional plant extracts. The most frequently used plants for tick control in this region was found to be: *Tithonia diversifolia* (Hemsl.) Gray (45.5%) and *Tagetes minuta* L. (27.3%) (Asteraceae). These are important exotic weeds in the area but have become important medicinal plants such that they are allowed to grow along farms edges. *Tithonia diversifolia* has now become a common hedge plant in the study area. Controlling ticks has implications in managing tick borne diseases such as anaplasmosis, Theileriosis, Babeosis and heartwater and therefore is a very important prophylaxis. Other studies indicate that *Tagetes minuta* which is used in Eastern Africa as fly

repellent contains pungent oil whose main constituents are carvone, linoöl and other elements (Bizimana and Schrecke, 1996). Further studies on the effect of these constituents or other son ticks are recommended.

3.2. Endoparasitism

The respondents classified all intestinal worms under one local name, *Njoka* and therefore use the same plant extracts for all helminths. The main species used for this were: the leaves of *Senna didymobotrya* (45%), seeds and fruits of *Cucurbita maxima* Lam. (18%) (Cucurbitaceae) and bark of *Olea europaea* L. (18%) (Oleaceae). While the use of *Cucurbita maxima* has been reported in other parts of Kenya (ITDG/IIRR, 1996) the other species are new records for anthelminthics in ethnoveterinary for this region. It has been shown that diseases caused by helminthes are the major productivity constraint in livestock in the tropics and subtropics, with gastrointestinal helminthe parasites causing the most common and economically important diseases of grazing animals (Githiori, 2004). These infections lead to lower outputs of animal products, as well as manure and traction leading to negative impacts on the livelihood of smallholder farmers (Perry and Randolph, 1999).

The herbal products of the plants identified in this study as useful traditional anthelmintics may form an alternative cost effective strategy of managing helminthiasis in cattle for this region especially when their efficacy is established. Studies on effects of traditionally utilised herbal anthelmintics show that there is a correlation between activity of such extracts and the way they are used in ethnoveterinary. The bark extracts as *Albizia anthelmintica* Brongn. (Mimosaceae) which is used especially among pastrolist communities in Kenya has been found to decrease faecal egg counts of *Haemonchus contortus* in sheep by 34% (Githiori et al., 2003). Further studies on the plants reported in this study are recommended.

3.3. East coast fever (Theileriosis)

The respondents in the study area usually recognise East Coast Fever (ECF) by the presence of swollen parotid lymph nodes especially in front of the shoulder blades. In this region, the disease is therefore referred to as "ngaí" after the local meaning for swollen lymph nodes. Diarrhoea was also cited as an indicator of ECF especially when the stools are blood stained. Treatment involves cauterising the lymph node with a hot iron, direct application of plant extracts especially latex on the lymph nodes or use of plant liquid preparations that are given orally to the cattle. The main plants used in this case are: *Synadenium compactum* (59%), *Dodonaea angustifolia* L.f. (Sapindaceae) (11%) and *Ajuga remota* Benth (Lamiaceae) (8%). Percentages represent frequency of use among the respondents. Treatment of ECF was found to have an informant consensus factor of 0.73 (Fig. 3). Such a high level of consensus calls for investigation on the evaluation of medicinal properties of these plants. The informant consensus factor has been viewed as an important indicator for important plant species for a given ailment and hence the plant species recorded as important in treating

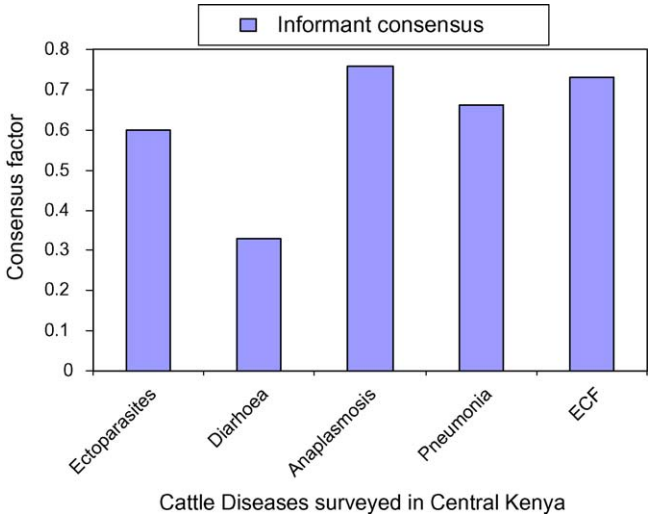

Fig. 3. Informants consensus for the main cattle ailments managed using traditional herbal medicines in Central Kenya.

ECF many help in discovery of natural marketable products. Theileriosis (ECF) is not only a prominent cattle disease in East and Southern Africa but also the most economically damaging (Mukhebi, 1991). Investigations on phytochemicals from these plants and efficacy studies will lead to improved management of this disease.

3.4. Diarrhoea

Five species were cited as important traditionally in managing diarrhoea in cattle, four of which are new records, as they have not been recorded before in ethnoveterinary management of diarrhoea in Kenya. Two species however, were particularly frequent: *Psidium guajava* L. (Myrtaceae) 30% and *Ficus thonningii* Bl. (Moraceae) 20%. This may reflect plants from which potential antidiarrhoeal compounds are likely to be isolated. Antidiarrhoeal properties can be explained in part by the presence of tannins due to their antiseptic and vasoconstrictor affects. Tannins also form protective layers on the skin and mucous membranes. Other important antidiarrhoeal substances include astringent phenolic compounds, triterpenoides and saponins some of which have been identified in *Psidium guajava* (van Wyk et al., 2002). Condensed tannins have been shown to have effects on gastrointestinal nematode parasites in grazing animals. Goats infected with *Haemonchus contortus* for example, when fed with *Acacia karoo* (Mimosaceae) (which contains condensed tannins) significant reductions in faecal egg counts are observed (Kahiya et al., 2003). Among the Samburu and Masaai pastrolists of Kenya, goats and sheep during the dry season are fed with pods of *Acacia tortilis* (Forssk.) Hyne (Mimosaceae), which contains condensed tannins (Gowda, 1997).

Studies in traditional management of diarrhoea in humans (Njoroge and Mengo, 2005) have shown that *Psidium guajava* is the highest utilised species. These results support other studies which have revealed that in most traditional societies, there is no

clear division between veterinary and human medicine (Ghirotti, 1996).

Although diarrhoea in cattle may be caused by sudden changes in animal diet and hence controlled by providing proper forage, bacteria cause it. This is especially the case for colibacillosis, which is the most frequent form of diarrhoea. Investigations into the antibacterial properties of these plant extracts form a good case for further work.

3.5. Anaplasmosis

This was the most common disease of cattle managed by traditional herbal means. Twenty-one plant species are used but the most common based on use reports among the respondents are: *Solanecio manii* (Hook.f.) C. Jeffrey (29%), *Senna didymobotrya* (10%), *Cyphostemma maranguense* (Gilg) Desc. (Vitaceae) (8.5%) and *Ajuga remota* (8.5%). Except for *Ajuga remota* and *Basella alba* L. (Basellaceae), which have been recorded before in management of anaplasmosis among the Kipsigis and Kikuyus, respectively, all the other plant species are new records in herbal ethnoveterinary treatment of anaplasmosis in this region. Informants highly agreed on the plants used for managing anaplasmosis with informant consensus factor of 0.76 (Fig. 3).

3.6. Upper respiratory conditions

Under this category are all the conditions related to discharge from nose and mouth, difficulty in breathing, sneezing and coughing. While these symptoms are indicative of pleuropneumonia, they could also be related to other diseases such as tuberculosis and pasteurellosis.

The main ailment managed with herbal preparations in upper respiratory system is pneumonia. This is diagnosed by coughs and difficulties in breathing in the animal. Five plant species are used in total; three were the most frequently cited: *Achyrospermum schimperi* (Hochst.) Perkins (Lamiaceae) (23%), *Dodonaea angustifolia* (23%) and *Eucalyptus saligna* Smith (Myrtaceae) (23%).

3.7. Dietary deficiencies

Most respondents reported that mineral blocks and concentrates have become very expensive. Cheaper plant products are available in the market such as: cotton seed, linseed, sunflower, soya meal and croton seeds. Although these are important nutritional sources of proteins, oils from these seeds are known to have antizymotic action (Malik et al., 1996). The local people however used plant species collected in the wild or allowed to grow near farm ends, which are perceived as important nutraceauticals. Of importance are those perceived to deal with calcium deficiency such as *Urtica massaica* Mildbr. (Urticaceae) 55.5% or those thought to be useful in providing vitamins for the animal such as *Plectranthus barbatus* Andr. (Lamiaceae) 7% and *Ipomoea batatas* (L.) Lam. (Convolvulaceae) 7%.

4. Conclusion

In ethnoveterinary medicine several traditional plant extracts have been found to be efficacious against some diseases causing organisms. Work in Kenya has been done mainly on chicken (Waihenya et al., 2002a,b) and sheep and goats (Githiori, 2004). In regard to cattle data on important traditional ethnophytotherapy are lacking for communities especially in Central Kenya. The data presented in this paper form a basis for further ethnoveterinary research in this region especially in studies dealing with efficacy, dosage, quality and toxicology. Those extracts found empirically to be particularly effective can be used in preparation of commercial indigenous-based veterinary pharmaceuticals. This will consequently lead to growth in national industry in indigenous drugs as well as protection of the important ethnoveterinary phytotherapeautics.

Since some of the plants used in ethnoveterinary management of cattle in this region were found to be rare or threatened species, this is a sign that this utilisation is unsustainable especially if commercial industrial products are developed from these plants. Conservation of such plants, *in situ* and *ex situ* is recommended. The local community of Central Kenya is the owner of the traditional knowledge presented in this paper, consequently any benefits that may arise from the use this knowledge must be shared with them.

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