Use of ethnoveterinary medicinal plants in cattle by Setswana-speaking people in the Madikwe area of the North West Province of South Africa

D van der Merwe, G E Swan and C J Botha[a]

ABSTRACT

Rapid Rural Appraisal (RRA) methods were employed to document the use of ethnoveterinary medicinal plants in cattle by Setswana-speaking people in the Madikwe area of the North West Province of South Africa. The study indicated that Setswana-speaking people in the North West Province have a rich heritage of ethnoveterinary knowledge, which includes all aspects of ethnoveterinary medicinal plant use. Information was gathered from informants through individual interviews, group interviews, guided field walks and observations. Ethnoveterinary uses in cattle of 45 plant species representing 24 families were recorded. Plants were used in 84 % of the total number of recorded ethnoveterinary remedies. These plants were used alone (64 %) or in mixtures (36 %) for 29 indications. The most important indications were retained placenta, diarrhoea, gallsickness, fractures, eye inflammation, general ailments, fertility enhancement, general gastrointestinal problems, heartwater, internal parasites, coughing, redwater and reduction of tick burden. Plant materials were prepared in various ways including, infusion, decoction, ground fresh material, sap expressed from fresh material, charred and dried. The most common dosage form was a liquid for oral dosing. Other dosage forms included, drops, licks, ointments, lotions and powders. Liquid remedies for oral dosing were always administered using a bottle. Medicinal plant material was preferably stored in a dried form in a cool place out of direct sunlight and wind. Lack of transfer of ethnoveterinary knowledge to younger generations puts this knowledge at risk. RRA was found to be a successful method of investigation for the study of ethnoveterinary medicine.

[a] Department of Paraclinical Studies, Faculty of Veterinary Science, University of Pretoria, Private Bag X04, Onderstepoort, 0001 South Africa

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Key words: herbal medicine, ethnoveterinary medicine, EVM, traditional medicine, cattle, ethnobotany, Rapid Rural Appraisal, Madikwe, North West Province

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INTRODUCTION

Use of medicinal plants for the treatment of various diseases has been part of human culture since ancient times. Medicinal properties of plants were mostly discerned through trial and error, but were also influenced by the belief systems of the people involved and often became entangled with religious and mythical practices[36]. Medicinal plant use evolved into an art and a science, practised according to the experience, traditions and disease theory of the healer. Treatment of animal diseases developed in parallel with the treatment of human diseases. This knowledge was passed on verbally, by example and sometimes through writing[36].

Ethnoveterinary medicine (EVM) is important in animal health care in developing countries[10]. It has become a recognised field of research that includes traditional veterinary theory, medicines, surgical methods, diagnostic procedures and animal husbandry practices[36]. Veterinary aspects of ethnobotany are included in the field of EVM. Ethnobotany can be defined as "the scientific investigation of plant use by indigenous cultures for food, medicine, pesticides, clothing, shelter and other purposes[25].

Traditional medicine is part of indigenous people's cultural heritage[5]. Most cultural information in Africa, including traditional medicine, is contained within oral tradition. Its absence from written records adds to the fragility of cultural knowledge in Africa[22].

In developed countries, the success of commercially produced medicines has created alienation between traditional health systems and the more controllable and predictable effects of orthodox medicines[5]. Developed societies, especially those belonging to cultures derived from the dominant western European cultures, abandoned much of its traditional medical/veterinary practices in favour of what is now viewed as orthodox medicine[40]. Loss of indigenous culture, in favour of western European derived culture, is an accelerating process among indigenous people around the world[40].

Recently, recognition has been given to the importance of the cultural and medicinal resources that are under threat. It has led to a renewed interest in- and research into traditional medicine[36]. Traditional medicine forms a valuable resource for the development of new pharmaceuticals[8,13,23,27]. Compounds derived from plants were reported in 1993 to be used in approximately 25 % of orthodox drugs in clinical use[27].

South Africa is home to more than 23000 plant species, representing around 10 % of all plant species in the world. The country fully contains one of the six Floral Kingdoms of the world - the Cape Floral Kingdom[32]. This diversity of flora is a rich source of herbal medicines for indigenous South African people – for human as well as animal use[9, 20,21,22, 30,34,35,45].

Traditional medicinal use of plants in South Africa is strongly related to physiological and pharmacological activity of active plant ingredients[15]. Active constituents were found in 81 % of plants tested when traditional medicinal use was utilised as the basis of plant selection. Nine percent of medicinal plants tested have potentially harmful toxic effects[15].

Publications that deal specifically with EVM in South Africa include studies in northern Kwazulu-Natal[10] and central Eastern Cape Province[35]. One publication on Lesotho, which has relevance for South Africa, is available[41]. Published data is incomplete and inadequate compared to the data available on human traditional medicine. Most South African ethnoveterinary data is found in publications where records of EVM plant use

are incidental to the main aims of the publications. A comprehensive database of EVM in South Africa is needed to bring it into mainstream knowledge and expose it to research.

This study aimed to document plant species used in ethnoveterinary medicine, the indications for their application and the methods of collection, preparation and administration. A secondary aim was to assess the suitability of the Rapid Rural Appraisal approach to the investigation of EVM in southern Africa.

MATERIALS AND METHODS

Study area

The Madikwe State Veterinary Area (Fig. 1) is situated in the northern part of the North West Province of South Africa.

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Survey procedure

The Rapid Rural Appraisal approach to data collection was used[2]. Ethnoveterinary information was collected through three techniques *viz*: interviews, observations and guided field walks. Permission to conduct research in the study area was obtained from traditional leaders (*kgosi*) at the start of the study. Field work was conducted during the summer months of 1998 and 1999. Winter months were unsuitable for data collection because of the seasonal occurrence of some plants and the lack of reproductive organs and leaves needed for plant identification.

Setswana-speaking people in the study area who were involved in livestock production and/or had information on current or historical ethnoveterinary plant use were included in the study. Participants, further referred to as informants, included farmers, extension officers, traditional healers, and other knowledgeable individuals. Farmers were divided into commercial farmers and small scale farmers. Commercial farmers

were defined as farmers who earned their income primarily from farming and who owned more than 30 head of cattle. All small scale farmers owned less than 30 head of cattle. The study aimed to record data on ethnoveterinary medicines used in cattle, but other ethnoveterinary information was recorded when encountered.

Kgosi were requested to suggest suitable interpreters. Respected persons with a good knowledge of the study area were sought. Interpreters suggested by the *kgosi* were used initially, but some were found unsuitable due to time constraints and/or lack of enthusiasm. Alternative interpreters, who were acceptable *kgosi*, were then used. When informants were able to communicate adequately in either English or Afrikaans no interpreters were used.

Formally arranged group meetings, such as farmers days and community meetings at tribal offices, as well as informal group meetings with farmers at state-held brucellosis survey days and communal dip tanks, were attended. The research aims were explained at these meetings. Informants who were willing and able to contribute to the research were identified and arrangements for more detailed discussions were made. Two group interviews with selected informants were held, but individual interviews were generally more practical. Incidental interviews were conducted with farmers or herdsmen encountered while travelling through the study area.

To provide structure to interviews and to ensure that important aspects of animal health were not omitted, questions were asked around specific disease topics *viz.* different organ systems, generalised conditions, diseases related to nutrition, plant poisoning and other forms of poisoning. The topics served as a guide and were adapted to accommodate the perceptions and knowledge of the informants interviewed. Informants were not only asked to name diseases, but also to describe the symptoms associated with those diseases and to correlate this with the indications for medicinal plant use. This was needed to more accurately determine the probable aetiological diagnosis of disease conditions described by persons without formal veterinary training.

The nature and perceived causes of diseases in animals, the role of plants in animal health, husbandry and production and the method and incidence of plant collection and use were also discussed. Notes on plant use included indications, plant parts used, collection and storage, preparation, administration and dosage, contra-indications, side-effects and toxicity, therapeutic success, rapidity and extent of recovery and monitoring of therapy.

Observations were made on the collection, preparation, use and storage of medicinal plant material, signs of impact on natural plant populations and artificial propagation of medicinal plants. Informants were asked to demonstrate certain aspects of ethnoveterinary plant use not adequately explained during interviews.

Plant samples were collected and photographs taken during field walks with informants. Plant names were verified during field walks. Informants were also asked to point out medicinal plants from dried plant samples and photographs.

Plant samples were identified with the help of the Department of Botany, University of Pretoria. Plant specimens were pressed, dried and stored in a herbarium cabinet at the Department of Pharmacology and Toxicology, Faculty of Veterinary Science, University of Pretoria at Onderstepoort. Specimens were protected from insects by applying insecticides and placing them into plastic covers.

RESULTS

Informants

Information was recorded through 28 detailed interviews with individuals, 2 group interviews, field walks and observations. Informants were from 14 localities spread throughout the study area. They represented 11 occupations of which small scale farmers, commercial farmers and traditional healers were the majority. Informants were mostly middle-aged and older men. No informants were women.

Indications for medicinal plant use

Forty five plant species, representing 24 families and used for 29 indications, were recorded (Table 1). The most important indications were retained placenta, diarrhoea, gallsickness, fractures, eye inflammation, general sickliness, fertility enhancement, general gastro-intestinal problems, heartwater, helminthiasis, coughing, redwater and tick burden reduction. There was considerable variation in the number of different ethnoveterinary medicines reported per indication and in the report rates of different indications. Indications that were related to problems with easily distinguishable features, such as retained placenta and fractures, tended to have less variation in the type of ethnoveterinary medicines used for their treatment. Indications such as helminthiasis and general ailments, which were more difficult to diagnose due to variation and subtlety of symptoms, and variations of what informants considered typical symptoms, tended to have more variable treatments. The accuracy of diagnoses made by informants were not verified.

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Perceived causes of disease

Natural phenomena were universally accepted as causes of some or all diseases in animals, even when informants could not explanation disease mechanisms. Diseases with typical seasonal patterns were often related to factors in the environment with similar seasonal patterns. For example: fresh green grass was perceived by some to be the cause of gallsickness (*gala*) and diarrhoea because their incidence tended to be higher during the growing season of grass. High milk production in cows was also associated with freely available green grass and excessive ingestion of milk was seen as the cause of diarrhoea in calves. Treatment therefore involved limiting milk intake by affected calves. Informants usually did not attribute diseases to micro-organisms. A notable exception was the use of sap from unripe Solanum panduriforme reported by one informant to kill the unseen micro-organisms that cause diarrhoea. Ticks were perceived to be the direct cause of diseases such as heartwater, sweating sickness and gallsickness. No informants attributed these diseases to micro-organisms or toxins transmitted by the ticks.. Large calves, small birth canals or abnormal presentation of calves were recognised as causes of dystocia. Informants readily diagnosed tissue damage due to external

parasites, trauma and burns. External parasites were perceived to be an important cause of teat damage, but internal parasites (*dinogana*) were regarded as an unimportant cause of animal health problems. Dichapetalum cymosum (*mogau*) was considered to be the most important cause of poisoning deaths in cattle. A pupa, found within a "shell" made from small twigs held together with silk, was also widely perceived to be the cause of acute deaths in cattle. Toxic plants, including Urginea sanguinea, Lantana camara, Solanum kwebense, Sarcostemma viminala, Kalanchoe spp., Cotyledon spp. and Acacia nilotica, occur in the area and were pointed out to informants during field walks. Although the plants were familiar to most informants, they were not perceived to be the cause of poisoning in animals.

Two informants classified diseases into two categories: diseases that are part of the natural phenomena of the animal's life; and diseases that are caused by the actions of evil people (*boloi*). They stated that diseases caused by *boloi* were uncommon.

The perceived mechanism of action of traditional medicines

Most informants attributed the action of medicines to a physical mechanism that they could not explain due to lack of knowledge. They expected a dose related response to medicine use. Most farmers perceived the fundamental mechanisms of action of traditional herbal medicines and orthodox stock remedies to be similar. They used both types of medicine allopathically and interchangeably depending on previous experience, cost and availability. A minority of informants perceived the replenishment of *maatla* (power) in the diseased animal through the use of medicines as the mechanism of action.

Plant collection

Medicinal plants material were usually obtained near towns or close to cattle grazing areas. Some informants had plants such as Aloe marlothii, Asparagus laricinus, Ziziphus mucronata, Peltophorum africanum and others growing at their homes. These plants were usually not cultivated, but were not removed if they grew around homes naturally. Aloe species were sometimes planted close to dwellings to ensure a convenient supply of leaves for medicinal use. Common medicinal plants, such as Senna italica, which is a pioneer on

disturbed soil in and around towns, was not given any special protection. The ability or inability of plants to adapt to garden environments also determined whether or not they were cultivated. Species such as Pouzolzia mixta, occurred only along rocky ridges. Although there was a demand for the plant in towns, people were unable to cultivate it outside of its natural habitat. Plants that were used infrequently and for which the need was unpredictable were not deemed to be worth the effort involved in cultivation. Most of the plant species used to treat cattle were collected only when the need arose.

Most informants stated that the medicinal properties of plants growing at their homes and plants that grew further away were the same. They did not consider nursery grown plants to be inferior and stated that they would welcome nursery grown plants as an easily accessible source of herbal medicines. All traditional healers, however, stated that wild plants were better sources of traditional medicines than cultivated plants. They were of the opinion that cultivated medicinal plants could be ineffective or harmful to patients. All informants gathered plants themselves. Farmers usually gathered plants only for their own use. Except for traditional healers, no informants gathered medicinal plants for commercial purposes. One traditional healer sold plants to colleagues. Laypersons normally gathered specific plant species based only on the medicinal indications associated with a particular plant species. Traditional healers sometimes applied additional criteria. The ancestors (*badimo*) would show plants to healers in their dreams. The *badimo* could show a healer a specific individual plant, a specific area, or just the species to use. Traditional healers preferred to gather plants in areas where there was little human activity. The presence of many people would reduce the power (*maatla*) of plants. People caused plants to be stepped on (*u a gata*) in a metaphysical sense, thereby reducing the plants' *maatla*.

Medicine storage

Medicinal plants were usually not stored, but were collected and used fresh when needed. Most informants stated that medicinal plants could be stored indefinitely as long as it was stored correctly. Only one informant, a traditional healer, maintained that plants would lose their medicinal potency even if stored correctly, but that correct storage would increase the length of time that it remained effective. Medicinal plants were preferably

stored in a dried form. Plant material was dried by spreading it out on an outside flat surface in dry weather, or was hung from hooks mounted on walls indoors. Large pieces of plant material were sometimes cut into smaller pieces before drying. Dried materials were ground to a powder or tied into bundles. Medicinal plant material was usually kept dry, in a cool place and out of direct sunlight and wind. This was achieved by storing plants in cool parts of a house in plastic or paper bags, newspaper and glass-, metal- or plastic jars.

Medicine preparation and dosage forms

The majority of ethnoveterinary medicines (64 %) utilised single ingredients, alone or with a vehicle for administration. Informants who utilised mixtures of active components stated that it made their medicines more potent. Non-plant material and material not directly derived from plants, utilised in mixtures, included salt, sodium permanganate, donkey faeces and orthodox medicines. Plant parts that were most commonly utilised in medicines, such as aloe leaves, roots, rhizomes, tubers, bulbs and bark were available throughout the year. Water extraction was the most commonly utilised preparation method. Infusions and decoctions comprised 82 % of the total number of medicines. In 13 % of medicines, either an infusion or a decoction could be used depending on the circumstances. Decoctions were prepared by boiling plant material in water for few minutes. Infusions usually required plant material to be soaked for a few hours or overnight. Infusions were preferred when it was inconvenient or impossible to boil water and rapid preparation of a medicine was unnecessary. Fresh plant material was preferred. When fresh plant material was not available, dried material was utilised using the same preparation methods as those used for fresh material.

Liquid dosage forms intended for oral dosing were utilised in 83 % of medicines. Dosing was usually done by mouth using a glass cool drink or beer bottle of 750 ml or one litre capacity. One informant dosed liquids through the nose, also using a bottle, claiming that dosing through the nose was easier. Ground plant material was sometimes mixed with coarse salt (and sometimes molasses) to form licks. All parenteral dosage forms were applied topically. Liquids were applied as lotions or eye drops. Powders were used in eye treatments by sprinkling it directly into the eyes. Other parenteral dosage forms included ointments and unaltered plant material.

DISCUSSION

Ethnoveterinary medicine (EVM)

There are important similarities between the results of studies conducted in northern Kwazulu-Natal[10] and central Eastern Cape Province[35]and the current study. These similarities reflect factors that are likely to be constant in areas of South Africa where developing black farmers are prominent - such as most former homeland areas. Ethnoveterinary medicine was an important part of the healthcare of animals in all studies. Reasons for EVM use included the high cost of orthodox medicines and the convenient availability of ethnoveterinary medicines. The use of chemicals, orthodox medicines and plants that only became available in the modern era indicates the dynamic nature of EVM. The way that people understand diseases is related to the way that these diseases are treated and the changes in the methods of treatment over time therefore suggests that disease perceptions are also dynamic. This is not surprising in the light of the cultural changes that are taking place in Africa[40]. The indications for ethnoveterinary medicines in cattle are similar in different areas. The plant species used are, however, usually different. This indicates that locally available plant populations are a major determinant of the plant species used in ethnoveterinary medicines. Liquid dosage forms consisting of infusions and decoctions used as drenches, licks and topical dosage forms such as powders, lotions and drops are common in all studied areas. These dosage forms are easy to prepare without specialised equipment and is a reflection of the low level of technological sophistication in EVM. The apparent lack of transfer of ethnoveterinary knowledge from older to younger generations was a cause of concern in all studies[10,35]. It was indicated in the present study by the predominance of middle-aged and older men among informants and the concern expressed by some older informants that young people were not interested in EVM.

Metaphysical properties in ethnoveterinary medicines were relatively unimportant in the Madikwe area compared to northern Kwazulu-Natal. The use of charms or the symbolic use of medicines was almost absent in the EVM practised by farmers in the Madikwe area. The use of charms by previous generations was, however, mentioned occasionally. This almost total adoption of an allopathic system of ethnoveterinary

medicine by modern farmers in the Madikwe area is in accordance with the findings of Coertze (1968). He found that contact with and pressure from white settlers led to a gradual transformation of the Tswana cultural pattern through adoption of western customs[7].

No ethnoveterinary medicine use by women was recorded. This marked gender bias reflects the limited involvement of women in cattle production and herd health in Madikwe.

The rationality of ethnoveterinary plant use

Plants containing high levels of tannins, including Acacia tortilis, Sclerocarya birrea, Senna italica, Rhus lancea, Peltophorum africanum, Elephantorrhiza elephantine, Ziziphus zeyheriana and Ziziphus mucronata were commonly used as ethnoveterinary medicinal plants[21,44,45]. They were used for diarrhoea, burns and blood cleansing. Tannins are naturally occurring phenolic compounds of plant origin, which can form cross-linkages between macromolecules such as proteins[18,29]. The pharmacological effects of tannins, which include astringent, antibacterial, antifungal, mucoprotectant and antioxidant effects and enzymatic inhibition[4], support the use of these plants to treat diarrhoea and burns.

Aloe marlothii was a very important ethnoveterinary medicinal plant in the study area. Aloes of various species were extensively used as cure-alls since ancient times in many parts of the world. It still forms the base of a large commercial industry in health-care products[44]. The genus has been extensively studied and is known to contain a number of biologically active substances. Anthraquinone derivatives, emodin and resins, isolated from A. ferox, A. perryi and A. vera are purgatives[21]. The purgative effect of anthraquinone derivatives is due to the formation of emodin anthrone under the influence of enteric bacterial enzymes. Emodin anthrone increases peristalsis and limits the absorption of water and electrolytes in the gut[4]. Aloe extracts inhibit histamine release from rat mast cells, which offers an explanation for the activity of aloe extracts in inflammatory conditions[21]. The leaves of Aloe greatheadii and Aloe zebrina were used to treat burns in animals in the study area. It contains copious amounts of slimy sap, which may have a soothing and cooling effect on inflamed skin lesions. Application of the leaves to skin lesions may also prevent desiccation

and provide a physical barrier to wound contamination. The emollient effects of the leaf sap are also utilised in humans for skin irritations, abrasions and burns[39,44]. A. zebrina proved ineffective in a test for antibacterial activity[45]. The rationale for its use is therefore unlikely to be prevention or treatment of bacterial infection in skin lesions, but rather the hydrating, insulating and protective effects of glycoproteins contained in aloe leaves[44].

The use of Senna italica to treat constipation may be explained by the purgative effects of oxymethylanthraquinone, which have been isolated from other Senna species[4,45]. The laxative effects of Ricinus communis are due to ricinoleic acid, which is released in the small intestine through hydrolization of castor oil. It stimulates intestinal secretion, promotes motility and decreases glucose absorption[31]. Unprocessed seeds contain the toxalbumin ricin, which can cause severe purgation and is highly toxic[24].

The use of plants to treat retained placenta in cows was recorded throughout the study area and showed a high degree of uniformity between informants, as indicated by an unusually high number of informants using a limited number of remedies. The sap of most plant species used in remedies for retained placenta can be described as slimy or soapy. Plants used to treat retained placenta with a soapy sap are Dicerocaryum eriocarpum, Dicerocaryum. senecioides, Pouzolzia mixta and Tribulus terrestris, while Aloe marlothii leaf-sap is slimy. Use of these plants may have its origin in the belief that plant characteristics can be transferred to patients[42]. Literature reports also indicate the use of D. eriocarpum for retained placenta in cows and in women[33,45] and as an aid to parturition in cows[45]. The Vhavenda use it as a soap substitute[33]. Informants expressed a high degree of confidence in the effectiveness of their remedies for retained placenta. They reported wide variation in the times taken from treatments to the release of the placental membranes - from a few minutes to several days. In normal cows, the placental membranes are usually released between 2 – 6 hours post partum[11]. The usual incidence of retained placenta in bovine herds is *c.* 11 %, if retained placenta is defined as the retention of foetal membranes for longer than 12 hours post partum. In cases of retained placenta the foetal membranes are released from 2 – 10 days post partum in most untreated cases[11]. The normal variation of time to release the placental membranes of cows in an untreated population is similar to

the variation in time to placental membrane release reported by informants using traditional remedies. It is therefore possible that the confidence of informants regarding the effectiveness of their remedies is not due to the pharmacological effects of their medicines. This is not to say, however, that these plants are devoid of biological activity. Saponin-containing plants are widely used medicinally and have several known biological effects. These include antibacterial, antifungal, antiviral, anti-inflammatory, anti-oedema, analgesic, antitussive and expectorant effects[4]. Not all saponins show all the listed effects and specific saponins have their own specific range of effects[4]. Studies to evaluate the biological activities of saponins contained in plants used for retained plancenta in cows are needed.

Two species utilized to treat redwater, Rhoicissus tridentata and Urginea sanguinea, have reddish coloured underground parts. This is possibly an example of the "doctrine of signatures"[28], where the reddish colour of the urine is linked to the red colour of the plants.

Withania somnifera, used in the study area to treat calf diarrhoea, is chemically complex. It contains more than 80 compounds and has been the subject of numerous studies. Its biological effects include antibiotic, cytotoxic and anti-inflammatory activities[4,44]. These effects could be used to rationalise its use in some types of diarrhoea.

Splints made from sheets of bark, cut from Sclerocarya birrea and Acacia karroo were used to treat longbone fractures due to the bark's tough, fibrous structure. A. karroo bark is utilised in many applications where a tough material is needed, such as the making of roof frames, ropes and baskets[12,45]. This is an example of a physical rather than a pharmacological effect.

A number of plants that were used medicinally in the study area have potentially dangerous toxic effects. They include Boophane disticha[14,17,44], Croton gratissimus[3,19,26,45], Phyllanthus spp.[45], Ricinus communis [24], Spirostachys africana[12,16,38,45], Solanum incanum and Solanum panduriforme[43], Urginea sanguinea[21,24,45] and

Withania somnifera[1,45]. Side effects or toxicity associated with the medicinal use of these plants in the study area was rarely reported. This is likely to be due to the relatively small amounts used in medicines.

Rapid Rural Assessment (RRA)

Rapid Rural Appraisal (RRA) is a data collection approach, used in rural areas, that is aimed at achieving understanding of a rural situation relatively quickly and cost-effectively[2,6]. It is often superior to traditional methods of investigation in rural communities[6]. The main strength of RRA is based on its adaptability. Traditional methods usually rely on questionnaires that are prepared in advance. A deficiency of traditional methods is that all relevant information cannot be known in advance. Fixed questions may be inappropriate to the situation under investigation and important facets of the local situation may be ignored. In the RRA approach, semi-structured interviews are preferred, with guidelines to open-ended discussions, rather than fixed questions. As information about the local situation is uncovered, approaches and lines of inquiry are adapted to take advantage of newly gained insights into the local situation[2]. RRA has been used successfully in the fields of agro-ecosystem analysis, farming systems research and applied anthropology[6].

Three techniques *viz.* interviews, observations and guided field walks were used in this study. Combinations of techniques increase the accuracy and detail of information obtained[37]. Group interviews generally have a higher rate of information generation. The accuracy of information can be better, because information is discussed and debated among group members. The disadvantages are that the more vocal people could dominate the discussion and some knowledgeable people may not participate fully. Highly esteemed members of the group may have erroneous opinions that go unchallenged and uncorrected in a group discussion[37]. Additional individual interviews with particularly knowledgeable participants of group interviews minimised the disadvantages of group interviews in this study.

Guided field walks were exceptionally valuable. Informants often learned about ethnoveterinary plant use from their teachers through guided field walks. They were therefore familiar with the concept and tended to

share information more readily while walking through the veld. Seeing medicinal plants often resulted in informant's remembering things about the plants that were omitted during interviews.

The establishment of a trust-relationship between the researcher and informants was a prerequisite for the successful completion of interviews. Trust often took time and repeated visits to achieve. The concerns of most informants could be addressed adequately through discussions of the aims of the project. Professional traditional healers were generally less co-operative than lay persons.

RRA proved to be a successful approach to EVM research in the Madikwe area. It yielded information relatively quickly and cheaply. RRA is adequate for providing qualitative information on the extent and variation of ethnoveterinary knowledge. The qualitative nature of results is, however, an important drawback when statistical data analysis is attempted.

CONCLUSION AND RECOMMENDATIONS

The Setswana-speaking communities of the Madikwe area have a rich heritage of ethnoveterinary knowledge. It includes all aspects of medicinal plant usage. EVM is important in animal health care in the area. The use certain medicinal plants can be shown to be rational in terms of the known biological effects of the plants involved.

No written records of ethnoveterinary records were encountered. Most young people seek employment opportunities in urban areas, where ethnoveterinary knowledge is of little practical value. The chain of transfer of ethnoveterinary knowledge from generation to generation may therefore be broken due to the modern circumstances of young people. It underscores the importance of recording ethnoveterinary knowledge while it is still freely available.

Research goals that should be adopted to ensure the long-term benefits for people from ethnobotany and traditional medicine in southern Africa include the following: Comparative studies should be carried out in other regions of South Africa to provide a comprehensive database on ethnoveterinary medicinal plants and ethnoveterinary practises. The pharmacological actions of ethnoveterinary medicines should be studied. The feasibility of promoting safe and effective herbal medicines should be investigated. Aspects that should be addressed include quality control, sustainability, cultivation, local self-sufficiency, sustainability and distribution. Viable alternatives to orthodox medicines that will reduce total expenditure on animal health should be promoted. Where applicable, intellectual property rights must be respected by researchers and developers.

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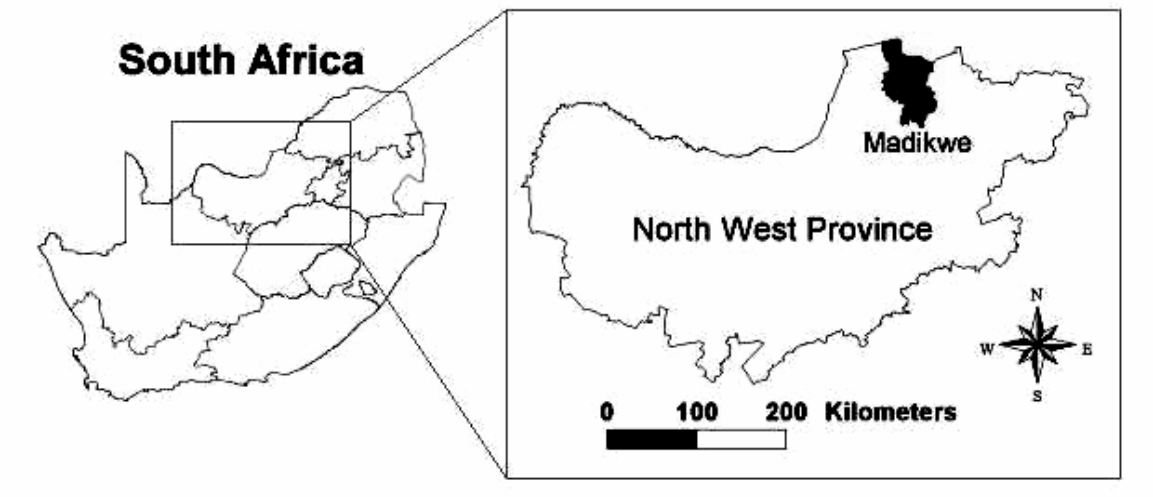

Fig. 1: The location of the Madikwe State Veterinary Area

Table 1: **Plant species used in ethnoveterinary medicines, their Setswana names, indications and plant parts used.**

Species	Setswana name(s)	Indications	Plant parts
Acacia karroo	mooka	fractures	bark
		diarrhoea	
Acacia tortilis	mosu	diarrhoea	branch tips
Aloe greatheadii var. *davyana* and *A. zebrina*	kgophane	burns	leaves
		general ailments	roots
		blood cleansing	whole plant
		internal parasites	
		eye infections	
Aloe marlothii subsp. *marlothii*	mokgopa	gallsickness	leaves
		internal parasites	
		external parasites	
		diarrhoea	
		constipation	
		retained placenta	
		dystocia	
		maggots	
Asparagus laricinus and *A. suaveolens*	lesitwane	sores	tubers
		redwater	
		uterine infection	
		general ailments	
		umbilical cord inflammation	
Boophane disticha	matubadifala	abortion	bulb scales
Cassine transvaalensis	mojelemane	diarrhoea	bark
Croton gratissimus var. *gratissimus*	moologa	pneumonia	leaves
		tonic	roots
		fertility enhancement	
Dicerocaryum eriocarpum and *D. senecioides*	makanangwane	retained placenta	roots
	makangwane	dystocia	whole plant
		general ailments	
		to ensure strong calves	
Ehretia rigida	morobe	fractures	roots

Elephantorrhiza elephantina	mosetlhane	Diarrhoea heartwater coughing pneumonia	root-stock
Englerophytum maglismontanum	motlatswa	fertility enhancement	roots
Grewia flava	moretlwa	fertility enhancement	roots
Harpagophytum procumbens	lematla sengaparile	retained placenta	fruit
Hypoxis hemerocallidea and *H.rigidula*	tsuku-ya-poo	fertility enhancement general ailments heartwater abortion	corms
Nicotiana tabacum	motsoko	eye infections	leaves
Ozoroa paniculosa var. *paniculosa*	monokane	diarrhoea redwater sweating sickness	bark rootbark
Peltophorum africanum	mosetla	tonic diarrhoea	bark rootbark
Phyllanthus burchellii and *P. parvulus*	lentsane	eye infections	aerial parts
Plumbago zeylanica	masegomabe	pneumonia	roots
Pouzolzia mixta	mongololo	retained placenta bloat vaginal discharge	roots leaves
Rhoicissus tridentata subsp. *cuneifolia*	ntagaraga	heartwater redwater internal parasites general ailments abortion	tubers
Rhus lancea	moshabele	diarrhoea gallsickness	roots bark
Ricinus communis	mokhura	constipation internal parasites	seeds

Schkuhria pinnata	santhloko lefero	eye infections pneumonia diarrhoea heartwater	aerial parts
Sclerocarya birrea	morula	diarrhoea fractures	bark
Seddera sufruticosa	thobega	fractures	roots
Senna italica subsp. *arachoides*	sebete	gallsickness general intestinal diseases heartwater anthrax pneumonia	roots
Solanum incanum	tolwana	sores	roots
Solanum panduriforme	mohato	diarrhoea	fruit sap
Spirostachys africana	morekhure	sweating sickness	wood
Terminalia sericea	mogonono	diarrhoea	roots
Tribulus terrestris	tshetlo	retained placenta bloat	whole plant aerial parts
Triumfetta sonderi	mokuku	retained placenta	rootbark
Urginea sanguinea	sekaname	general ailments general intestinal diseases internal parasites blood cleansing gallsickness heartwater redwater sores retained placenta	bulbs
Vitex zeyheri	mokwele	eye infections	leaves
Withania somnifera	mokukwane	diarrhoea	roots
Ximenia americana var. *microphylla*	seretologa	internal parasites	roots
Ziziphus mucronata	mokgalo	fertility enhancement sores burns	roots leaves
Ziziphus zeyheriana	sekgalo-fatshe	diarrhoea internal parasites general ailments	root-stock