

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

By

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SUMMARY

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

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**Submitted in partial fulfillment of the requirements for the degree of
MAGISTER SCIENTIAE**

PROMOTER: Prof. G. E. Swan

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Department of Pharmacology and Toxicology
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The role of plants in the treatment of disease and enhancement of production in animals in South African rural communities is poorly documented. Rapid Rural Appraisal (RRA) methods were employed to describe the use of ethnoveterinary medicinal plants in cattle by Setswana-speaking people in the Madikwe area of the North West Province of South Africa. Information was gathered from key spokespersons through individual interviews, group interviews, guided field walks and observations. Ethnoveterinary uses in cattle of 46 plant species representing 24 families were recorded. Plants were used in 84 % of the total number of ethnoveterinary remedies. These plants were used alone (64 %) or in mixtures (36 %) for 43 indications. The most important indications for the use of ethnoveterinary remedies were retained placenta, diarrhoea, gallsickness, fractures, eye inflammation, general ailments, fertility enhancement, general gastrointestinal problems, heartwater, internal parasites, coughing, redwater and the reduction of tick burdens. Plant

materials were prepared in various ways including, infusion (36 %), decoction (33 %), infusion or decoction (13 %), ground fresh material (6 %), sap expressed from fresh material (3 %), charred (2 %) and dried (1 %). Unprocessed, fresh material was used in 6 % of remedies. The most common dosage form was a liquid for oral dosing (83 %). Other dosage forms included, drops, licks, ointments, lotions and powders. Liquid remedies for oral dosing were administered using a bottle. 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.

The impact of ethnoveterinary medicinal plant use on medicinal plant population densities was also assessed through a comparison of the medicinal plant densities inside and outside the Madikwe Game Reserve. Belt transects were used in a stratified trial design to record plant densities. No statistically significant differences in medicinal plant densities that could be attributed to medicinal plant use, were found.

OPSOMMING

Gebruik van etnoveterinêre medisinale plante in beeste deur Setswana-sprekers in die Madikwe area van die Noord-Wes Provinsie

Deur

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LEIER: Prof. G. E. Swan

MEDELEIER: Prof. C. J. Botha

Voorgelê ter gedeeltelike vervulling van die vereistes vir graad

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Die rol van plante in die behandeling van siekte en verhoging van produksie in diere in landelike gemeenskappe in Suid-Afrika is swak gedokumenteerd. Vinnige-Landelike-Evaluering (VLE) metodes is gebruik om die gebruik van etnoveterinêre medisinale plante in beeste in die Madikwe area van die Noord-Wes Provinsie van Suid-Afrika te beskryf. Inligting is versamel deur onderhoude met sleutel segspersone in individuele en groepsverband te hou, deur begeleide veldbesoeke en deur observasies te onderneem. Etnoveterinêre gebruike in beeste van 46 plant spesies vanuit 24 families is gedokumenteerd. Plante is in 84 % van tradisionele medisynepreparate gebruik. Hierdie plante, alleen (64 %) of in mengsels (36 %), is vir 43 verskillende indikasies gebruik. Die belangrikste indikasies vir die gebruik van

etnoveterinêre medisinale preparate was agtergeblewe plasenta, diaree, galsiekte, frakture, oog inflammasie, algemene ongesteltheid, vrugbaarheidversteuringe, algemene maagdermkanaal probleme, hartwater, interne parasiete, hoes, rooiwater en bosluisbestryding. Plantmateriaal was in verskillende maniere, insluitend infusie (36 %), dekoksie (33%), infusie of dekoksie (13 %), gemaalde vars material (6 %), vars plantsap (3 %), verkool (2 %) en gedroog (1 %), voorberei. Onveranderde vars plantmateriaal is in 6 % van tradisionele medisynes gebruik. Die mees algemene doseervorm was 'n vloeisof vorm vir orale dosering (83 %). Ander doseervorms was druppels, lekkie, salwe, vloeistowwe vir topikale aanwending en poeiers. Vloeibare medisyne vir orale dosering medisynes is by wyse van 'n bottel gedoseer. Die studie het aangetoon dat Setswana-sprekers in die Noord-Wes Provinsie 'n ryk erfenis van etnoveterinêre kennis besit. Dit sluit alle aspekte van etnoveterinêre medisinale plantgebruik in.

Die impak van etnoveterinêre medisinale plantgebruik op medisinale plant populasiedigthede was deur die vergelyking van medisinale plantdigthede binne en buite die Madikwe Wildreservaat ge-evalueer. Gordeltransekte is gebruik in 'n gestratifiseerde proefontwerp om plantdigthede te dokumenteer. Geen statisties-betekenisvolle verskille in medisinale plantdigthede, wat toegeskryf kon word aan medisinale plantgebruik, is gevind nie.



CHAPTER 1

INTRODUCTION

Use of medicinal plants for the treatment of various diseases has been part of human culture since ancient times. People found food, clothing and medicines in the relatively undisturbed environment of the past. 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. This knowledge was passed on verbally and by example through time. 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.

Indigenous cultures around the world have come under severe pressure from dominant western viewpoints. Acculturation puts a vast store of potentially valuable traditional knowledge at risk. This, as well as the importance of conservation of culture for its own sake, makes efforts to preserve cultural knowledge essential.

The environmental and biomedical sustainability of many modern technologies, including orthodox medicine, has been questioned. Some scientists are searching for alternatives to achieve continued progress in the efficacy and economy of health care and agriculture. The search, in this regard, has triggered a re-evaluation and appreciation of indigenous and traditional knowledge and methods.

A growing human population is exerting increasing pressure on our plant communities. Demand for natural products is increasing while areas of spontaneous vegetation, where most of these products are primarily found, are becoming ever smaller. Medicinal plants are part of an ecosystem. Exhaustive exploitation of parts of an ecosystem may have

detrimental consequences for the ecosystem as a whole. Many natural resources, including medicinal plants, depend on a functional ecosystem for sustainability.

A study was undertaken to examine the ethnoveterinary plant use of Setswana-speaking communities in the Madikwe area of the North West Province. The study could provide further insight into the potential of natural and cultural resources in South Africa and could be a model for investigation of ethnoveterinary plant use in other areas.

1.1 HYPOTHESES

Setswana-speaking people in the study area still use plants in ethnoveterinary practices relating to cattle. These plant uses are important and rational components of ethnoveterinary practices and has not yet been systematically recorded.

The gathering of medicinal plants by local communities for ethnoveterinary purposes do not reduce population densities of these plants significantly.

1.2 OBJECTIVES

- To document plant species used in ethnoveterinary medicine, the indications for their application and the methods of preparation and administration in the study area.
- To ascertain the incidence and method of collection of plants with ethnoveterinary applications in the study area.
- To provide an inventory of ethnoveterinary medicinal plants that could form a basis for selection of plants for further pharmacological study.
- To determine the impact of ethnoveterinary plant use on medicinal plant populations.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Ethnoveterinary medicine is an important facet in the veterinary care of animals in developing countries (Cunningham & Zondi 1991). It has become a recognised field of research that includes traditional veterinary theory, medicines, surgical methods, diagnostic procedures and animal husbandry practices (Mathias, McCorkle & Schillhorn Van Veen 1996). Veterinary aspects of ethnobotany are included in the field of ethnoveterinary medicine. Ethnobotany can be defined as “the scientific investigation of plant use by indigenous cultures for food, medicine, pesticides, clothing, shelter and other purposes” (Kendler, Koritz & Gibaldi 1992).

Traditional medicine is an important part of indigenous people’s cultural heritage (Capasso 1985). 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 (Iwu 1993).

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 (Capasso 1985). Developed societies, especially those belonging to cultures derived from the dominant western European cultures, abandoned much of its medical/veterinary tradition in favour of what is now viewed as orthodox medicine (Prance 1994). Loss of indigenous culture, in favour of western European derived culture, is an accelerating process among indigenous people around the world (Prance 1994).

Lately, 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 (Mathias *et al.* 1996).

Traditional medicine forms a valuable resource for the development of new pharmaceuticals (Cox 1994, Farnsworth 1994 and Iwu 1994a). Compounds derived from plants are used in approximately 25 % of orthodox drugs in clinical use (Kinghorn & Balandrin 1993).

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 (Low & Rebelo 1996). This diversity of flora is a rich source of herbal medicines for indigenous South African people – for human as well as animal use (Cunningham 1994, Cunningham & Zondi 1991, Fourie, Swart & Snyckers 1992, Hutchings 1989, Hutchings, Scott, Lewis & Cunningham 1996, Iwu 1993, Mabogo 1990, Masika, Sonandi & Van Averbek 1997, Reyneke 1971 and Watt & Breyer-Brandwijk 1962).

Ethnobotanical research in South Africa started during the colonial period when it was recognised that it could give an indication of the economic potential of plants (Cunningham 1989). Reviews of ethnobotanical research in southern Africa include those by Hutchings *et al.* (1996), Liengme (1983), Van Wyk, Van Oudtshoorn & Gericke (1997) and Watt and Breyer-Brandwijk (1962).

Traditional medicinal use of plants in South Africa is strongly related to physiological and pharmacological activity of active plant ingredients (Fourie *et al.* 1992). 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.

Potential benefits obtainable from ethnoveterinary research were summarised by Mathias *et al.* (1996) and include:

- Increased choice of animal health care methods through identification and validation of traditional alternatives.
- The development of more accessible health care systems.
- Discovery of drugs and treatments that may be useful in the human medical and veterinary fields.
- Enhancement of rural economic opportunities by stimulation of the medicinal plant industries - including plant production, product development, sales and practitioner services.
- Encouragement and maintenance of biological and cultural diversity.
- Promotion of environmental protection and sustainable use of natural resources.
- Cost savings and increased timeliness in the implementation of rural disease-control programs
- Increased co-operation and synergism between animal and human health practitioners and those responsible for the dissemination of information.
- Greater awareness and respect for traditional expertise.
- Improved development planning and policy making through active participation of local communities.

Ethnoveterinary surveys in South Africa have so far involved only limited geographical areas and traditional systems. Published data is incomplete and inadequate compared to the data available on human traditional medicine. Most ethnoveterinary data, published in South Africa, is found in publications on ethnobotany and other publications where records of ethnoveterinary medicinal plant use are incidental to the main aims of the publications. Publications and conference proceedings that deal specifically with ethnoveterinary medicine include that by Cunningham & Zondi (1991), who studied Zulu and Xhosa ethnoveterinary medicine, and Quinlan (1998), who recorded traditional veterinary plant use in Lesotho. More work is needed to provide a comprehensive database of the veterinary use of medicinal plants in South Africa.

2.2 ETHNOVETERINARY PLANT USE AND INTELLECTUAL PROPERTY RIGHTS

International pharmaceutical companies that utilise plants as resource materials in drug development programs, tend to use host countries where plants are collected as global warehouses of raw materials and potentially valuable indigenous knowledge - to be exploited and abandoned at will (Iwu 1994b). Ethnic groups and local communities therefore need legal protection from unscrupulous exploitation (Iwu 1994b). Rights under the United Nations Convention on Biodiversity are prospective only (Barton 1994). Various efforts have been made to provide legal protection of intellectual property rights of indigenous people, but the protection of traditional information has never been widely accepted internationally (Barton 1994).

Examples of previous proposals for provision of legal protection of intellectual property rights include:

- Copyright-style protection of folklore (Jabbour 1983); and
- Model Provisions for National Laws on the Protection of Expressions of Folklore against Illicit Exploitation and other Prejudicial Action developed by the World Intellectual Property Organisation (United Nations Commission on Human Rights 1992).

Contemporary intellectual property law offers few opportunities of protection of traditional knowledge and its use to derive economic benefit from medicinal plants (Barton 1994). Traditional information on the use of plants cannot be patented; neither can a plant be patented. Only an identified active principle can be patented subject to the normal restrictions and requirements of patent laws (Barton 1994). The most promising way around this legal problem relies on physical control of the plants and traditional knowledge pertaining to their use. Control over the resource empowers the owner to make use of trade secret protection. It is an application of contract law in that the party

holding the material or information requires those who want access to it to accept an agreement of which the terms are subject to negotiation. These agreements must give the recipient the right to obtain traditional knowledge, to collect material and to research the material. In return, the recipient is obliged to evaluate the material, protect the information, obtain patents and share royalties according to an agreed formula (Barton 1994). There are, however, serious drawbacks to the trade secret protection approach. It relies on the physical control over the resource because it does not protect against competition, there is no protection in terms of derived knowledge and it does not act retrospectively (Barton 1994). Another limitation of trade secret protection is that the law does not recognise ethnic groups and communities. Therefore, it does not have legal existence as do the nation state or the individual. Protecting the rights of ethnic groups through contractual agreements is therefore problematic (Iwu 1994a).

Ethics can be defined as: “a code of morals of a particular person, religion, group, profession etc.”(Cunningham, De Jager & Hansen 1992). Laws describe the rights of communities and individuals. Ethics, on the other hand, deals with the responsibilities of communities and individuals. It describes what ought to be done, rather than what must be done (Müller 1999). Ethical agreements and codes of conduct offer alternatives to legal protection where legal protection is impractical or incomplete. It enables the recognition of the rights of ethnic groups and local communities on a level that is unattainable by law. Enforcement of ethical codes is limited by the fact that it is not legally binding unless it forms part of a contractual agreement. The legal complexities of defining ethnic groups for contractual purposes limit the use of contractual agreements to enforce ethical codes of conduct (Barton 1994).

Cunningham *et al.* (1992) proposed the development and adoption of an ethical code of conduct for professional researches in the ethnobotanical field along the following guidelines:

- Research objectives and the potential application of obtained information must be communicated.
- Results must be adequately communicated. Decisions based on results and determination of research priorities must be done jointly.
- Protection against exploitation must be provided through legally binding contractual agreements and access to research supervisors or a controlling professional body.
- Confidentiality must be honoured.
- Consideration must be given to provisional patents.

There remains an urgent need for uniform agreements that recognise the intellectual property rights of ethnic groups and communities both within nation states and internationally (Barton 1994).

2.3 ORIGIN AND HISTORY OF SETSWANA-SPEAKING COMMUNITIES

An archaeological survey was conducted in the Madikwe Game Reserve situated in the northern part of the study area (Huffman, Calabrese, Grant & Lathy 1996). Evidence of human activity which could date back to the Early Stone Age, between 1 000 000 and 250 000 years ago was found. Middle Stone Age sites (250 000 to 25 000 years ago) and Late Stone Age sites (25 000 to 500 years ago) were also discovered. Middle to Late Iron Age sites were found at a chain of hills called the “Rant van Tweedepoort” and along the Dwarsberg dating between AD 1400 and 1700. Evidence of Sotho-Tswana homesteads as well as artefacts of Khoisan people were found in the reserve. Evidence of a large Tswana settlement from the early 19th century can be found within the Madikwe Game Reserve.

People belonging to the Sotho culture and language group, along with other dark-skinned or “black” groups in modern South Africa, probably originated in the Cameroon region of western Africa. From before 200 BC a series of migrations led to the eventual occupation of southern Africa. Here some intermingling occurred with local Khoisan people. This

process of migration to parts of southern Africa, previously occupied by Khoisan groups only, was probably completed by 700 AD (Oakes 1994).

Common historical roots explain the cultural similarities between the different “black” cultural groups in southern Africa. The two main African ethnic groups in South Africa are the Nguni and the Sotho (Oakes 1994).

The Sotho subdivisions that are recognised were made primarily on linguistic differences (Harman 1984) *viz.*:

- North-Sotho, found mainly in the Northern Province and Gauteng.
- South-Sotho, found mainly in the Free State Province and Lesotho.
- West-Sotho, found mainly in the North West Province, western Free State Province, Northern Cape Province and Botswana. The West-Sotho is also referred to as the Tswana.

The main Tswana divisions are the Rolong, Tlhaping, Hurutshe, Kwena, Fokeng, Kgatla, Ngwaketse, Ngwato, Tawana and Kgalakgadi. These groupings are the result of tribe fragmentation that occurred at various stages. The names are mostly derived from the names of tribe founders or leaders (Harman 1984).

Reyneke (1971) reviewed the recent Tswana history. Before the early 19th century there was a period of relatively stable occupation of the area by Tswana people, who are referred to as Batswana and their language as Setswana. The duration and details of this period of stability is unknown due to a lack of written records.

From about 1820, major upheavals were caused in the eastern part of South Africa by Zulu expansionism under their king, Shaka. This had effects throughout southern Africa – including regions as far North and West as the North West Province. In 1822 the renegade Zulu Chief, Mzilikazi and his followers left Zululand to escape from punitive action by Shaka. During 1824 he settled at the Olifants River. They were forced to move

to the Magaliesberg in 1825, close to where Pretoria was later founded, due to a drought. From here, he conducted campaigns against the Batswana to the North and West, where Brits and Rustenburg are now situated. In 1830, Mzilikazi and his followers were attacked and partly defeated by Zulu impi's sent by the Zulu king, Dingane. Mzilikazi then moved his headquarters from the Magaliesberg to the Marico River. This was disastrous for the Batswana as Mzilikazi's impis disturbed the power structure within the region and caused fragmentation of Batswana groups (Reyneke 1971).

Coinciding with these upheavals, several missionaries entered the area. Hunters, traders and adventurers followed them. In 1829, Robert Moffat, the missionary, described the destruction wrought by the impis of Mzilikazi: "...the ruins of innumerable towns, some of amazing extent...now since the invasion...and the terror of the Matabele it had become the habitation of wild beasts" (Oakes 1994).

During the late 1830's, European settlers arrived in greater numbers in the form of the Voortrekkers. It was followed by many skirmishes between the Voortrekkers and Mzilikazi's impis. Mzilikazi and his followers were attacked and defeated by a joint Voortrekker, Griqua and Batswana force at Gabeni in 1837, and driven northwards across the Limpopo River. Mzilikazi established his new capital at Bulawayo in modern Zimbabwe (Oakes 1994).

This was followed by a period of relative peace and stability for the Batswana. Voortrekkers settled in the area in greater numbers. They established farms and expected local tribes to supply farm labourers. With some exceptions, the Batswana tribes generally continued to live in the settlements where they were, but traditional leadership in the area remained fragmented. Through selective support of traditional leaders, successive white governments encouraged this fragmentation (Oakes 1994).

In South Africa, contact with and pressure from white settlers led to a gradual transformation of the Tswana cultural pattern through adoption of western customs (Coertze 1968, Harman 1984).

During the 1960's and 1970's there was again major social change in the study area. The area was incorporated into the former Bophuthatswana tribal homeland under the apartheid policies of the South African government. Most farms in the area belonging to white farmers were disowned and were either transferred to new black commercial farmers or were used as communal farmland. Bophuthatswana was never recognised as an independent state by the international community and the region was reincorporated into South Africa in 1994 (Oakes 1994). The area's return to South Africa was associated with political unrest and brief periods of near anarchy (Oakes 1994, Bosman 1995).

2.4 TRADITIONAL DISEASE PHILOSOPHY

The Tswana-people form part of the Sotho cultural and language group of southern Africa. They have been referred to as western Sotho to distinguish them from the Southern Sotho in the Free State Province and Lesotho and the Northern Sotho in the Northern Province (Reyneke 1971). Kriel (1992) extensively studied the disease philosophy of the Northern Sotho. Reyneke (1971) studied the practices of traditional healers (*dingaka* – plural, *ngaka* - singular) of the Kgatla-Bagakgafela (a Tswana subgroup). The close similarities between the disease concepts described in the two studies indicate a high degree of agreement between disease philosophies amongst the Sotho-groupings in South Africa.

To understand the Sotho's disease philosophy it is necessary to understand their view of people in relation to the world.

The world, both material and immaterial, is seen as one coherent whole. Everything in the world is connected and change in one part will have an effect on other parts. Actions that follow a certain pattern will lead to a predictable result due to the fixed relationship between cause and effect (Reyneke 1971). Reality is experienced intuitively, communally and subjectively (Kriel 1992). The world is anthropocentric in the sense that the human community forms the central core around which life revolves - not the individual.

Ancestors form an integral part of the community and have influence on the community (Kriel 1992 and Reyneke 1971). All things have mystical or supernatural power characteristics (*maatla*) that can influence persons, objects or events (Kriel 1992). The immaterial characteristics of all objects, including plants, are indivisible from their physical reality – the one does not exist without the other (Kriel 1992 and Reyneke 1971).

Two types of traditional healers (*dingaka*) are recognised (Reyneke 1971 and Harman 1984) viz.:

- *Dingaka tse ditshopya* are *dingaka* that only practise traditional medicine
- *Dingaka tse dinaka* are *dingaka* that also practise divination.

Most forms of disease are perceived to involve the reduction of *maatla* in the afflicted individual. Disease can be typified in two ways:

- It may be a natural occurrence when it is part of the accepted natural interactions between entities in the world. Natural disease may be associated with specific localities, seasons and the tendency to develop abnormalities in certain organs and processes during the normal progression of life from infancy to old age (Kriel 1992). This type of disease is sent by God (*Modimo*) and can be influenced or cured by conventional doctors with the use of orthodox medicines and by *dingaka* with the allopathic use of traditional medicines (Reyneke 1971).
- Disease that is not explainable in terms of the natural cycle of life is not fundamentally distinguished from other forms of misfortune. Misfortune is the result of a reduction of *maatla* that protects against evil. This *maatla* is finite and when it is taken away from one individual, it has to be derived again from something else to be restored. It is therefore the result of disharmony in the material and/or immaterial world. The key to curing this type of disease is identification of the cause of the disharmony and the restoration of harmony (Kriel 1992). Evil people (*boloi*) can, through evil practises and use of medicines, cause misfortune that manifests itself as

disease. Allopathic use of medicines cannot influence these diseases - only *dingaka* have the necessary skills to rid a person of the effects of misfortune (Reyneke 1971).

An individual's *maatla* may be increased or decreased by the use of medicines. The use of herbal medicines by an uninformed person can worsen disease by causing further disharmony and decrease in the sick individual's *maatla*. Evil people or a person's enemy can cause disease intentionally by the negative use of medicines (Reyneke 1971).

The Tswana name for traditional medicines is *dithlare*. The word literally means “trees”, but it is used to refer to traditional medicines from various sources (Harman 1984).

A prominent characteristic of a plant, bird or animal can be transferred if a part thereof is used medicinally (Reyneke 1971). The Vhavenda uses this concept to maintain good condition in their cattle. A ground lizard species, which has a smooth, shiny skin, is buried in the cattle kraal. The shiny skin of the lizard is equated with good condition in cattle and the presence of the lizard in the cattle kraal will transfer this characteristic to the cattle in the kraal (B C W Van der Waal, University of Venda, pers. comm., 1999). Another example is the treatment of cows with *Sarcostemma viminalis* by the Zulu to enhance milk production. Copious latex is released when the plant is damaged, which symbolises a high milk yield (Cunningham & Zondi 1991).

Traditional healers tend to specialise in certain diseases or problems even though they may still be involved in general practice as well (Ashton 1952 and Reyneke 1971). Some traditional healers specialise in animal health problems (S. Mahlaba, Inyangas National Association, pers. comm., 1999).

2.5 MEDICINAL PLANT COLLECTION AND STORAGE

Traditional healers do not gather plants indiscriminately. Various traditional practices and taboos influence the harvesting of medicinal plants (Ashton 1952, Reyneke 1971 and Van Wyk *et al.* 1997). There is often a form of consultation with ancestors through dreams or other media, such as the interpretation of the pattern in which bones and other objects

(*ditaula*) fall on the ground, before plants are collected. Ancestors will provide clues to the locality, time of day, plant parts and species to be collected for specific problems. A specific individual plant may even be pointed out. This information can be supplemented with the healer's own experience and knowledge (Reyneke 1971).

Traditional healers who are more experienced teach other traditional healers. They may use plant names that are different from the common names to protect privileged knowledge. Uninformed persons do not know the plants from which medicines are made from the names used by traditional healers and will therefore not be able to collect medicinal plants by themselves (Reyneke 1971). Social conventions also control the collection of indigenous plant material to some extent. For example: the felling of fruit trees such as *Sclerocarya birrea* (Marula tree) is often prohibited; the gathering of medicinal plants may be seasonally restricted; and the vegetation around cemeteries may be protected (Cunningham 1988).

In the modern era, rapidly growing urban populations have created a large demand for medicinal plants that are gathered in rural areas and taken to urban centres to be sold at shops and informal markets. Market forces of supply and demand drive professional herb gatherers to collect as much plant material as possible to supply the growing demand. It creates a situation where poor supply of plants due to limited natural populations can lead to increasing demand and market value. That in turn will result in greater motivation for herb gatherers to decimate remaining plants (Cunningham 1990 and Van Wyk *et al.* 1997). It has been stated that this practice threatens the sustainability of medicinal plant communities (Cunningham 1988, Cunningham 1990 and Gerstner 1946).

Plant parts that are harvested include roots, bulbs, rhizomes, tubers, bark, leaves, stems, flowers, fruits, seeds, gums, exudates and nectar (Van Wyk *et al.* 1997). The pharmacological and toxicological effects of different parts of a plant may differ substantially (Iwu 1993, Van Wyk *et al.* 1997). Plant parts that tend to be constantly available such as roots and bark are used more often than plant parts such as seed or leaves that may not be available during parts of the year (Iwu 1993, Reyneke 1971, Van Wyk *et al.* 1997). The harvesting of different plant parts varies in the extent to which it affects plant viability. The harvesting of roots frequently destroys plants (Van Wyk *et al.* 1997). The same applies to over-harvesting of bark, while collection of leaves, fruits, seeds and gum is usually less destructive (Cunningham 1990).

Medicinal plants are used either fresh or after a period of storage. Plant material is usually stored in a dried form. It may be cut into slices to facilitate drying. Dried material

is sometimes powdered before storage. Plant material is stored in bags, newspaper, glass jars and cans. Stored plants should be protected from exposure to sun, water, dust, wind and contact with strangers. Plant material intended for sale in markets is often tied into bundles (Van Wyk *et al.* 1997).

2.6 PREPARATION METHODS AND DOSAGE FORMS

Plant material utilised as human or animal medicines is used in a wide variety of preparations and dosage forms (Table 2.1) including: tinctures, infusions, decoctions, linctuses, lotions, ointments, powders, suspensions, solutions and volatile preparations intended for inhalation (Cunningham & Zondi 1991, Hutchings *et al.* 1996, Van Wyk *et al.* 1997 and Watt and Breyer-Brandwijk 1962). The preparations and dosage forms that have been described for ethnoveterinary medicines are similar to those described for human use, but do not include some of the more specialised dosage forms such as linctuses and volatile preparations intended for inhalation. The most common preparations for use in animals are watery plant extracts such as infusions and decoctions (Cunningham & Zondi 1991).

The method of preparation of plant extracts has a direct influence on their biological activity. Different preparation methods and dosages may even lead to opposite effects in some cases (Iwu 1993).

Resource-poor communities in the North West Province have inadequate access to orthodox veterinary drugs and stock remedies (McCrindle, Mokantla and Myburg 1998). Ethnoveterinary plant use could provide a viable alternative if farmers are empowered to use medicinal plants optimally (McCrindle *et al.* 1998).

Table 2.1: Dosage forms and preparation methods (Cunningham & Zondi 1991, Hutchings *et al.* 1996, Van Wyk *et al.* 1997 and Watt & Breyer-Brandwijk 1962)

Dosage form	Preparation methods
Extract	Extracts are prepared by extracting the active principles of crude drugs with suitable solvents such as water or alcohol. Extracts are administered per os, per rectum or are applied topically.
Decoction	Decoctions are prepared by putting plant material (usually macerated plant material) into water and boiling the plant material for a variable length of time. The extract is then used.
Infusion	Infusions are made by pouring hot or cold water onto plant material (usually macerated plant material) and letting it stand for a variable length of time. The extract is then used.
Tincture	Tinctures are alcoholic extracts of medicinal material.
Inhalation	Inhalations are preparations containing volatile substances that are intended for inhalation to bring it into contact with the linings of the respiratory tract.
Linctus	Linctuses are prepared by mixing liquid medicinal substances with sugar to form viscous liquids.
Lotion	Lotions are liquid preparations intended for topical application. They may be aqueous- or alcoholic solutions or suspensions.
Ointment	Ointments are semi-solid preparations intended for topical application. They contain active ingredients in a vehicle that may be of animal, vegetable, mineral or synthetic origin.
Mixture or concoction	Mixtures or concoctions refer to combinations of various medicinal constituents in a single vehicle
Drops	Drops are liquid preparations intended for topical use in eyes, ears or nasal passages.
Powder	Finely ground, dry material for topical application.
Lick	Dry or semi-dry material intended for slow ingestion by animals through licking.
Snuff	Snuff is dried, finely powdered material intended for inhalation through the nostrils.

2.7 ETHNOVETERINARY PLANT USE BY SETSWANA-SPEAKING COMMUNITIES

As in most of South Africa, there is little data available on the ethnoveterinary medicine practised by the Setswana-speaking people of the North West Province. Reyneke (1971) studied the beliefs in supernatural phenomena among Tswana people. His study area included parts of the northern North West Province. It included many aspects of traditional medicine and demonstrated the importance of plants in Tswana traditional medicine. Since his study focused on human medicine, the medicinal plant use for veterinary purposes among the Tswana remains poorly documented.

A study that examines the ethnoveterinary plant use of Tswanas was needed to document plant species used and the indications for its use. The methods of preparation and application of traditional remedies in animals also needed to be investigated. Such a study could provide a basis for further research on the medicinal potential of indigenous plants.

A further aspect of ethnoveterinary medicinal plant use on which published information is lacking, is the impact that it has on natural resources. The Madikwe area provided an opportunity for an investigation of the impact of ethnoveterinary medicinal plant use on medicinal plant populations.

CHAPTER 3

SURVEY OF ETHNOVETERINARY PLANT USE IN THE MADIKWE STATE VETERINARY AREA

3.1 INTRODUCTION

Ethnoveterinary plant use is an important facet of indigenous knowledge in South Africa. In spite of the lack of official recognition and support of indigenous knowledge in the past, the importance of ethnoveterinary knowledge can no longer be ignored (McCrindle *et al.* 1998). It offers opportunities for overcoming some of the limitations of orthodox medicines in rural areas and for the further development of indigenous knowledge, which may have wide application in the fields of pharmacology and medicine (Mathias *et al.* 1996). Documentation of ethnoveterinary knowledge ensures its retention and facilitates its accessibility to the benefit of a larger audience.

Setswana-speaking people share a common cultural heritage with other Sotho groups in southern Africa. This heritage includes a rich oral tradition in the use of indigenous plants for medicinal purposes (Reyneke 1971). Ashton (1952), Mampane, Joubert & Hay (1987), McCrindle *et al.* 1998, Kriel (1992), Quinlan (1998) and Reyneke (1971) have studied aspects of the use of plants as medicines by Sotho people. These studies were not, however, comprehensive investigations of the veterinary uses of plants and reports of ethnoveterinary plant use were usually incidental to the primary aims of these studies. They also focused on regions other than the Madikwe State Veterinary Area and on other sections of the Sotho people. This locality was chosen for study because of the lack of ethnoveterinary data from the area, the importance of cattle farming in the area (Directorate of Veterinary Services 1998) and the likelihood that people residing in the area possess cultural knowledge about the health care of cattle. The area was also accessible to the researcher and co-operation with the State Veterinary Services could be arranged.

This study will contribute to the documentation of ethnoveterinary knowledge in South Africa.

3.2 MATERIALS AND METHODS

3.2.1 Study area

The Madikwe State Veterinary Area (Figure 3.1) is situated in the northern part of the North West Province of South Africa and is part of the Madikwe Magisterial district of the North West Province.

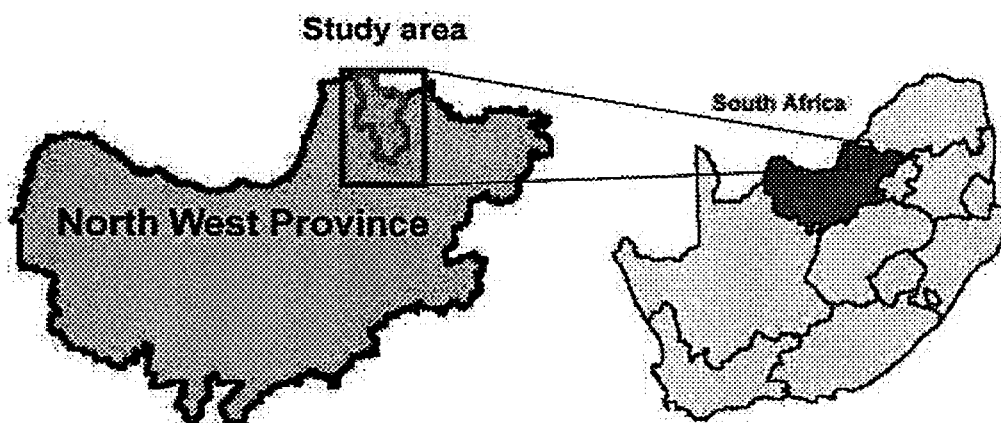


Figure 3.1: The location of the Study Area

3.2.1.1 Hydrology

There is one perennial river in the area, the Tholwane River that flows in a northerly direction through the study area. It is dammed in two places viz. the Madikwe Dam and Uitkyk Dam.

Seasonal rivers found in the area include the Marico River, Ptsedisulejang Stream, Masekolane River, Thulane River, Kolobeng River, Mothlabe River and Sefathlane River (Bosman 1995).

3.2.1.2 Climate

Temperatures vary between extremes of up to 40°C in summer to as low as -9°C in winter. The average temperature is *c.* 20°C (Bosman 1995).

Rainfall occurs in summer, but is erratic and variable. It can be expected to vary from 300 mm to 750 mm per year (Van Rooyen & Bredenkamp 1996a; Van Rooyen & Bredenkamp 1996b; Van Rooyen & Bredenkamp 1996c). The northern parts of the study area are generally drier than the southern parts. The average annual rainfall in the Madikwe Game Reserve, situated in the northern part of the study area, is approximately 500 mm per year (Davies 1997). In Madikwe Town, which is situated in the central part of the study area the average annual rainfall is 670 mm (Bosman 1995).

3.2.1.3 Vegetation

Acocks (1988) classified the vegetation in the study area into four Bushveld veld types including:

- Other Turf Thornveld
- Kalahari Thornveld
- Mixed Bushveld
- Sourish Mixed Bushveld

He defined a veld type as “a unit of vegetation whose range of variation is small enough to permit the whole of it to have the same farming potentials”.

A more recent vegetation classification was published (Low & Rebelo 1996). The fundamental difference between the classifications of Acocks (1988) and Low and Rebelo (1996) is that Acocks aimed at creating a basis for agricultural planning, whereas Low and Rebelo intended to form a basis for decision making that involve the conservation and promotion of biodiversity. They classified the vegetation into

vegetation types that they defined as a coherent array of plant communities that share common species (or abundance of species), possess a similar vegetation structure (vertical profile) and share the same set of ecological processes. Plant communities within specific vegetation types therefore have similar uses, management programmes and conservation requirements. Three vegetation types were recognised in the more recent classification (Figure 3.2). They all belong to the Savanna Biome viz.:

- Clay Thorn Bushveld: Found on flat plains with black or red vertic clay soils, derived from basalt. The dominant woody species are *Acacia tortilis*, *Acacia nilotica*, *Acacia karroo*, *Acacia tenuispina*, *Acacia gerrardii*, *Acacia nigrescens*, *Acacia robusta*, *Ziziphus mucronata*, *Dichrostachys cinerea* and *Grewia flava*. Dominant grasses are *Ischaemum afrum*, *Sehima galpinii*, *Setaria incrassata* and *Panicum coloratum*. Overgrazing causes an increase in the woody species cover with increased dominance in the grass sward of *Bothriochloa insculpta*, *Aristida bipartita*, *Brachiaria eruciformis* and *Sorghum versicolor* (Van Rooyen & Bredenkamp 1996a).
- Mixed Bushveld: A variable vegetation type found on undulating to flat plains. The structure is determined by fire and grazing and varies from dense, short bushveld to open tree savanna. The soil is coarse and sandy on granite, quartzite, sandstone or shale bedrock. On shallow soil, the dominant woody species is *Combretum apiculatum*. Other common woody species are *Acacia caffra*, *D. cinerea*, *Lannea discolor*, *Sclerocarya birrea* and *Grewia* species. The grazing on shallow soils is sweet. Dominant grasses include *Digitaria eriantha*, *Schmidtia pappophoroides*, *Antheophora pubescens*, *Stipagrostis uniplumis*, *Aristida* species and *Eragrostis* species. On deeper soils, the dominant woody species are *Terminalia sericea*, *Ochna pulchra*, *G. flava*, *Peltophorum africanum* and *Burkea africana*; characteristic grass species are *Eragrostis pallens* and *Perotis patens* (Van Rooyen & Bredenkamp 1996b).

- Kalahari Plains Thorn Bushveld: Found on flat to undulating sandy plains. The soil is deep sandy to loamy sands of aeolian origin on calcrete bedrock. The dominant tree species are *Acacia erioloba* and *Boscia albitrunca*. Other characteristic tree species are *Acacia luederitzii* and *T. sericea*. The dominant species in the shrub layer are *Acacia mellifera*, *Acacia hebeclada*, *Acacia haematoxylon*, *Lycium hirsutum* and *Grewia flava*. The grass layer is dependent on rainfall during the growing season. Characteristic species are *Eragrostis lehmanniana*, *Schmidtia kalahariensis* and *Stipagrostis uniplumis* (Van Rooyen & Bredenkamp 1996c).

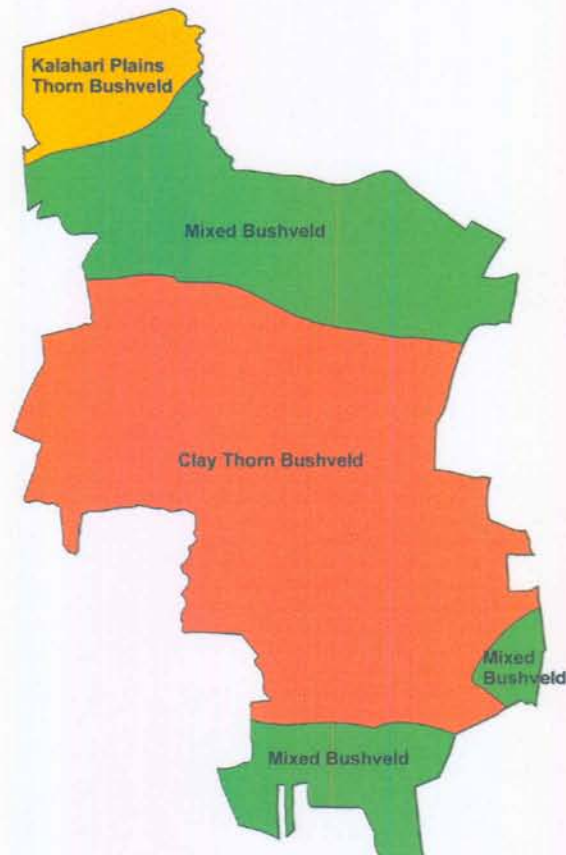


Figure 3.2: Vegetation types of the Madikwe State Veterinary Area (adapted from Low & Rebelo 1996)

3.2.1.4 Human population composition and socio-economic description

The people living in the study area are mostly descendants of Hurutshe-Kwena people that probably migrated to the Brits-Rustenburg area between 1350 and 1450. They divided due to a dispute over the succession of leadership. Over time more divisions followed that eventually led to a profusion of subgroups. The Kgatla is a large subgroup of the Hurutshe with its own divisions that can be separated from the other Hurutshe subgroups. Those groups that are represented in the study area include:

- Hurutshe groups: ba ga Gopane, ba ga Moilwa, ba ga Suping and boMokgatla,
- Kgatla groups: ba ga Motsha and ba ga Makau and
- Kwena groups: Modimosane, Phalane and Fokeng (Harman 1984).

Socio-economic data is based on socio-economic surveys of the Madikwe District by the Department of Agriculture and Environmental Affairs (Bosman 1995) and on surveys conducted in the villages surrounding the Madikwe Game Reserve as part of a feasibility study prior to the establishment of the reserve (Developmental Research 1993). The surveys include village demographics, household size, income and sources of income. They indicated that, in general, the communities are under-developed with very few available economic opportunities.

A large section of the population (50 %) is below the age of 24 years, and about 10 % of the population is older than 65 years. The relatively high numbers of children and young people can be explained by a high prevalence of large families. An additional factor is presumed to be that many adults tend to leave rural areas in search of economic opportunities.

Residents rely mainly on income generated from outside the area. Of the economically active population (including people who were employed and people who have the potential for being employed) 34 % are unemployed, 6 % are employed in the formal sector and 60 % are employed in the informal sector.

The incidence of illiteracy is high among the adult population (36 %). It appeared that the better-educated people tend to leave the area.

Poverty is widespread with only 1 % of households earning the minimum level of income regarded as necessary to satisfy elementary basic needs. Formal income accounts for 60 % of household income, pensions 18 % and informal income 14 %. Income from agriculture (own farming, not through employment on farms) is 2 % of the total and is unevenly spread between households. The upper quartile of households receives more than 50 % of the total income, while the bottom quartile receive just over 4 %.

More than 50 % of the population is involved in agriculture to some extent. Most of the agricultural activity is restricted to livestock production. Nearly 50 % of households do not own any livestock. Almost 75 % of stock owners own less than 5 animals each. A small minority of people own more than 100 head of livestock each. Cattle are the most numerous of domestic animals in the area followed by goats, sheep, donkeys and pigs (Figure 3.3).

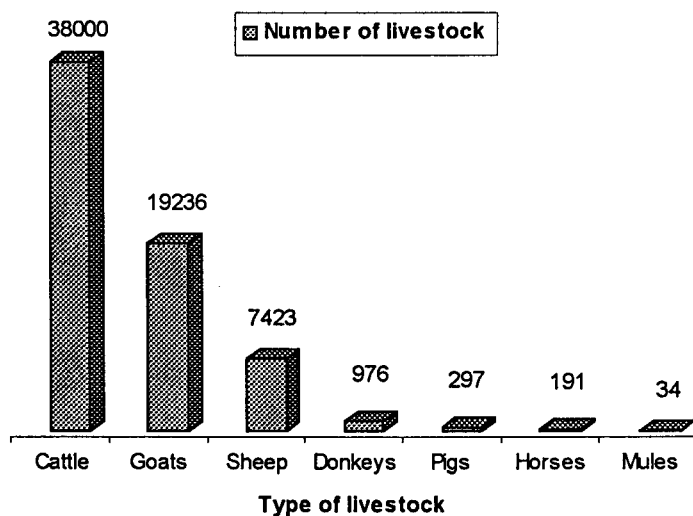


Figure 3.3: Estimated livestock numbers in the Madikwe State Veterinary Area (Directorate of Veterinary Services 1998)

Infrastructure development is poor, particularly roads, sewerage, water supply and electricity.

3.2.2 Target population and system delineation

Setswana-speaking people in the study area involved in livestock production and/or people who have information on current or historical ethnoveterinary plant use were included in the study. Although the primary aim of the study was ethnoveterinary medicinal plant use in cattle, observations on ethnoveterinary plant use in other animal species were recorded if found.

3.2.2.1 Interpreters

Traditional leaders (kgosi) in the study area were consulted at the start of the study and permission was requested from them to conduct the research in the study area. The aims and objectives of the research were explained to the kgosi and the services of interpreters were requested. Persons with a good knowledge of the study area, and who were respected members of the community, were sought. Although interpreters suggested initially by the kgosi were used, some were found unsuitable due to time constraints and/or lack of enthusiasm. Alternative interpreters, to whom the kgosi did not object, were thus selected when needed. Interpreters were not utilised when spokespersons were able to communicate adequately in either English or Afrikaans.

3.2.2.2 Spokespersons

Formally arranged group meetings, such as farmers- and community meetings at tribal offices, and informal group meetings with farmers at State brucellosis survey days and at communal dip tanks, were attended. These meetings were used to explain the aims of the research to members of the community. Spokespersons who participated in the project were not selected randomly from the target population. People who were willing and able to contribute to the research were identified and the most suitable arrangements for more detailed discussions were made. Group interviews with selected spokespersons were held

when groups of people could participate at the same time and individual interviews were arranged when it was more convenient. Occasionally, interviews were conducted with farmers or herdsmen, incidentally encountered while travelling through the study area, who were found to be knowledgeable regarding the traditional use of plants in animals.

Spokespersons included extension officers, traditional healers, farmers and other individuals who were knowledgeable about ethnoveterinary plant use. 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. Small scale farmers included all farmers who owned less than 30 head of cattle. Most small scale farmers owned less than 10 head of cattle and depended on alternative sources of income.

3.2.3 Survey procedure

The study 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 in other species, which make plant identification difficult.

The Rapid Rural Appraisal approach to data collection was used. It includes a wide range of survey techniques from which specific techniques are chosen depending on the purpose and circumstances of the situation prevailing in the area (Beebe 1995). Ethnoveterinary information was collected through three techniques *viz*: interviews, observations and guided field walks.

3.2.3.1 Interviews

Discussions were held on the following themes:

- The nature and perceived causes of diseases in animals.
- The use of plants in the treatment of diseases in animals.
- The use of plants in the prevention of animal disease and the improvement of animal husbandry and production.
- The method and incidence of plant use and of plant collection.

To give structure to interviews and to ensure that important aspects of animal health were not omitted, questions were asked around specific disease topics within the 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 spokespersons interviewed.

Notes on plant use included details on the following:

- Indications
- Parts of plants used
- Collection and storage
- Preparation
- Administration and dosage
- Contra-indications
- Side effects and toxicity
- Therapeutic success, time to recover and extent of recovery
- Monitoring of therapy

Spokespersons were asked to describe the symptoms of the diseases they treated with plants to correlate this with the indications for medicinal plant use. The purpose was to more accurately determine the diagnosis where descriptions of disease symptoms did not

match the normal range of symptoms seen in a specific disease. Where a diagnosis was uncertain the disease was identified to syndrome level only.

When traditional healers were interviewed, additional information was gathered on the following topics:

- The training of traditional healers.
- Collaboration and continuing education among traditional healers and between traditional healers and conventional health care.
- The roles of traditional healers in primary health care.
- Organised structures that traditional healers can belong to.
- The method of monitoring the success of treatment.
- The method of establishing activity of a specific plant.
- Factors affecting the quality of medicinal plants such as storage, expiry of medicines and sources of plants.
- Views on the availability of traditional medicines in the open market.
- The influence of western culture on the practice of traditional healers.

3.2.3.2 Observations

The ways in which spokespersons gathered medicinal plant material, prepared and used remedies and stored medicinal plant material were observed whenever the opportunity presented itself. Other observations included places where medicinal plants were gathered, signs of impact on natural plant populations and artificial propagation of medicinal plants. Spokespersons were also asked to demonstrate certain aspects of ethnoveterinary plant use if it could not be adequately explained during an interview. The consultation rooms of traditional healers were visited to observe the methods of medicinal plant storage and remedy preparation used by traditional healers. When possible, the researcher accompanied spokespersons while they gathered medicinal plants to observe their collection methods.

3.2.3.3 Guided field walks

Spokespersons were asked to point out plants to the researcher and to explain how plants were gathered or to demonstrate plant gathering where appropriate. Field walks also presented opportunities to gather plant samples and to take photographs. Information, such as plant names and indications, were verified during field walks.

3.2.3.4 Data management

Data were recorded in field notes. Information recorded in field notes was transferred to a manuscript book in a neat and easily readable form at the end of each day. Data were captured and stored in a computer database at Onderstepoort. Plant specimens were 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. Photographs were taken of plants when adequate sample specimens could not be gathered.

3.2.3.5 Plant identification

Spokespersons were asked to point out the plants that were mentioned in interviews during guided field walks. In addition spokespersons were requested to point out plants from dried plant samples and photographs. Information recorded during plant collection included:

- Date
- Collector's name
- Provisional plant name
- Collection number
- Location (province, district, farm, nearest town and description of precise location)
- Vegetation type (grassland, open/closed woodland etc.)
- Substrate (soil, stony/rocky soil, bare rock, termite mound etc.)
- Moisture regimen (poorly-drained, well-drained, river bank, depression/pan etc.)
- Soil type (gravel, sand, clay, loam etc.)

- Exposure (shade, partial shade, full sun)
- Aspect (N, S, W, E, SE etc.)
- Slope (level 0 - 2° , gentle 2 - 10°, moderate 10 - 45°, steep > 45°)
- Biotic effects (undisturbed, old land, cultivated land, planted pasture etc.)
- Plant features (life form, stem habit, underground parts, markings, colour, texture smell etc.)
- Local abundance
- Phenology
- Pollinators
- Herbivory (e.g. eaten by cattle)
- Notes on plant use

The Department of Botany, University of Pretoria, assisted with the identification of collected plant specimens. Most plant specimens were identified through comparison of collected plant samples with specimens in the H. G. W. J. Schweickert Herbarium at the University of Pretoria. Personnel at the Department of Botany assisted with the identification of specimens that could not be identified with certainty through comparison with herbarium specimens.

3.3 RESULTS

Forty-six plant species and their indications for their ethnoveterinary use were recorded through 28 detailed interviews with individuals, 2 group interviews, field walks and observations.

3.3.1 Spokespersons

Spokespersons represented 11 different occupations and 14 different locations throughout the study area were utilised (Table 3.1). Group interviews were held at Manamela (group of 12 small-scale farmers, reference number 25) and Molatedi (group of 15 small-scale farmers, reference number 27).

Only two group interviews were held. Individual interviews were held after completion of group interviews with people who were identified as being particularly knowledgeable.

Towns where interviews were held were spread throughout the study area except the northern part, which fell within the Madikwe Game Reserve where there were no towns (Figure 3.4).

The establishment of a trust-relationship between the researcher and spokespersons were a prerequisite for the successful completion of interviews. Trust often took time and repeated visits to achieve. Some spokespersons were unwilling to disclose information for the following reasons:

- Some people were concerned about prosecution under laws and regulations they did not know about and were unwilling to disclose practises in fear that it might harm them in some way.
- Some people were aware that the use of *Cannabis sativa* and the extra-label use of stock remedies are unlawful and were unwilling to discuss these topics.
- Professional healers were often not willing to co-operate out of fear that they would lose their professional advantage if their knowledge became widely known.
- Some traditional remedies may be dangerous and people were concerned that it could be disclosed to people who may misuse it.
- Previous contacts with government officials were, in some instances, confrontational or detrimental, and people therefore wanted to be certain about the identity of the researcher and the aims of the research.

The research project was explained and questions answered as objectively as possible to address spokespersons' concerns. Repeated visits and discussions on general topics were often necessary before spokespersons were willing to discuss ethnoveterinary topics openly. The typical pattern involved the following:

- A first visit (usually a group meeting) where the research was explained and its aims discussed.
- A second visit during which specific individual concerns were addressed and a more personal relationship between researcher and spokesperson was established.
- A third meeting during which ethnoveterinary matters were discussed more fully and field walks were conducted.

The concerns of most spokespersons could be addressed adequately.

Small gifts were given to some spokespersons as tokens of appreciation. Gifts included ropes and various types of stock remedies. Basic veterinary medicines and instruments were carried and free veterinary service was rendered where it was possible to do so. This service was often of benefit in establishing trust between the researcher and spokespersons. Farmers and lay members of the public were generally well disposed towards the project after the aims of the research were explained and questions were answered. Selected spokespersons were usually willing to participate if they were able to.

Professional traditional healers were generally not co-operative. The traditional healers were reluctant to participate in the research since, in their opinion, shared knowledge could be abused and they could lose their professional advantage and source of income.

The people of the towns where group interviews were held (Molatedi and Manamela) were positive and enthusiastic about the project and this played a vital role in the success of these interviews. The significance of people's attitudes towards the project in determining the extent of participation underscores the importance of establishing trust relationships between the researcher, the community and individual spokespersons.

The most valuable interpreters were those who had good communication skills, showed an interest in the study and were able and willing to help. Respected members of the community were good interpreters because they facilitated the establishment of trust between the researcher and spokespersons.

The ways in which spokespersons gathered medicinal plant material, prepared and used remedies and stored medicinal plant material were observed whenever the opportunity presented itself. However, it could not be done with all spokespersons because most spokespersons collected and used medicinal plants sporadically.

The knowledge of extension officers was limited compared to the general amount of information obtained from other spokespersons. A possible reason for their lack of knowledge is that they do not use traditional remedies themselves. They gained their information mostly through observing local farmers.

Table 3.1: Occupation, locality and reference number of individually interviewed spokespersons

Occupation	Locality	Reference number(s)
Extension officer	Pella Brakkuil Madikwe Town	5 20 22
Traditional healer	Silwerkrans	1, 2, 4, 16, 17
Commercial farmer	Mabaalstad Sesobe Driefontein	6 8 18
Small scale farmer	Mabaalstad Molatedi Koffiekraal Dwarsberg Silwerkrans	7, 13, 21, 23 10, 14, 15 19 28 30
Game ranger	Madikwe Game Reserve	11
Retired school principal	Molatedi	12
Retired farmer	Silwerkrans	26
Cattle herdsman	Klipkuil	3
Church minister and part-time farmer	Uitkyk	9
Driver and part-time farmer	Madikwe Town	24
Gardener	Obakeng	29

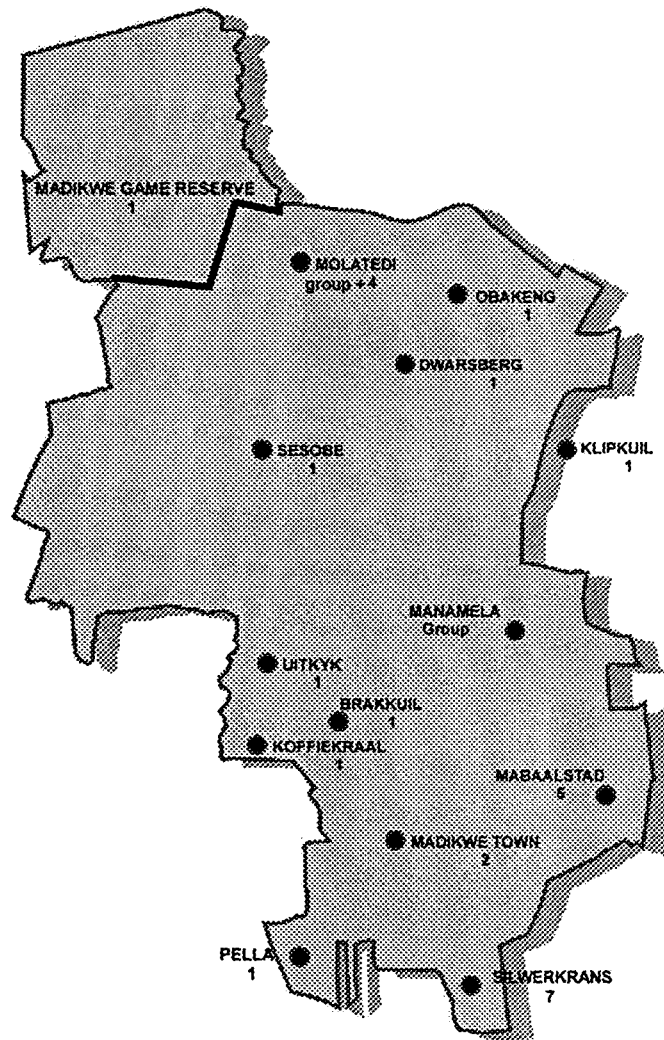


Figure 3.4: Towns where interviews were held and number of interviews per town

Only traditional healers from Silwerkrans were willing to be interviewed. It was probably due to efforts by the kgosi, who supported the project and has considerable social authority. However, even in Silwerkrans many traditional healers were unwilling to co-operate.

Traditional healers did not perceive orthodox medicine as a threat to their traditional healing practices.

Levels of ethnoveterinary knowledge among commercial farmers were generally high. They also had a good knowledge of orthodox stock remedies and orthodox disease theory. They perceived the fundamental mechanism of action of traditional herbal medicines and orthodox stock remedies to be similar and used both allopathically and interchangeably depending on previous experience with remedies, cost and availability.

The levels of ethnoveterinary and orthodox medicinal knowledge in small scale farmers and other spokespersons were variable and without pattern.

3.3.2 Indications and traditional remedies

Spokespersons identified a large range of indications for which traditional remedies were used in cattle and other animals. Traditional remedies have been categorized according to indications within different organ systems or disease conditions (Tables 3.2 – 3.17).

The most important indications were retained placenta, diarrhoea, gallsickness, fractures, eye inflammation, general sickliness, fertility enhancement, general gastrointestinal problems, heartwater, helminthiasis, coughing, redwater and tick burden reduction.

All liquid remedies were dosed, using a bottle, except remedies for eye inflammation, which were applied topically. Remedies that were pastes or ointments were applied topically.

Because spokespersons usually did not make use of professional veterinary services to obtain diagnosis, diagnosis made by spokespersons were mostly based on their own

disease theory and experience and sometimes on advice from other members of the community. Even when the described symptoms were typical of a named disease there remained considerable doubt as to the accuracy of specific diagnosis made by spokespersons. The indications obtained were therefore a reflection of the way in which spokespersons described and named syndromes that they encountered in their animals, rather than a reliable record of specific diseases encountered in the study area. In cases where descriptions of symptoms were not usually associated with named diseases, indications were recorded in terms of syndromes.

There was considerable variation of remedies used per indication (Figure 3.5). Wide variation in knowledge between spokespersons was also reflected by the variation of the report rates of different indications (Figure 3.6). Indications that were related to problems with easily distinguishable features, such as retained placenta and fractures, tended to have less variation in remedies between spokespersons. Indications for which little variation was recorded could also indicate the possibility of true efficacy or it could be due to widespread fallacies. Indications such as helminthiasis and general ailments that were more difficult to diagnose due to variation and subtlety of symptoms and variations of what spokespersons considered typical symptoms, tended to have more variation in the remedies used (Figure 3.5).

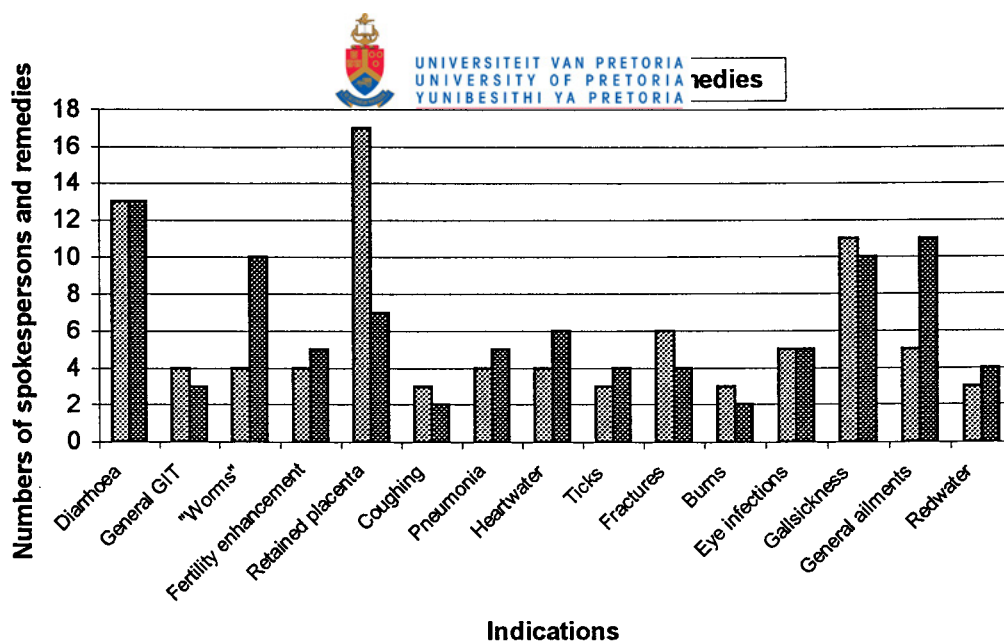


Figure 3.5: Comparison of the number of spokespersons and the number of reported remedies per indication for indications reported by more than 10 % of spokespersons

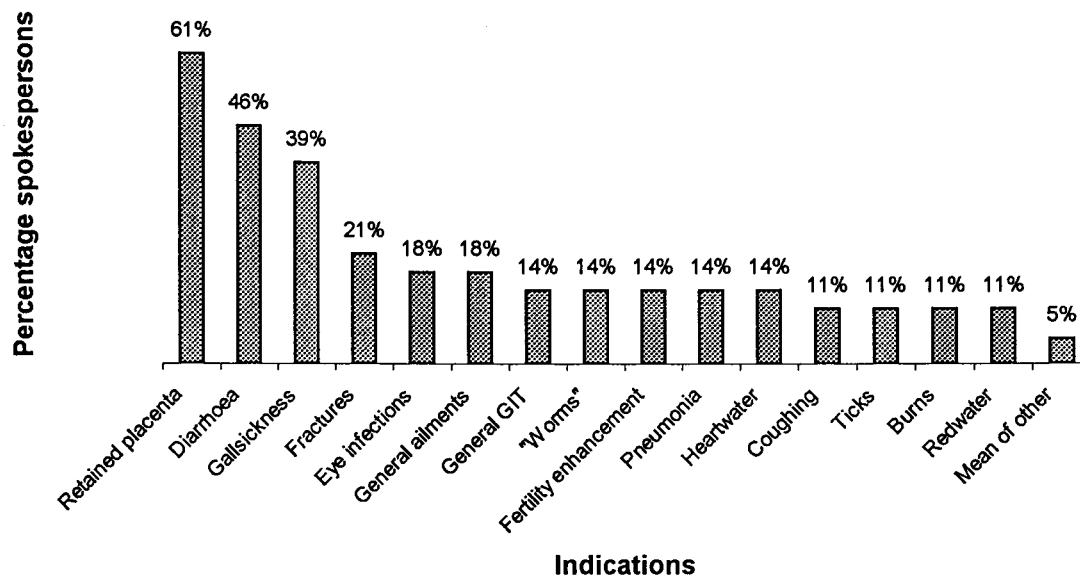


Figure 3.6: Proportions of spokespersons (n=28) reporting the various indications

3.3.2.1 Remedies for eye inflammation

Eye inflammation (*bolwetsi jwa matlo*) was an occasional problem for most cattle owners. Spokespersons stated that they encountered more problems with eye inflammation during summer months when flies were more numerous. They did not determine specific types of inflammation before they commenced treatment and they did not use different remedies for different types of eye inflammation (Table 3.2).

Traditional remedies that were not plant-based were known to many cattle-owners and were used more widely than plant-based remedies. These included the sprinkling of powdered, dry millipede exoskeleton or sugar into the affected eyes. Orthodox medicines, such as Terramycin Eye Powder™ (oxytetracycline HCl 20 mg/g, benzocaine 10 mg/g, Pfizer AH), were also commonly used to treat eye infections. Spokespersons who used plant-based remedies also used other traditional remedies or commercial medicines, depending on availability of ingredients and the effect obtained with applied remedies.

Table 3.2: Remedies used to treat eye inflammation

Plants species	Plant parts	Preparation	Spokesperson
<i>Aloe greatheadii</i> or <i>Aloe zebrina</i>	Leaf sap	Sap diluted with water	16
<i>Schkuhria pinnata</i>	Aerial plant parts	Infusion or decoction	13, 24
<i>Phyllanthus burchelli</i> or <i>Phyllanthus parvulus</i>	Aerial plant parts	Infusion	24
<i>Nicotiana tabacum</i>	Leaves	Powdered dry leaves	6
<i>Vitex zeyheri</i>	Leaves	Infusion	15

3.3.2.2 Remedies for gastrointestinal disorders

Diarrhoea was an important indication for the use of traditional remedies (Table 3.3). It was reported by 46 % of spokespersons (Figure 3.6). Remedies for diarrhoea were liquid decoctions, infusions or mixtures that were administered per os. The use of bark, roots and root-stocks were common in remedies for diarrhoea.

Spokespersons differentiated between different types of diarrhoea and did not treat all types of diarrhoea the same way. The most important distinctions were between diarrhoea in adult cattle and calf diarrhoea, and diarrhoea with and without the presence of blood in the faeces. Diarrhoea in adult cattle was usually associated with an abundance of fresh, green grass after spring rains and was generally not treated. Calf diarrhoea was also usually associated with abundant food for cows resulting in a high milk yield. Mild calf diarrhoea was often managed by limiting the calf's access to its mother to limit its milk intake. More severe cases and cases of bloody diarrhoea were usually treated using traditional remedies. Spokespersons usually had a high degree of confidence in the use of traditional remedies to treat diarrhoea and the use of orthodox medicines was uncommon. Spokespersons often expressed the opinion that traditional remedies were more effective than orthodox medicines for the treatment of diarrhoea.

One spokesperson used *Solanum panduriforme* specifically for the treatment of bloody diarrhoea in calves and goat kids, whereas another spokesperson stated that *Acacia tortilis* was particularly effective against severe and bloody diarrhoea in calves. Treatments of calf diarrhoea generally included the limitation of milk intake by calves as well as the application of remedies.

General remedies for gastrointestinal problems were used for any condition where gastrointestinal involvement was suspected. It was mostly applied as a gastrointestinal tonic to maintain gastrointestinal function, rather than as a remedy for the treatment of specific conditions. This type of remedy was not widely used and was reported by only

four spokespersons. It involved the use of five plant species and three remedies (Table 3.4).

Table 3.3: Remedies used to treat diarrhoea

Plants species	Plant parts	Preparation	Spokesperson
<i>Ozoroa paniculosa</i>	Bark and/or rootbark	Infusion or decoction	14, 26
<i>O. paniculosa</i> and <i>Terminalia sericea</i> and <i>Senna italica</i> and sometimes <i>Cassine transvaalensis</i>	Rootbark Roots Roots Bark	Decoction	15
<i>O. paniculosa</i> and <i>Acacia karroo</i> and <i>S. italica</i>	Bark Bark Roots	Infusion	23
<i>Rhus lancea</i>	Roots	Decoction	9
<i>Sclerocarya birrea</i>	Bark	Infusion	12, 24
<i>Aloe marlothii</i>	Leaves	Crushed fresh leaves mixed with water and salt and dosed	12
<i>Schkuhria pinnata</i>	Aerial plant parts	Infusion or decoction	24
<i>C. transvaalensis</i>	Bark	Infusion or decoction	12, 15, 16
<i>Elephantorrhiza elephantina</i>	Root-stock	Infusion or decoction	16, 17
<i>Peltophorum africanum</i> and <i>S. birrea</i>	Bark	Infusion	24, 25
<i>Ziziphus zeyheriana</i>	Root-stock	Decoction	7, 18
<i>Solanum panduriforme</i>	Fruit	Fresh sap from green fruit	13
<i>Withania somnifera</i>	Roots	Infusion	6
<i>Acacia tortilis</i>	Branch tips	Infusion	24

Puncturing the ruminal and abdominal walls with a sharp object to let excess gas escape was the usual treatment for bloat. The use of *Tribulus terrestris* to treat bloat was reported by only one spokesperson.

Constipation was infrequently treated in cattle. Three remedies for constipation were reported by two spokespersons. These remedies were usually used for the symptomatic relief of the symptoms of a type of *gala* with dry faeces. *Gala* is a term used for cases of poor appetite and lethargy in cattle and does not refer to a specific disease.

Table 3.4: Remedies used to treat general gastrointestinal problems, bloat and constipation

Indications	Plants species	Plant parts	Preparation	Spokesperson
General gastrointestinal problems (<i>bolwetsi ba mala</i>)	<i>Aloe marlothii</i>	Leaves	Decoction	18
	<i>Senna italica</i>	Roots	Infusion or decoction	8, 17, 18
	<i>Urginea sanguinea</i> and <i>Aloe greatheadii</i> or <i>Aloe zebrina</i>	Bulb Whole plant	Infusion	15
Bloat (<i>ibipetswe</i>)	<i>Tribulus terrestris</i>	Aerial parts	Infusion	5
	<i>Pouzolzia mixta</i>	Roots	Decoction	18
Constipation (<i>go bipelwa</i>)	<i>Aloe marlothii</i>	Leaves	Crushed fresh leaves mixed with water and salt and dosed	12
	<i>Ricinus communis</i>	Seeds	Crushed seeds mixed with water	17
	<i>S. italica</i>	Roots	Infusion mixed with salt	17

3.3.2.3 Remedies for “worms”

Cattle owners generally had a poor understanding of helminthiasis. Most spokespersons had never seen gastro-intestinal worms in their cattle, but sometimes reported the use of remedies for this purpose. It is possible that some remedies reported for use against worms may actually be for the treatment of non-specific ailments or disease conditions.

Table 3.5: Remedies used to remove “worms”

Plants species	Plant parts	Preparation	Spokesperson
<i>Aloe greatheadii</i> or <i>Aloe zebrina</i>	Whole plant	Infusion	15
<i>Aloe marlothii</i>	Leaves	Fresh leaves placed in drinking water	24
		Crushed fresh leaves mixed with water and dosed	24
		Crushed fresh leaves mixed with salt and offered as a lick	24
		Crushed fresh leaves and salt and flowers of sulphur and Rumevite™ powder mixed and offered as a lick	17
<i>Ricinus communis</i>	Seeds	Crushed seeds mixed with water	17
<i>Urginea sanguinea</i> and <i>A. greatheadii</i> or <i>A. zebrina</i>	Bulb	Infusion	15
	Whole plant	Decoction	
<i>U. sanguinea</i> and <i>Ximenia americana</i>	Bulb	Decoction	18
	Roots		
<i>Ziziphus zeyheriana</i>	Root-stock	Decoction	18
<i>Rhoicissus tridentata</i>	Tubers		18

3.3.2.4 Remedies for reproductive disorders

Except for retained placenta, the different remedies used for reproductive disorders tended to be unique to specific spokespersons with only one remedy reported by more than one spokesperson (Tables 3.6 and 3.7).

The use of plants to treat retained placenta in cows was recorded throughout the study area and showed a high degree of uniformity between spokespersons, as indicated by an unusually high number of spokespersons per remedy (Figure 3.5). The relative uniformity

of remedies used to treat retained placenta may be related to the uniformity of the symptoms associated with the condition and the relative ease with which retained placenta can be diagnosed without specialised knowledge or equipment.

Most remedies involved in the treatment of reproductive conditions were administered per os. An exception was the use of sap from *Dicerocaryum* spp., mixed with water, which was applied to the inside uterine and vaginal walls to lubricate the birth canal of cows suffering from dystocia.

Table 3.6: Remedies used to treat retained placenta

Indications	Plants species	Plant parts	Preparation	Spokesperson
Retained placenta (<i>ke motlhana o o saletseng</i>)	<i>Dicerocaryum eriocarpum</i> or <i>Dicerocaryum senecioides</i>	Roots or Whole plant	Infusion or decoction	6, 12, 15, 21, 24, 25
	<i>Harpagophytum procumbens</i>	Fruit	Decoction	17
	<i>Pouzolzia mixta</i>	Roots (usually) or Leaves	Infusion (usually) or decoction	10,12, 13,14,17,18, 23,24, 25,26, 28
	<i>Aloe marlothii</i>	Leaves	Decoction	16
	<i>A. marlothii</i> and <i>Urginea sanguinea</i>	Leaves Bulb	Infusion	25
	<i>Triumfetta sonderi</i>	Rootbark	Infusion	1
	<i>Tribulus terrestris</i>	Whole plant or Fruit	Infusion	12, 20

Table 3.7: Remedies used for abortion, dystocia, fertility enhancement, to promote the birth of strong calves and uterine infections

Indications	Plants species	Plant parts	Preparation	Spokesperson
Abortion (<i>pholotso</i>) – cows that aborted and other cows in the herd are treated to prevent further abortions	<i>Boophane disticha</i> and <i>Hypoxis</i>	Bulb scales	Infusion or decoction	18
	<i>hemerocallidea</i> and <i>Pouzolzia mixta</i> and <i>Rhoicissus tridentata</i>	Corm Roots Tubers		28
	<i>Hypoxis rigidula</i> and <i>R. tridentata</i>	Corm Tuber	Crushed corms and tubers are mixed with salt and offered as a lick	
Dystocia (<i>pharelo</i> / <i>ipharetswe</i>)	<i>Dicerocaryum eriocarpum</i> or <i>Dicerocaryum senecioides</i>	Whole plant	A decoction is dosed and a mixture of crushed plant material and water is used to lubricate the birth canal	24
	<i>Aloe marlothii</i>	Leaves	Decoction	16
Fertility enhancement	<i>Croton gratissimus</i>	Roots	Unknown	22
	<i>H. hemerocallidea</i> (used in cows)	Corm	Decoction	24
	<i>H. rigidula</i> (used in bulls)	Corm	Decoction	4, 24
	<i>Ziziphus mucronata</i> and <i>Englerophytum magalismsontanum</i> and <i>Grewia flava</i>	Roots	Crushed roots material is mixed with salt and offered as a lick	28
Promote birth of strong calves	<i>D. eriocarpum</i> or <i>D. senecioides</i>	Roots	Decoction	13
Uterine infections (<i>bolwetsi jwa popelo</i>)	<i>Asparagus laricinus</i> or <i>Asparagus suaveolens</i>	Tubers	Decoction	24

3.3.2.5 Remedies for respiratory system disease

Spokesperson 20 mixed Terramycin Animal Formula™ soluble powder (oxytetracycline HCl, 55 mg/g, Pfizer A. H) with an infusion of *T. sericea* leaves, to treat coughing in cattle (Table 3.8).

Table 3.8: Indications and remedies involving the respiratory system

Indications	Plants species	Plant parts	Preparation	Spokesperson
Coughing (gotlhala)	<i>Elephantorrhiza elephantina</i>	Root-stock	Decoction or Infusion mixed with salt	18, 24
	<i>Terminalia sericea</i>	Leaves	Infusion mixed with Terramycin™ powder	20
Pneumonia (bolwetsi jwa makgwafo)	<i>Schkuhria pinnata</i>	Aerial plant parts	Infusion or decoction	16
	<i>Croton gratissimus</i>	Leaves	Decoction	6
	<i>E. elephantina</i>	Root-stock	Decoction	18
			Infusion mixed with salt	24
	<i>Senna italica</i>	Roots	Infusion or decoction	24
	<i>Plumbago zeylanica</i>	Roots	Decoction	6

3.3.2.6 Remedies for nervous system disease

Heartwater, referred to as *semê* by most spokespersons, were often stated to be an important cause of morbidity and mortality in goats, but were less common in cattle. The remedies used against heartwater in goats were also used in cattle. Remedies consisted of decoctions or infusions that were administered per os (Table 3.9).

Spokespersons did not differentiate between ataxia caused by weakness and ataxia due to nervous system abnormalities.

Table 3.9: Indications and remedies involving the nervous system

Indications	Plants species	Plant parts	Preparation	Spokesperson
Ataxia	<i>Aloe marlothii</i>	Leaves	Crushed fresh leaves mixed with water and salt and dosed	12
Heartwater (semé) in cattle or goats	<i>Schkuhria pinnata</i>	Aerial plant parts	Infusion or decoction	13
	<i>Elephantorrhiza elephantina</i>	Root-stock	Decoction	18
	<i>Senna italica</i>	Roots	Decoction	13, 18
	<i>S. italica and Urginea sanguinea</i>	Roots Bulb	Infusion or decoction	24
	<i>Hypoxis rigidula</i>	Corm	Decoction	2
	<i>Rhoicissus tridentata</i>	Tubers	Decoction	2

3.3.2.7 Remedies for external parasites

External parasites were very commonly encountered problems of cattle and other domestic animals in the study area.

Only three spokespersons used plant-based remedies on their cattle to reduce tick burdens and one spokesperson used it to treat maggot infestations of wounds (Table 3.10). A single plant species, *Aloe marlothii*, was used.

Commercial ectoparasiticides were more commonly used. Spokespersons stated that the use of plant-based remedies did not remove ticks totally, but reduced tick burdens. They perceived commercially available ectoparasiticides to be more effective, but also more costly.

Table 3.10: Indications and remedies involving external parasites.

Indications	Plants species	Plant parts	Preparation	Spokesperson
Lice (<i>dinta</i>) in chickens	<i>Aloe marlothii</i>	Leaves	Fresh leaves placed in drinking water	13
Maggots (<i>diboko</i>)	<i>A. marlothii</i>	Leaves	Crushed leaf mixed with water and applied topically	16
Tampans (<i>matampane</i>) in chickens	<i>A. marlothii</i>	Leaves	Fresh leaves placed in drinking water	7, 17, 24
Tick (<i>dikgofa</i>) burden reduction in cattle	<i>A. marlothii</i>	Leaves	Fresh leaves placed in drinking water	24
			Crushed fresh leaves mixed with water and dosed	24
			Crushed fresh leaves mixed with water and salt and dosed	7
			Crushed fresh leaves mixed with salt and offered as a lick	13
Tick (<i>dikgofa</i>) burden reduction in dogs	<i>A. marlothii</i>	Leaves	Crushed fresh leaves mixed with water and dosed	13

3.3.2.8 Remedies for musculoskeletal system disease

Splints were made from the bark of *Sclerocarya birrea* and *Acacia karroo* to treat fractures in calves and small stock. The charred roots of *Seddera suffruticosa* and *Ehretia rigida* were mixed with a vehicle for topical application over fracture sites (Table 3.11).

Topical remedies were often applied with splints to accelerate the healing process. The users of these remedies expressed a high degree of confidence in its effectiveness in animals and humans.

Table 3.11: Indications and remedies involving the musculoskeletal system

Indications	Plants species	Plant parts	Preparation	Spokesperson
Fractures (<i>erobegile</i>)	<i>Sclerocarya birrea</i>	Bark	Splints	21
	<i>Acacia karroo</i>	Bark	Splints	7, 25, 26
	<i>Seddera suffruticosa</i>	Roots	Charred root powder alone or mixed with cream applied topically	9, 11
	<i>Ehretia rigida</i>	Roots	Charred root powder is mixed with fat and applied topically	29
Shoulder stiffness (<i>magetla</i>)	<i>Aloe marlothii</i>	Leaves	Decoction	19

3.3.2.9 Remedies for abscesses, the skin and adnexa

Burns were an uncommon problem in cattle, but sheep were said to be prone to burns during veld fires. The reported remedies used for the treatment of burns were used in all animal species and man (Table 3.12).

The Setswana term for sores and wounds (*dinto*) had a broad definition – it included inflamed skin lesions, abscesses and lesions of internal organs such as lungs and liver. Generalised, non-specific symptoms of disease were often attributed to sores (*dinto*) in internal organs, and were treated with the same remedies as those used for visible sores. These remedies were plant decoctions or infusions and were administered per os. Abscesses (*tlhagala*) were regarded as a specific type of sore.

Spokespersons used different Setswana terms for the sweating disease in calves: *bolwetsi jwa phufulo* and *bololo*. However, they described similar symptoms consistent with sweating sickness in calves caused by *Hyalomma* tick toxicoses.

The use of *Spirostachys africana* by Spokesperson 16, a traditional healer, to treat sweating sickness was unusual. He believed that the remedy would only be effective if plant material was harvested at the moment of sunrise. Such beliefs regarding the gathering of medicinal plant material were unusual among farmers, but were more prevalent among traditional healers.

Papillomatosis (*dikakana*) was said to be uncommon in cattle, but were more frequently encountered in goats. One spokesperson applied *Aloe marlothii* sap to cuts made in the warts. Most spokespersons did not apply any remedies to the lesions, but simply cut the warts from the skin using a sharp blade.

Table 3.12: Indications and remedies involving abscesses and the skin and adnexa

Indications	Plants species	Plant parts	Preparation	Spokesperson
Burns (<i>dintho tsa molelo</i>)	<i>Aloe greatheadii</i> or <i>Aloe zebrina</i>	Leaves	Fresh leaf applied topically	12, 27
	<i>Ziziphus mucronata</i>	Leaves	Leaves are ground, mixed with white petroleum jelly (Vaseline™) and applied topically	29
Sores and wounds (<i>dintho</i>) – Sores may include inflamed skin lesions, abscesses and lesions of internal organs such as lungs and liver.	<i>Asparagus laricinus</i> or <i>Asparagus suaveolens</i>	Tubers	Decoction	24
	<i>Z. mucronata</i>	Roots	Infusion	28
	<i>Solanum incanum</i> and <i>A. laricinus</i> and/or <i>A. suaveolens</i> and/or <i>Urginea sanguinea</i>	Roots Tubers Tubers Bulb	Decoction	24
Abscesses (<i>tlhagala</i>)	<i>A. laricinus</i> or <i>A. suaveolens</i>	Tubers	Decoction	24
Sweating sickness (<i>bololo</i>)	<i>Spirostachys africana</i>	Wood	Infusion	16
Sweating sickness (<i>bolwetsi jwa phufulo</i>)	<i>Ozoroa paniculosa</i>	Bark and/or Rootbark	Infusion or decoction	14
Papillomatosis (<i>dikakana</i>)	<i>Aloe marlothii</i>	Leaf sap	Applied topically to cuts in warts	18

3.3.2.10 Remedies for gallsickness

Gallsickness (*gala*) was an important indication for the use of plant-based traditional remedies (Table 3.13). The term *gala* was used for most conditions that lead to poor appetite, lethargy and weight loss without any obvious cause.

Table 3.13: Remedies used to treat gallsickness

Plants species	Plant parts	Preparation	Spokesperson
<i>Rhus lancea</i>	Roots	Decoction	9
<i>Aloe marlothii</i>	Leaves	Fresh leaves placed in drinking water	24
		Crushed fresh leaves mixed with water and dosed	24
		Crushed fresh leaves mixed with water and salt and dosed	12
		Crushed dried leaves mixed with water and salt and dosed	13
		Crushed fresh leaves mixed with salt and offered as a lick	12, 21, 24
		Decoction	12, 14, 19, 25, 27
		Infusion or decoction	4, 6, 10, 12, 13, 15, 25, 27
<i>Senna italica</i>	Roots	Infusion or decoction	24, 25
<i>S. italica</i> and <i>Urginea sanguinea</i>	Roots	Infusion	24, 25
	Bulb		

3.3.2.11 Remedies for blood cleansing and general ailments

Two older men reported remedies for blood cleansing (*go tlhatswa madi*) (Table 3.14). This indication was not encountered among younger spokespersons. It was applied when the perceived cause of any condition was related to something harmful that resided in the blood.

Table 3.14: Remedies for blood cleansing

Plants species	Plant parts	Preparation	Spokesperson
<i>Aloe greatheadii</i> or <i>Aloe zebrina</i>	Whole plant	Infusion	15
<i>Aloe marlothii</i>	Leaves	Crushed fresh leaves mixed with water and salt and dosed	12
<i>Urginea sanguinea</i> and <i>A. greatheadii</i> or <i>A. zebrina</i>	Bulb Whole plant	Infusion	15

Remedies used for general ailments were variable and were sometimes applied with other traditional remedies or orthodox medicines to increase the likelihood of recovery and to shorten the recovery period.

Table 3. 15: Remedies for general ailments

Indications	Plants species	Plant parts	Preparation	Spokesperson
General ailments in cattle	<i>Asparagus larycinus</i> or <i>Asparagus suaveolens</i>	Tubers	Decoction	24
	<i>Aloe greatheadii</i> or <i>Aloe zebrina</i>	Roots	Decoction	24
	<i>A. greatheadii</i> or <i>A. zebrina</i>	Whole plant	Infusion	15
	<i>Aloe marlothii</i>	Leaves	Fresh leaves put into drinking water	13
			Crushed fresh leaves mixed with salt and offered as a lick	13
	<i>Urginea sanguinea</i> and <i>A. greatheadii</i> or <i>A. zebrina</i>	Bulb Whole plant	Infusion	15
	<i>Hypoxis hemerocallidea</i>	Corm	Decoction	18
	<i>Hypoxis rigidula</i>	Corm	Decoction	18
	<i>Dicerocaryum eriocarpum</i> or <i>Dicerocaryum senecioides</i>	Roots	Roots are boiled and then crushed and mixed with water	4
	<i>Ziziphus zeyheriana</i>	Root-stock	Decoction	25
	<i>Rhoicissus tridentata</i>	Tubers	Decoction	18
General ailments in poultry	<i>A. marlothii</i>	Leaves	Fresh leaves placed in drinking water	20

3.3.2.12 Remedies for anthrax and redwater

The spokesperson that reported a remedy for anthrax (Table 3.16) did not have a well-defined concept of the disease and described vague symptoms associated with it. It is therefore unlikely that the disease referred to by the spokesperson actually was anthrax.

Redwater (*bolwetsi jwa mothlapo o moshibidu*) is an indication that refers to reddish discoloration of the urine and is not necessarily bovine babesiosis, which is commonly known as “redwater” in English. Spokespersons stated that the condition was uncommon.

Table 3.16: Remedies used to treat anthrax and redwater

Indications	Plants species	Plant parts	Preparation	Spokesperson
Anthrax (<i>bolwetsi jwa lebete</i>)	<i>Senna italica</i>	Roots	Infusion or decoction	18
Redwater (<i>bolwetsi jwa mothlapo o moshibidu</i>)	<i>Ozoroa paniculosa</i>	Roots	Infusion or decoction	15
	<i>Asparagus laricinus</i> or <i>Asparagus suaveolens</i>	Tubers	Decoction	24
	<i>A. laricinus</i> and <i>Urginea sanguinea</i>	Tubers Bulb	Infusion	24
	<i>Rhoicissus tridentata</i>	Tubers	Decoction	2

3.3.2.13 Remedies used as tonics

Tonics were used in healthy cattle to enhance their resistance to disease and to increase their growth rate and milk production. It was also given to animals to shorten the recovery period after illness. It was a relatively unimportant indication in cattle for plant-based remedies and was reported by only two spokespersons (Table 3.17).

Table 3.17: Remedies used as tonics

Indications	Plants species	Plant parts	Preparation	Spokesperson
Tonic (bovine)	<i>Croton gratissimus</i>	Leaves	Decoction	11
	<i>Peltophorum africanum</i>	Rootbark	Crushed rootbark is put into the drinking water	1
Tonic (ovine)	<i>C. gratissimus</i>	Leaves	Decoction	11
Tonic (caprine)	<i>C. gratissimus</i>	Leaves	Decoction	11
Tonic (poultry)	<i>Aloe marlothii</i>	Leaves	Fresh leaves placed in drinking water	25

3.3.3 Documentation of plants used for ethnoveterinary purposes

Plants with ethnoveterinary uses recorded in the study are arranged alphabetically by genus and species names. Botanical names, synonyms and families are those accepted by Arnold and De Wet (1993), except in the case of *Englerophytum magalismontanum*, which is, called *Bequaertiodendron magalismontanum* by Arnold and De Wet (1993). *E. magalismontanum* is used in more recent publications (Van Wyk & Van Wyk 1997, Von Breitenbach 1995).

Tswana names are those that were recorded in the study. Spelling was determined phonetically, except where Reyneke (1971) recorded the same names, in which case the spellings of Reyneke (1971) were used.

Indications reflect the use of traditional medicines in cattle unless stated otherwise.

Spokespersons were often vague regarding the exact quantities of plant material needed to prepare remedies. Statements like “enough to make a strong remedy” and “a few handfuls” were often the only indications of quantity. Exact amounts are only given where spokespersons used exact measurements. The same applied to doses.

A spoonful refers to a tablespoonful of material unless stated otherwise. The usual volume of a spoonful is *c.* 15 ml, but variations are possible and it is therefore only a rough guide to volume.

Plant names are followed by the reference number of either specimens or photographs, kept at the Department of Pharmacology and Toxicology, Faculty of Veterinary Science, University of Pretoria.

Spokespersons reporting the ethnoveterinary use of the various plants are indicated in brackets.

3.3.3.1 *Acacia karroo* Hayne

Photographs: P14 and P15

Family: Fabaceae

Tswana name: *mooka*

Bark was used to treat fractures (7, 25, 26) and diarrhoea (23). For the treatment of fractures, sheets of bark were harvested. It was then tied around the fracture site with the inner bark facing towards the skin to form a splint. The remedy for diarrhoea was prepared from equal amounts of macerated bark of *A. karroo* and *Ozoroa paniculosa* and roots of *S. italica*. The plant material was mixed and left in cold water overnight. Enough plant material was used to make a strong infusion. The dosage was about half a litre for calves and approximately a litre for adult animals, twice a day for two days.

No side effects or toxicity were reported.

3.3.3.2 *Acacia tortilis* (Forssk.) Hayne subsp. *heteracantha* (Burch.) Brenan

Photographs: P4 and P5

Family: Fabaceae

Tswana name: *mosu*

Leaves and branch tips were used to treat diarrhoea (24). The treatment was said to be highly effective against severe and bloody diarrhoea in calves. Only the tips of branches where the thorns were still pliable were used. Plant material was crushed and mixed with lukewarm water for a few minutes. Enough plant material was used to make a strong infusion. A litre of the infusion was dosed. A single treatment was usually sufficient.

No side effects or toxicity were reported.

3.3.3.3 *Aloe greatheadii* Schonl. var. *davyana* (Schonl.) Glen & Hardy

Photographs: P1, P2 and P6

and

Aloe zebrina Bak.

Photographs: P7, P8 and P9

Family: Asphodelaceae

Tswana name: *kgophane*; spokespersons did not differentiate between the two species.

Reyneke (1971) recorded the name *kgophane* for *Aloe transvaalensis* Kuntze

Spokespersons 12 and 27 used leaves to treat burns. Fleshy leaves were cut open and tied to the affected skin so that the exposed leaf pulp faced the skin.

Spokesperson 15 made an infusion by crushing the whole plant, mixing it with water and straining it. Freshly made infusions were dosed for general ailments, to clean the blood and intestines and for control of intestinal parasites.

Spokesperson 16 used leaf sap, mixed with water, as eye drops to treat eye infections.

Spokesperson 24 made a root decoction to treat general ailments in calves. Roots were crushed and boiled in water until the water turned brownish in colour. The extract was dosed to calves after cooling. The amount of plant material used to make the decoction and the dose used were not standardised.

No side effects or toxicity were reported.

3.3.3.4 *Aloe marlothii* Berger subsp. *marlothii*

Photographs: P10 and P11

Family: Asphodelaceae

Tswana name: *mokgopa*

The leaves were used to treat and prevent gallsickness and to treat helminthiasis, diarrhoea, constipation, general ailments, retained placenta, dystocia, to remove maggots from wounds and to reduce tick burdens. It is used in chickens to treat general ailments, to reduce tampans and lice, and as a general tonic and in dogs to reduce tick burdens.

A variety of preparation methods were used viz.:

- Fresh leaves were placed into the drinking water to treat and prevent gallsickness (24), to remove internal parasites (24), to reduce tick burdens and for general ailments in cattle (24); for tampans (7, 17, 24), lice (13), general ailments (20) and as a tonic (25) in chickens.
- Fresh leaves were crushed, mixed with water and dosed to treat gallsickness (24), internal parasites (24) and to reduce tick burdens in cattle (24) and in dogs (13).
- Fresh leaves were crushed, mixed with water and salt and dosed to treat gallsickness, to clean the blood, to kill the causative organisms of diarrhoea, to treat constipation and ataxia (12) and to reduce the tick burden in cattle (7).
- Dried leaves were crushed, mixed with water and salt and dosed to treat gallsickness (13).
- Crushed fresh leaves were mixed with salt and offered as a lick to treat and prevent gallsickness (12, 21, 24), internal parasites (24), to reduce tick burdens and for general ailments in cattle (13). Spokesperson 12 was of the opinion that when cattle were accustomed to the lick they also ingested *A. marlothii* leaves from plants growing in the veld. They then “treated” themselves (12). This was not observed during the study.

- Leaf decoctions were made by boiling a crushed leaf in a litre of water for a few minutes. The extract was dosed after cooling to treat gallsickness (14, 19, 25, 27), dystocia and retained placenta (16), for general intestinal problems (18) and a disease described as stiffness in the shoulders called *magetla* (19).
- Leaf decoctions made by boiling two leaves with 2 tablespoons salt in five litres of water for a few minutes were used to treat gallsickness. After cooling, one litre of the extract was dosed (12). The treatment was repeated once a week for as long as necessary.
- One leaf of *A. marlothii* and a bulb of *Urginea sanguinea* was crushed and mixed with a litre of water. The mixture was dosed to treat retained placenta (25).
- A tablespoon ground leaf, a cup of salt, a spoonful of flowers of sulphur and a cup of commercially available ruminotonic powder, such as Rumix™ (Sodium propionate 15 % m/m, molasses products 47,5 % m/m, Logos Agvet), were mixed and offered in the form of a lick to treat and prevent intestinal parasites (17).
- A crushed leaf was mixed with water and applied topically as a wash to remove maggots from wounds (16).
- Warts were treated by applying leaf sap to cuts made into the warts (18).

Treatment with aloe leaves resulted in purgation lasting a few days (12, 14, 24, and 25). Mixing the leaves with salt increased the purgative effect (12). Licks with aloe leaves gave the faeces a more fluid consistency (12).

3.3.3.5 *Asparagus laricinus* Burch.

Specimen: *D. van der Merwe* 8 (Onderstepoort)

and

Asparagus suaveolens (Burch.) Oberm.

Specimen: *D. van der Merwe* 55 (Onderstepoort)

Family: Asparagaceae

Tswana name: *lesitwane* for both species

Spokesperson 24 used tuber decoctions of both *A. laricinus* and *A. suaveolens* to treat sores (sores include inflamed skin lesions, wounds, abscesses and lesions of internal organs such as lungs and liver), redwater, uterine infections and general ailments. Spokesperson 29 used *A. laricinus* tubers to treat sores, to ripen abscesses and to treat umbilical cord inflammation in calves.

Spokesperson 24 used both species for the same indications, but maintained that *A. laricinus* was usually more effective. The preparation method was the same for all indications although different mixtures of ingredients could be used. Crushed plant material was boiled in a litre of water for a few minutes to prepare a decoction. The decoction was ready when the water turned brownish in colour. It was dosed after cooling. It was strained, if necessary, before dosing. One treatment was usually sufficient.

- For the treatment of sores, *A. laricinus* or *A. suaveolens* tubers were mixed with *S. incanum* roots and used to make a decoction that was dosed to the affected animal.
- Tuber decoctions were usually used alone to treat general ailments and uterine infections, but were sometimes used with *Solanum incanum* roots or powdered, dried *Urginea sanguinea* bulb in severe cases.
- Tubers were mixed with an *U. sanguinea* bulb decoction to treat redwater. After the animal had recovered, it was treated with a decoction made from a mixture of *Sclerocarya birrea* and *Peltophorum africanum* bark. It helped to make the animal “clean”.

Spokesperson 29 prepared an infusion for the treatment of sores by mixing a few handfuls of crushed *A. laricinus* tubers and *Ziziphus mucronata* roots in lukewarm water for a few minutes. The infusion was dosed to affected animals. To ripen abscesses, a paste was prepared by mixing ground *A. laricinus* tubers with a small quantity of water. The paste was applied to the skin over the abscess and an occlusive bandage was made from a plastic bag by tying it over the abscess where possible. To treat umbilical cord inflammation in calves an *A. laricinus* tuber infusion was prepared using the same

method as that used to treat sores, but without *Z. mucronata* roots. The infusion was dosed.

Tubers were included in human remedies for backache (1, 24) and symptoms of painful and difficult urination in men (24). It had a diuretic effect in humans (24).

3.3.3.6 *Boophane disticha* (L. f.) Herb.

Photographs: P12 and P13

Family: Amaryllidaceae

Tswana name: *matubadifala*

The plant formed part of a remedy given to cows when abortions occurred to prevent further abortions in the herd (18). The whole herd was treated including the cow that had aborted. Bulb scales were mixed with the tuber of *Rhoicissus tridentata* subsp. *cuneifolia*, the root of *Pouzolzia mixta* and the corm of *Hypoxis hemerocallidea*. The amounts of the different ingredients were not standardised. The mixture was crushed, added to cold water and left for a few hours or boiled for a few minutes. The watery extract was dosed.

Spokesperson 18 was not aware of side effects or toxicity in cattle, but he indicated it to be poisonous to humans if used incorrectly.

3.3.3.7 *Cassine transvaalensis* (Burt Davy) Codd

Specimen: *D. van der Merwe* 27 (Onderstepoort)

Family: Celastraceae

Tswana name: *mojeleman*

Bark decoctions or infusions are used to treat diarrhoea (12, 15, and 16). Crushed, fresh bark was put into cold water overnight to make an infusion (12) or it was boiled until the water turned brownish in colour (usually about fifteen minutes) to make a decoction (15). The amount of bark used was not fixed, but it was enough to make a “strong” extract.

Extracts were sometimes strained before dosing. One litre of extract was dosed and it was repeated when necessary.

No side effects or toxicity was reported.

3.3.3.8 *Croton gratissimus* Burch. var. *gratissimus*

Specimen: *D. van der Merwe 28* (Onderstepoort)

Family: Euphorbiaceae

Tswana name: *moologa*

Leaf decoctions were used to treat pneumonia (6) and as a tonic (11). Root decoctions were used to promote fertility in cows (22).

For the treatment of pneumonia (6) leaves were boiled for a few minutes. The resulting decoction was dosed to the affected animal. The amount of leaves and water was not standardised. There was no specific dosage. The treatment was repeated as needed.

For use as a tonic in calves, kids and lambs (11) leaves were boiled in five litres of water, mixed with one or two spoonfuls of white paraffin, for a few minutes. The amount of leaves used was not standardised. About four spoonfuls of the decoction was dosed to animals at four to eight weeks of age.

The spokesperson (22) who described the use of roots to promote fertility did not know the detail of the preparation method and dosage. He had seen old people use it a long time ago. They used to boil leaves in water and then dosed the water to cows.

No side effects or toxicity was reported in the study area.

3.3.3.9 *Dicerocaryum eriocarpum* (Decne.) Abels

Specimen: *D. van der Merwe 10* (Onderstepoort)

and

Dicerocaryum senecioides (Klotzsch) Abels

Specimen: *D. van der Merwe* 35 (Onderstepoort)

Family: Pedaliaceae

Tswana names: *makanangwane*; *makangwane* – For both species.

The whole plant or the roots were used to treat retained placenta (6, 12, 15, 21, 24, 25) and dystocia (24). The roots were also used to treat general ailments (4) and to ensure the birth of strong calves (13). Variations in preparation and use included:

- Spokespersons 6 and 15 used a root infusion to treat retained placenta. A root was crushed, mixed with a litre of warm water strained and dosed to the cow. Spokesperson 21 used a similar preparation, but he used cold water instead of warm water. A root decoction could also be used (25). Only one treatment was administered. The placenta would sometimes start to come out within minutes of treatment, but could take as long as two days to be expelled.
- Spokesperson 12 boiled a whole crushed plant with a similar amount of donkey faeces in a litre of water for about 20 minutes. After it had cooled, the fluid was strained and dosed to the cow. He said that the placenta would typically be expelled within a few hours after treatment.
- Spokesperson 24 used the plant for retained placenta and to aid calving in cases of dystocia. He boiled a crushed plant in a litre of water for a few minutes. The decoction was strained and dosed after it had cooled. The same decoction could be used for retained placenta and dystocia. A soapy fluid was formed when crushed plant material was mixed with water. In cases of a dystocia, it could be used to lubricate the birth canal and the arms of persons assisting with the calving process.
- Spokesperson 4 used boiled roots to treat general ailments in cattle. Roots were boiled for a few minutes, ground, mixed with water and dosed to the animal. There was no standard dosage. He sometimes added a piece of *Urginea sanguinea* bulb to make the medicine “stronger”.

- Spokesperson 13 used a root decoction to treat cows that produced weak calves to ensure that their next calves would be strong. A crushed root was boiled in a litre of water for about half an hour. It was dosed after it had cooled. Three treatments were administered one month apart.

No side effects were reported in the study area.

3.3.3.10 *Ehretia rigida* (Thunb.) Druce

Specimen: *D. van der Merwe* 45 (Onderstepoort)

Family: Boraginaceae

Tswana name: *morobe*

Roots were used to treat fractures in animals and humans (29). Roots were charred in a fire. The charred roots were then ground to a powder and mixed with fat to form a paste. The paste was applied to the skin over the fracture site. The fractures were reported to heal within three weeks after treatment (29)

No side effects or toxicity was reported.

3.3.3.11 *Elephantorrhiza elephantina* (Burch.) Skeels

Specimen: *D. van der Merwe* 29 (Onderstepoort)

Family: Fabaceae

Tswana name: *mosetlhane*

The root-stock was used to treat diarrhoea (16, 17), heartwater (18), coughing (18, 24) and pneumonia (18, 24).

For the treatment of diarrhoea, Spokespersons 16 and 17 mixed crushed root-stock with water and allowed it to stand for a few hours to obtain an infusion. Alternatively, the crushed root-stock could be boiled in water for a few minutes to obtain a decoction. A decoction was preferred when the remedy was needed urgently. Both decoctions and

infusions were ready for use when the water turned brownish-red in colour. The amounts of plant material and root-stock used were not standardised. The extract was left to cool and was strained if necessary before dosing. The dosage was variable, but a litre of extract was usually dosed once or twice a day for as long as needed.

Spokesperson 18 used a decoction for heartwater, coughing and pneumonia. The preparation method and dosage was the same as that used by spokespersons 16 and 17. Spokesperson 24 preferred to use an infusion to which salt was added. Dosage was also the same as that used by spokespersons 16 and 17.

No side effects or toxicity was reported.

3.3.3.12 *Englerophytum magalismontanum* Krause

Specimen: *D. van der Merwe* 47 (Onderstepoort)

Family: Sapotaceae

Tswana name: *motlatswa*

The roots were part of a mixture used to promote fertility in cows (24). Crushed roots of *E. magalismontanum*, *Ziziphus mucronata* and *Grewia flava* were mixed in a litre of water. The amounts of roots used were not standardised. Letting the roots soak in warm water for a few hours or overnight resulted in an infusion. Alternatively, boiling the roots for a few minutes resulted in a decoction. It was said to be better to use an infusion, but a decoction could be used if the remedy has to be made quickly. The watery extract is ready when the water turned brownish in colour. It also had an astringent taste when it was ready. The watery extract was strained and dosed after it had cooled. Only one treatment was normally given, but it could be repeated if necessary.

No side effects or toxicity was reported.

3.3.3.13 *Grewia flava* DC.

Specimen: *D. van der Merwe* 57 (Onderstepoort)

Family: Tiliaceae

Tswana name: *moretlwa*

The roots were part of a mixture used to promote fertility in cows (24). Crushed roots of *G. flava*, *Ziziphus mucronata* and *Englerophytum magalismsontanum* were mixed in a litre of water. The amounts of roots used were not standardised. Letting the roots soak in warm water for a few hours or overnight resulted in an infusion. Alternatively, a decoction was made by boiling the roots for a few minutes. It was said to be better to use an infusion, but a decoction could be used if the remedy has to be made quickly. The watery extract is ready when the water turned brownish in colour. It also had an astringent taste when it was ready. The watery extract was strained and dosed after it had cooled. Only one treatment was normally given, but it could be repeated if necessary.

No side effects or toxicity was reported.

3.3.3.14 *Harpagophytum procumbens* (Burch.) DC.

The plant was identified by the spokesperson from photographs.

Family: Pedaliaceae

Tswana name: *lematla / sengaparile*

The fruit was used to treat retained placenta (17). A fruit was crushed and boiled in a litre of water for a few minutes. After it had cooled, the decoction was strained and dosed. The animal was treated once only.

No side effects or toxicity was reported.

3.3.3.15 *Hypoxis hemerocallidea* Fisch. & C. A. Mey

Specimen: *D. van der Merwe 3* (Onderstepoort)

Family: Hypoxidaceae

Tswana name: *tsuku-ya-poo*

The corms were used to promote fertility (24) and for general ailments (18). It was described as a “female” *tsuku-ya-poo* (24) and was preferably used to treat infertility in female animals. The preparation method for both spokespersons was to prepare a decoction of the corm by mixing corm shavings or a piece of crushed corm with boiling water. It was then boiled for a few minutes. After cooling, the extract was dosed to the affected animal. The dose and dose interval were not fixed. Treatments were repeated as needed.

No side effects or toxicity was reported.

3.3.3.16 *Hypoxis rigidula* Bak.

Specimen: *D. van der Merwe 4* (Onderstepoort)

Family: Hypoxidaceae

Tswana name: *tsuku-ya-poo*

The corms were used to promote fertility (4, 24, and 28), as a panacea (18), to treat heartwater (2) and cows that had aborted (28) to prevent further abortions in the herd. It was described as a “male” *tsuku-ya-poo* (24) and was preferably used to treat infertility in bulls.

The most common preparation method was to prepare a decoction of the corm by mixing shavings or a piece of crushed corm with boiling water. It was then boiled for a few minutes. After cooling, the extract was dosed to the affected animal. The dose and dose interval was not fixed. Treatments were repeated as needed (2, 4, 18, 24).

To treat cows that had aborted and other cows in the same herd, *H. rigidula* corms and *Rhoicissus tridentata* tubers were crushed and mixed with coarse salt. The mixture was offered to the affected animals as a lick (28). The same method was used to promote fertility in bulls, but then *R. tridentata* was omitted from the lick (28).

Spokesperson 12 reported the *H. rigidula* for a disease called *serutswana*, which he thought was black quarter. He used the Afrikaans term for black quarter: “*sponssiekte*”. The symptoms he described for the disease were not specific and could include any debilitating disease. A piece of each limb of the sick animal, such as a piece of skin, was strung up on a thorn taken from *Acacia tortilis* and buried with a piece of *H. rigidula* corm. It was believed that the disease was “buried” in the process.

No side effects or toxicity was reported.

3.3.3.17 *Jatropha zeyheri* Sond.

Specimen: *D. van der Merwe 17* (Onderstepoort)

Family: Euphorbiaceae

Tswana name: *seswagadi*

Tubers were used to treat transmissible venereal tumour (*gobalesa*) in the dog (18). The tuber of one plant was crushed and boiled in half a litre of water for a few minutes. The decoction was dosed to the dog after it had cooled. The treatment was only repeated if a single treatment was not effective.

The remedy had a diuretic effect (18).

3.3.3.18 *Nicotiana tabacum* L.

No voucher specimen. Commercially available snuff tobacco or dried tobacco leaves obtained from other areas were used.

Family: Solanaceae

Tobacco was used to treat eye infections in cattle and goats (6, 25).

A dried tobacco leaf was ground to a powder. Tobacco snuff could also be used. The tobacco powder was folded into a piece of cloth; the cloth was dipped in water and squeezed, and the drops collected from it. The drops were instilled into the affected eyes

a few times per day for as long as required (6). Tobacco powder could also be sprinkled directly into the eye (25).

No side effects were reported with the topical use of a tobacco infusion.

3.3.3.19 *Ozoroa paniculosa* (Sond.) R. & A. Fernandes var. *paniculosa*

Specimen: D. van der Merwe 36 (Onderstepoort)

Family: Anacardiaceae

Tswana name: *monokane*

Bark and rootbark were used in the treatment of diarrhoea (15,23,26) and redwater (15). One spokesperson (14) also reported its use in the treatment of sweating sickness (*bolwetsi jwa phufulo*) in calves. The disease symptoms that spokesperson 14 described were consistent with *Hyalomma* tick toxicoses. He also used the Afrikaans name “*sweetsiekte*” for the disease.

No standard preparation method could be established. The plant was used alone (14,26) or in combination with various other plants (15,23).

Spokesperson 14 used the same preparation method for diarrhoea and sweating sickness. A few spoonfuls of crushed bark or rootbark was added to a litre of water. The water was boiled until it became brown in colour. After cooling down it was dosed to the affected animal. The treatment was repeated as needed. When treating sweating sickness it was also important to keep the animal out of direct sunlight. Spokesperson 14 indicated that the treatment usually had limited success in the treatment of sweating sickness.

Spokesperson 15 mixed equal amounts of crushed rootbark of *O. paniculosa*, crushed roots of *Senna italica* and crushed roots of *T. sericea*. Sometimes the bark of *Cassine transvaalensis* was added as well. Enough crushed plant material to make a “strong” decoction (usually about two spoonfuls per litre) was added to water and boiled until the water turned brown in colour. The resultant decoction was then strained and dosed to

affected animals. The dose was about half a litre for calves and about a litre for adult animals twice a day for two days.

Spokesperson 23 macerated and mixed equal amounts of the bark of *O. paniculosa*, the bark of *Acacia karroo* and the roots of *S. italica*. The mixture was left in cold water overnight. Enough plant material was used to make a strong infusion. The dosage was about half a litre for calves and about a litre for adult animals twice a day for two days.

Spokesperson 26 macerated and mixed rootbark of *O. paniculosa* with water (one spoonful rootbark for calves and two spoonfuls rootbark for adult cattle) and dosed the mixture without further preparation. The treatment was repeated as needed.

All spokespersons claimed good results in the treatment of bovine diarrhoea.

No side effects or toxicity was reported.

3.3.3.20 *Peltophorum africanum* Sond.

Specimen: *D. van der Merwe 56* (Onderstepoort)

Family: Fabaceae

Tswana name: *mosetla*

Rootbark was used as a tonic (1). It was crushed and put into the drinking water of cattle to improve their general resistance to disease.

The bark was used to treat diarrhoea (24, 25). Crushed bark of *P. africanum* was mixed with crushed bark of *S. birrea* to prepare an infusion. Either fresh or dried bark was used. About two spoonfuls bark was put into a litre of boiling water. It was then left to stand until it had cooled and turned brownish in colour. The infusion was stirred and then dosed to the animal. The treatment was repeated as needed (24). Another method for treating diarrhoea was to prepare a bark decoction of *P. africanum* without the addition of *S. birrea*. The amount of plant material used was not standardised, but enough crushed bark

was added to a litre of water to make a “strong” decoction. The decoction was boiled until the water turned brownish in colour. It was dosed to the animal after it had cooled. The treatment was repeated as needed. Although dried bark could be used, the remedy was more effective if fresh bark was used (25).

No side effects or toxicity was reported in the study area.

3.3.3.21 *Phyllanthus parvulus* Sond.; and
 Phyllanthus burchellii Müll. Arg.

Specimens: *D. van der Merwe 38b* and *D. van der Merwe 38a* (Onderstepoort)

Family: Euphorbiaceae

Tswana name: *lentsane*. The two species have the same Tswana name.

The aerial parts were used to treat eye infections in animals and man (24). Dried plant material was ground to a powder. The powder was used to prepare an infusion that was then instilled into the eyes as eye drops. Alternatively, a pinch of powder could be sprinkled directly into the eye. A single treatment was usually administered.

No side effects or toxicity was reported in the study area.

3.3.3.22 *Plumbago zeylanica* L.

Identified from the Tswana name used by Reyneke (1971). The spokesperson used the same name.

Family: Plumbaginaceae

Tswana name: *masegomabe*

Roots were used to treat pneumonia (6). A crushed root was boiled in water for a few minutes resulting in a root decoction that was dosed after it had cooled. The amounts of root material and water were not standardised and treatment was repeated as needed.

No side effects or toxicity were reported.



3.3.3.23 *Pouzolzia mixta* Soims

Specimen: *D. van der Merwe* 58 (Onderstepoort)

Family: Urticaceae

Tswana name: *mongololo*

Leaves and roots were used to treat retained placenta (10, 12, 13, 14, 17, 18, 23, 24, 25, and 26). Roots were used to treat bloat and vaginal discharge (18).

Spokesperson 10 prepared a leaf infusion by putting leaves in hot (not boiling) water for a few minutes or in cold water overnight. He then dosed two litres of the infusion. The treatment was repeated daily until the placenta was expelled. He also used it to prevent retained placenta after a difficult calving. When he used it prophylactically, the dose was half a litre once only.

Spokespersons 12, 17, 23, 24, 25 and 26 prepared a root infusion by placing a crushed root in water overnight. They then dosed one litre of the infusion. A single treatment was usually sufficient, but it could be repeated if necessary. Spokesperson 17 stated that *P. mixta* was more effective than *Harpagophytum procumbens* in the treatment of retained placenta. A member of group 25 said that the treatment was effective, but that *Dicerocaryum eriocarpum* had a more rapid action.

Spokesperson 14 prepared an infusion of roots and leaves. Pounded plant material was mixed with water and dosed. The amount of plant material was not standardised, but a one or two handfuls dosed with a litre of water were said to be sufficient. He did not believe that the length of time that the plant material was left standing in the water made a difference to the remedy's effectiveness.

Spokesperson 18 prepared a decoction of crushed roots by boiling it in water for a few minutes. The amount of root material was not standardised. A litre of decoction was dosed. One treatment was usually sufficient, but the treatment could be repeated if

necessary. He also used the decoction in cases of foul smelling or purulent vaginal discharges and ruminal bloat.

No side effects or toxicity was reported.

3.3.3.24 *Rhoicissus tridentata* (L. f.) Wild & Drum. subsp. *cuneifolia* (Eckl. & Zeyh.) N. R. Urton

Specimen: *D. van der Merwe 6* (Onderstepoort)

Family: Vitaceae

Tswana name: *ntagaraga*

The tubers were used to treat heartwater (2), redwater (2), helminthiasis (18), general ailments (18) and cows that had aborted (28).

To treat cows that had aborted, *Hypoxis rigidula* corms and *R. tridentata* tubers were crushed and mixed with coarse salt. The mixture was offered to the affected animals as a lick (28).

To treat heartwater, redwater, helminthiasis and general ailments the tubers were crushed and boiled in water for a few minutes to form a decoction. The decoction was dosed after it had cooled (2, 18).

No side effects or toxicity was reported.

3.3.3.25 *Rhus lancea* L.f.

Specimen: *D. van der Merwe 44* (Onderstepoort)

Family: Anacardiaceae

Tswana name: *moshabele*

Roots were used to treat calf diarrhoea and gallsickness (9). Bark was used to treat calf diarrhoea (28).

Roots were dug out near the base of the tree. A root decoction was prepared by mixing crushed roots (enough to make a strong decoction) in 2 – 3 litres of boiling water. The mixture was boiled until the water turned brown in colour. After it had cooled down the decoction was dosed to the animal. The treatment was repeated as needed (9). The same method was used by spokesperson 28, using bark instead of roots.

No side effects were reported.

3.3.3.26 *Ricinus communis* L.

Family: Euphorbiaceae

Tswana name: *mokhura*

Seeds were used to treat constipation and helminthiasis (17). One or two crushed seeds were dosed with water. A single treatment was usually sufficient.

Treatment induced diarrhoea that could be severe if an overdose was given (17).

3.3.3.27 *Schkuhria pinnata* (Lam.) Cabr.

Specimen: *D van der Merwe 19* (Onderstepoort)

Family: Asteraceae

Tswana names: *santhloko*; *lefero*

All plant parts occurring above ground were used to treat eye infections in humans/animals (13, 24), bovine pneumonia (16) and calf diarrhoea (24). It was also used to promote recovery from heartwater (13).

Infusions were made by adding crushed plant material to warm water for a variable length of time or decoctions were prepared by adding it to boiling water for approximately five minutes. The watery extract was used after it had cooled down. Plant

material was added to water until a “strong” extract was obtained. The amounts of plant material and water used were not standardised. To treat eye infections the extract was used as eye drops or to wash the eyes. To treat calf diarrhoea and heartwater the extract was dosed to the affected animal. There was no standard dosage. Treatments are repeated as needed.

The effect of the treatment on eye infections was reported to be variable. Spokesperson 24 stated that calf diarrhoea could be treated more effectively using other traditional remedies. It was claimed to shorten the recovery period of heartwater.

No side effects or toxicity was reported.

3.3.3.28 *Sclerocarya birrea* (A. Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro

Family: Anacardiaceae

Tswana name: *morula*

Bark was used to treat bovine diarrhoea (12, 24, 28) and fractures (21).

To treat bovine diarrhoea, a strip of fresh bark was macerated or dried bark was powdered. Enough bark material to make a strong infusion was added to a litre of hot water and left until the water turned brownish in colour. About one litre of the infusion was dosed to adult animals and about half a litre to calves. The treatment was repeated as necessary. Spokesperson 28 said that a decoction could also be used, but an infusion was better.

Splints are made from sheets of bark to treat fractures. Bark sheets are wrapped around the affected limb with the inner bark facing the patient’s skin.

No side effects were reported.

3.3.3.29 *Seddera suffruticosa* (Schinz) Hallier f.

Specimen: *D. van der Merwe* 43 (Onderstepoort)

Family: Convolvulaceae

Tswana name: *thobega*

Roots were used to treat fractures in animals and humans (9, 11). Spokesperson 9 slowly charred a piece of root by placing it on a sheet of corrugated iron over a hot fire. The charred root was then ground to a powder and the powder was applied to the skin around a fracture site to speed up healing. Spokesperson 11 prepared charred root powder in the same way as spokesperson 9. He then mixed it with dairy cream before applying it to the skin around a fracture site. He said that the person that prepared the remedy had to do it in such a manner that spilt medicine would not end up on the ground where people or animals could walk over it. It had to be done over an impermeable sheet or over a hole or a thorn bush. If persons or animals walked over the spilt medicine, they would become prone to fractures.

No side effects or toxicity were reported.

3.3.3.30 *Senna italica* Mill. subsp. *arachoides* (Burch.) Lock

Specimen: *D. van der Merwe* 20 (Onderstepoort)

Family: Fabaceae

Tswana name: *sebeta*

Infusions and decoctions, made from the roots, were used to treat gallsickness (4, 6, 10, 11, 12, 13, 15, 25, 27), general intestinal problems (8, 17, 18), heartwater (13, 18), anthrax (18), diarrhoea (21, 23, 24, 25, 27), constipation (22) and pneumonia (24).

Preparation methods were variable, but in all cases, roots were used to prepare decoctions or infusions. Infusions were prepared by placing crushed roots in hot or cold water. If roots were added to cold water, it had to stand for a longer time (usually overnight). Hot water infusions took less time to prepare and decoctions could be prepared by boiling

crushed roots for a few minutes. The watery extracts were dosed after it had cooled. The extract was sometimes strained before dosing. Fresh or dried roots could be used. There was no standard dosage. Notable variations in preparation and usage included:

- Spokesperson 13 used a decoction to prevent heartwater in goats. Each kid was dosed with a cup (approximately 200ml) of root decoction every three months.
- Spokesperson 18 used a decoction made from one crushed root, a litre of water and one spoonful salt to treat heartwater in cattle.
- Spokesperson 15 used *S. italica* as part of a mixture to treat diarrhoea. The remedy was made from crushed roots of *S. italica*, *Ozoroa paniculosa* and *Terminalia sericea*. Sometimes crushed bark from *Cassine transvaalensis* was added as well. A decoction was prepared by boiling the mixture in water for approximately fifteen minutes. The amounts of plant material and water were not standardised. After the decoction had cooled, half a litre was dosed to calves and one litre to adult cattle. The treatment was repeated twice per day for two days.
- Spokesperson 23 prepared an infusion made from a mixture of crushed roots of *S. italica* mixed with crushed bark from *O. paniculosa* and *Acacia karroo* to treat diarrhoea.
- Spokesperson 24 used a decoction made from *S. italica* roots, *Elephantorrhiza elephantina* root-stock and *Urginea sanguinea* bulb to treat respiratory diseases.
- To treat constipation, an infusion was made by mixing one spoonful of crushed roots with a litre of hot water (not boiling water) with two spoonfuls of salt. It was dosed once a day for as long as needed. To treat diarrhoea, two spoonfuls of crushed roots were used without salt. Otherwise, the preparation method and dosage was the same as for the treatment of constipation (17).

According to Spokespersons 8 and 17, the roots caused purgation when mixed with salt.

3.3.3.31 *Solanum incanum* L.

Specimen: *D. van der Merwe* 50 (Onderstepoort)

Family: Solanaceae

Tswana name: *tolwana*

Root decoctions were used alone or in mixtures to treat “sores” (24). Sores included inflamed skin lesions, abscesses and lesions in internal organs such as lungs and liver. Sometimes a crushed *Asparagus laricinus* or *Asparagus suaveolens* root or a crushed *Urginea sanguinea* bulb was mixed with crushed *Solanum incanum* roots to make the remedy more potent. Crushed plant material was boiled in a litre of water for a few minutes to make a decoction. The decoction was ready for use when the water turned brownish in colour. It was dosed after cooling and was sometimes strained if necessary before dosing. One treatment was usually sufficient, but it was repeated if necessary.

Tolwana was used by people to protect themselves from the negative effects of bad medicines and metaphysical phenomena used with evil intent by their enemies. Roots were charred in a fire. The charred roots were then used to draw lines on the soles of the feet (24).

3.3.3.32 *Solanum panduriforme* E. Mey

Specimen: *D. van der Merwe* 52 (Onderstepoort)

Family: Solanaceae

Tswana name: *mohato*

Sap from the fruit was used to treat diarrhoea in calves (13). Approximately four drops of sap from an unripe fruit was dosed once.

Sap from unripe fruit was applied topically to teeth and gums to relieve toothache in humans (24). Another method of treating toothache was to squeeze out sap from an unripe fruit onto a piece of cloth. The cloth was then wrapped around a twig and held

over a candle flame until black smoke formed. The patient then held his breath and opened his mouth wide while wafting the smoke into his open mouth by hand.

No side effects were seen at the correct dose, but the sap could cause diarrhoea at higher doses (13).

3.3.3.33 *Spirostachys africana* Sond.

Family: Euphorbiaceae

Tswana name: *morekhure*

Wood was used to treat sweating sickness (*bololo*) in calves (16). The symptoms that spokesperson 16 described were consistent with *Hyalomma* tick toxicoses, although he used a different name for the disease.

To prepare the remedy, a piece of the white wood found directly beneath the bark of a mature tree was cut out. This had to be done exactly at sunrise to make the medicine effective. The amount of wood was not standardised. The wood was put in a container with enough water to cover the wood. It was left to stand for three days. After three days, the infusion was dosed to the calf. The dose was the amount of fluid that could be held in the palm of the hand. The treatment was not repeated. Spokesperson 16 said that it took a long time (up to six months) to achieve total recovery. Treatment caused diarrhoea that lasted for a few hours to a few days (16).

3.3.3.34 *Terminalia sericea* Burch. ex DC.

Specimen: *D. van der Merwe 49* (Onderstepoort)

Family: Combretaceae

Tswana name: *mogonono*

The roots were used to treat diarrhoea (15) and the leaves for coughing in sheep (20).

Crushed *T. sericea* roots were mixed with crushed roots of *Senna italica* and *Ozoroa paniculosa* in water. The amounts used were not standardised. The mixture was boiled for about 15 minutes to obtain a decoction. The decoction was ready when the water turned brownish in colour. After it had cooled, one litre was dosed to adult cattle and half a litre was dosed to calves. The treatment was repeated twice per day for two days (15).

Spokesperson 20 prepared a leaf infusion that was mixed with Terramycin Animal Formula™ soluble powder (oxytetracycline HCl 55mg/g, Pfizer A.H.) to treat coughing sheep. The amounts used and the dosage were not standardised.

No side effects or toxicity was reported in the study area.

3.3.3.35 *Tribulus terrestris* L.

Specimen: *D. van der Merwe 11* (Onderstepoort)

Family: Zygophyllaceae

Tswana name: *tshetlo*

Aerial parts were used to treat bloat (5); the whole plant (12) and the fruit (20) were used to treat retained placenta.

Spokesperson 5 did not differentiate between free gas and frothy bloat. To treat bloat, he put a few handfuls of crushed leaves and twigs in warm water and dosed it to the animal.

To treat retained placenta, spokesperson 12 mixed a whole, crushed plant with water and dosed it. Spokesperson 20 placed a handful of crushed fruit in warm water overnight. The infusion was dosed.

No side effects or toxicity associated with using the plant medicinally were reported. The plant was perceived to have caused mortalities in goats after they ingested it during a very hot day (19).

3.3.3.36 *Triumfetta sonderi* Ficalho & Hiern

Specimen: *D. van der Merwe* 5 (Onderstepoort)

Family: Tiliaceae

Tswana name: *mokuku*

Rootbark was used to treat retained placenta (1). A handful of crushed rootbark was mixed with water and dosed. Only one treatment was given.

No side effects or toxicity was reported.

3.3.3.37 *Urginea sanguinea* Schinz

Photograph: P4

Family: Hyacinthaceae

Tswana name: *sekaname*

Bulbs were used alone or in mixtures to treat general ailments (15), general intestinal problems (15), helminthiasis (15, 18), to clean the blood (15), gallsickness (24, 25), heartwater (24), redwater (24), sores (sores include inflamed skin lesions, abscesses and lesions of internal organs such as lungs and liver) (24) and retained placenta (25). It was also used for the treatment of heartwater in goats (24).

For the treatment of general ailments, general intestinal problems, helminthiasis and to clean the blood, Spokesperson 15 made a cold water infusion from a mixture of a whole plant of *Aloe greatheadii* or *Aloe zebrina* and part of the bulb of *U. sanguinea*, which was then dosed.

For the treatment of helminthiasis, one half of a bulb was crushed and mixed with a similar amount of the root of *Ximenia americana* var. *microphylla*. It was boiled in a litre of water for a few minutes. After the decoction had cooled, the full litre was dosed to adult cattle and half a litre to calves (18).

To treat gallsickness, spokesperson 24 used powdered dried bulbs. A spoonful of powder was mixed with warm water and dosed. When *Senna italica* was used to treat gallsickness, the remedy was made more effective by the addition of *U. sanguinea* (24, 25). A mixture with *S. italica* roots was also used for the treatment of heartwater in cattle and goats (24). For the treatment of sores and redwater it was mixed with crushed *A. laricinus* tubers (24).

For the treatment of retained placenta, a fresh bulb was crushed, mixed with a crushed leaf of *Aloe marlothii* and water and dosed (25). Spokesperson 24 was also aware of this remedy for retained placenta, but he said that other remedies were more effective.

Use of *U. sanguinea* bulbs in animals at the correct dosage did not cause side effects or toxicity. Spokesperson 24 stated, however, that it should be used with caution in humans because an overdose could be lethal and that frequent use in humans caused weakness. It was used for sickness and malaise in humans, but the amount used in humans could not exceed a piece of bulb that is the size of a thumbnail. He also said that the bulb was irritating to the skin. It caused itching and a burning sensation on normal skin and intense pain on bruised skin. The bulb was used when a person had to be severely punished. A bulb was crushed and mixed with water and the person was hit with a sjambok or other object to bruise the skin. A water and *U. sanguinea* bulb mixture was then sprinkled onto the bruised skin to cause severe pain.

3.3.3.38 *Vitex zeyheri* Sond.

Specimen: *D. van der Merwe* 53 (Onderstepoort)

Family: Verbenaceae

Tswana name: *mokwele*

The leaves were used to treat eye infections (15). The remedy was prepared by mixing crushed leaves with water resulting in a cold-water infusion that was strained and used as

eye drops. Two to three drops were placed into the eyes twice a day until the infection had cleared up.

No side effects or toxicity was reported.

3.3.3.39 *Withanea somnifera* (L.) Dun.

Specimen: *D. van der Merwe 14* (Onderstepoort)

Family: Solanaceae

Tswana name: *mokukwane*

The roots were used to treat diarrhoea (6). One or two handfuls of crushed roots were mixed with a litre of hot (not boiling) water. After it had cooled, the infusion was dosed. Only one treatment was given. The remedy was said to be very effective in calves.

No side effects or toxicity was reported in the study area.

3.3.3.40 *Ximenia americana* L. var. *microphylla* Welw. Ex Oliv.

Specimen: *D. van der Merwe 46* (Onderstepoort)

Family: Olacaceae

Tswana name: *seretologa*

Roots were used to treat helminthiasis (18). Half of an *Urginea sanguinea* bulb was crushed and mixed with a similar amount of crushed *X. americana* root. It was boiled in a litre of water for a few minutes. After the decoction had cooled, the full litre was dosed to adult cattle and half a litre to calves (18). One dose was usually sufficient.

No side effects or toxicity was reported.

3.3.3.41 *Ziziphus mucronata* Willd. subsp. *mucronata*

Specimen: *D. van der Merwe 54* (Onderstepoort)

Family: Rhamnaceae

Tswana name: *mokgalo*

The roots formed part of a mixture used to promote fertility (24) and to treat sores (29). Leaves were used to treat burns sustained during veld fires (29).

To promote fertility, crushed roots of *Z. mucronata*, *Englerophytum magalismontanum* and *Grewia flava* were mixed in a litre of water. The amounts of roots used were not standardised. Letting the roots soak in warm water for a few hours or overnight resulted in an infusion. Alternatively, a decoction was prepared by boiling the roots for a few minutes. Infusions were said to be better than decoctions, but a decoction could be used if the remedy had to be prepared quickly. The watery extract was ready for use when the water turned brownish in colour. It also had an astringent taste when it was ready. The watery extract was strained and dosed after it had cooled. Only one treatment was normally given, but it could be repeated if necessary (24).

To treat sores, an infusion prepared from *Asparagus laricinus* tubers and *Ziziphus mucronata* roots was prepared by mixing a few handfuls of plant material in lukewarm water for a few minutes. The infusion was dosed (29).

To treat burns, leaves were ground and mixed with white petroleum jelly (Vaseline™) to form a paste. The paste was applied topically to burns (29).

No side effects or toxicity was reported.

3.3.3.42 *Ziziphus zeyheriana* Sond.

Specimen: *D. van der Merwe 15* (Onderstepoort)

Family: Rhamnaceae

Tswana name: *sekgalo-fatshe*

The root-stock was used to treat diarrhoea (7, 18), helminthiasis (7) and general ailments (25).

To treat diarrhoea and to treat and prevent helminthiasis spokesperson 7 prepared a decoction by boiling a crushed root-stock in water for a few minutes. The amount of water and crushed root-stock was not standardised, but enough root-stock had to be used to make a “strong” extract. The decoction was ready when the water turned reddish in colour. After it had cooled, about half a litre of the decoction was dosed to an animal. One treatment was usually sufficient, but it could be repeated if necessary. Spokesperson 18 used the same preparation method to treat diarrhoea in calves. He dosed a half to one litre of decoction to a calf. One treatment was usually effective.

For the treatment of general ailments, the same preparation method as the one used for diarrhoea was used. A litre of decoction was dosed and it was repeated the next day (25).

No side effects or toxicity was reported.

3.3.4 Non-botanical remedies

Traditional medicines that were not directly prepared from plants included materials of animal origin (for example pig’s fat and millipede exoskeleton), transformed plant material (for example cow dung, and soot) and inorganic material (for example salt). Some remedies also included material that only became widely available in the modern era such as used motor oil, diesel and grease. These remedies are summarised in Table 3.18.

Table 3.18: Indications, ingredients, preparation and dosage for ethnoveterinary remedies not directly made from plants

Indications	Ingredients, preparation method and dosage	Spokesperson
Broken horns	Stockholm tar is used to cover the lesion to prevent maggot infestation.	12
	Heated, fresh cow dung is applied to the lesion to stop the bleeding.	15, 25
Cutting of teeth in calves	A mixture of powdered charcoal and salt is rubbed onto the gums of young animals that are cutting teeth to facilitate the process.	10
Diarrhoea in calves	A decoction made from an unidentified polypore type mushroom that grows on the <i>Acacia erioloba</i> trees is dosed.	21
	A cup of wheat flower is mixed with a litre of water and dosed.	12, 25
<i>Dichapetalum cymosum</i> (mogau) poisoning	The affected animals must be kept away from water for 24 – 48 hours and must be dosed with a litre of traditional beer.	15, 27
Eye infections	Sugar is sprinkled into the affected eye.	6, 25
	The dry exoskeleton of a millipede (<i>sebokolodi</i>) is ground into a powder and sprinkled into the affected eye.	6, 7, 12, 18, 21, 24, 25, 27
	Powdered, dry millipede (<i>sebokolodi</i>) exoskeleton is mixed with sugar and sprinkled into the affected eye.	17
	A ring shaped iron with roughly the same circumference as the eye is heated and pressed against the eye to cause a superficial burn wound on the skin surrounding the eye. The heat will cause the eye to heal quickly.	18, 24
	Powdered charcoal is sprinkled into the eye.	18
Gallsickness	A handful of coarse salt is mixed with 750 ml of vinegar and about a litre of water. The mixture is dosed. It can be repeated twice a day if needed.	6

Table 3.18 (continued): Indications, ingredients, preparation and dosage for ethnoveterinary remedies not directly made from plants

Indications	Ingredients, preparation method and dosage	Spokespersons
Heartwater	When sheep are introduced to an area where heartwater occurs from an area where heartwater does not occur a sheep from the heartwater endemic area must be slaughtered. The rumen content of the slaughtered sheep is then mixed with the drinking water of the introduced sheep to prevent them from developing heartwater.	9
Maggots	Old motor oil, diesel, grease or petrol is applied topically to maggot-infested wounds. A mixture of acaricide and petrol is applied topically. A more rapid response is obtained when brake fluid is added as well, but it causes pain.	7, 25 12
Mastitis	A piece of the wall of a termite mound is heated in a fire. The heated piece of termite mound wall is then held under the udder on a spade or some other suitable object. The termite mound wall should not touch the udder. The udder is then milked out onto the termite mound wall. This must be repeated twice a day until the mastitis is cleared up. A feather shaft from a chicken's wing feather is used to open blocked teat canals. The udder is then milked out twice a day.	18 27
Papilloma	A leather thong must be fastened round the neck of the affected animal.	21
Pneumonia	A few granules of potassium permanganate is mixed with water and dosed.	12
Retained placenta	The soot that is found on wall surfaces over fireplaces is scraped off. A handful of soot is mixed with a litre of water and dosed to the affected animal. Sometimes a handful of salt is added. About five pieces of donkey faeces is mixed with a handful of coarse salt and dosed.	3, 7, 8, 9, 12 8
Sweating sickness (<i>bololo</i>)	A cup to half a litre of pig's fat is dosed and the skin is covered in a layer of pig's fat.	15, 21, 24, 25, 27

3.3.5 Sources of ethnoveterinary knowledge

The ways that lay people gained their knowledge of traditional medicine differed from that of professional traditional healers. Most lay spokespersons learned about the medicinal uses of plants from people in their communities. Old people were the source of information in most cases. It was usually a parent or other family member, but unrelated persons also taught each other. Farmers often learned about remedies from other farmers, both through verbal communication and through observations. Two spokespersons said that the ancestors (*badimo*) taught them about medicinal plants through dreams.

Traditional healers obtained their knowledge mostly through training from other traditional healers. One traditional healer went to a school for traditional healers in the Transkei, but most other traditional healers trained through apprenticeships with experienced traditional healers. Traditional healers also consulted other traditional healers who were regarded as specialists in certain remedies to learn about these remedies from them. They usually had to pay these colleagues large sums of money for this purpose. In addition, all the traditional healers said that they obtained information directly from the *badimo*.

The progression or disappearance of disease symptoms was used to determine failure or success of remedies. No instances of specific monitoring of efficacy was recorded. Some spokespersons stated that they did not need to monitor the success of treatment, because themselves and other people have used these remedies for a long time and they knew all its effects and outcomes from experience.

3.3.6 Spokespersons' perceptions of the causes of animal diseases

According to spokespersons 24 and 29, diseases fall into two basic 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*). The spokespersons that applied this theory to animals stated that diseases caused by *boloi* were rare, but possible, and most animal diseases are of natural origin.

Some spokespersons were unwilling to discuss diseases caused by *boloi*, and were deliberately vague concerning their belief or non-belief in the power of *boloi*. It may be the result of previous ridicule of these beliefs by people of the orthodox school of thought. Belief in the actions of *boloi*, as a possible cause of animal disease, could therefore be more prevalent than is suggested by the number of spokespersons that were willing to discuss it.

Natural phenomena were universally accepted by the various spokespersons as causes of disease in animals. Most spokespersons did not have an explanation of the causes of some diseases, but still believed it to be natural phenomena. Diseases with typical seasonal patterns were often related to factors in the environment with similar seasonal patterns. Fresh green grass was perceived by some to be the cause of gallsickness (*gala*) because its incidence tended to be higher during the growing season of grass. The same applied to diarrhoea. Too much milk was seen as the cause of diarrhoea in calves and high milk production in cows was associated with freely available green grass. It was the reason for the treatment of calf diarrhoea to often involve the milking of the calf's mothers to limit milk intake by the calf.

The perceived action of medicines was in most instances to clear the symptoms of disease without the user of the remedy being able to explain the reason for its action.

The replenishment of *maatla* (power) in the diseased animal by the use of medicines was perceived as the cause of the medicine's action in some cases, but the majority of spokespersons attributed it to some other physical mechanism that they could not explain due to lack of knowledge.

Spokespersons usually did not attribute diseases to microorganisms. A notable exception was the use of sap from unripe *Solanum panduriforme* to kill the organisms that cause diarrhoea.

Spokespersons were generally aware that ticks play a role in certain diseases such as heartwater, sweating sickness and gallsickness, but no spokespersons attributed these diseases to microorganisms or toxins carried by the ticks. Ticks were perceived as the direct cause of disease.

Plant toxicity caused by *Dichapetalum cymosum* (*mogau*) was widely known in the study area. It was the most important cause of toxicity in cattle and deaths due to *mogau* toxicity were expected to occur every year. A pupa that is 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. The pupa was usually found around *Panicum maximum* grass and was sometimes ingested with grass. The symptoms described for this intoxication could be attributed to *D. cymosum* intoxication. Furthermore, these poisonings occurred in areas where *D. cymosum* was prevalent.

A number of other toxic plants that are known to cause toxicity in livestock under natural conditions were observed in the area viz.:

- *Urginea sanguinea*
- *Lantana camara*
- *Solanum kwebense*
- *Sarcostemma viminalis*
- *Kalanchoe* and *Cotyledon* spp.
- *Acacia nilotica*

These plants were pointed out to spokespersons during field walks and were known to most spokespersons, but spokespersons did not perceive them to be the cause of toxicity in their animals.

Large calves, small birth canals or abnormal presentation of calves were recognised as causes of dystocia.

Tissue damage due to external parasites, trauma and burns were readily diagnosed.

External parasites were perceived as being an important cause of teat damage, but intestinal parasites (*dinogana*) were regarded as an unimportant cause of health problems.

Spokespersons often asked the researcher to explain the causes of disease from an orthodox veterinary perspective and readily accepted orthodox disease theory.

3.3.7 Medicinal plant collection and storage

Medicinal plant collection and storage did not follow a single pattern. Professional traditional healers generally gathered and stored medicinal plants differently from farmers and other lay people.

3.3.7.1 Medicinal plant collection

Spokespersons usually gathered and utilised medicinal plant material that they could obtain from their immediate surroundings. Most plants that were described during interviews were found during field walks near the towns where spokespersons lived or close to their cattle. Some spokespersons had plants such as *Aloe marlothii*, *Asparagus larycinus*, *Ziziphus mucronata*, *Peltophorum africanum* and others growing at their homes. These plants, which grew naturally around homes, were often not removed because of their usefulness as medicinal plants. *A. marlothii* was sometimes planted close to dwellings to ensure a convenient supply of leaves for medicinal use.

Senna italica was well known and widely utilised as a medicinal plant in humans and animals. Although the plant probably was heavily harvested for medicinal purposes and the harvesting of roots destroyed harvested plants, it was commonly encountered as a pioneer on disturbed soil in around towns where it was not given any special protection. The growth and reproductive potential of *S. italica* and its ecological niche makes it

unnecessary to protect and nurture plants at the home to ensure a readily available supply of medicinal plant material

Another factor that controlled the cultivation of plants was the inability of certain plants to adapt to the garden environments of towns. Some species such as *Pouzolzia mixta* occurred only in rocky soil along rocky ridges. Although there was a demand for the plant in towns, people were unable to cultivate it outside of its natural habitat and they therefore had no choice but to collect wild plants.

Plants that were used infrequently and for which the need tended to be unpredictable were not deemed to be worth the effort involved in cultivation. Such plants were collected only when the need arose. Most of the plants used to treat cattle fell into this category.

All lay spokespersons, except two, stated that the medicinal properties of plants at their homes and plants that grew further away were the same (Figure 3.7). They also did not consider nursery grown plants to be inferior and said that they would welcome nursery grown plants as an easily accessible source of herbal medicines. They would utilise medicinal plants that were available on the open market that originated from nurseries and it would provide a source of medicinal plant material when wild plants were unavailable. All the traditional healers, however, stated wild plants were better sources of traditional medicines than cultivated plants (Figure 3.7). They were of the opinion that medicinal plants on the open market would be undesirable because such plants could be poisonous and ineffective.

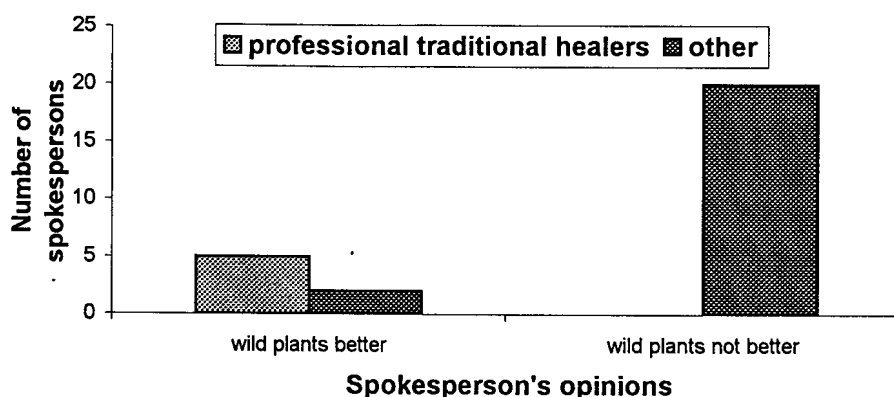


Figure 3.7: The perception of relative efficacy between wild-growing and cultivated plants

All spokespersons gathered plants themselves. Farmers usually gathered plants only for their own use. Laypersons normally gathered specific plant species based only on the medicinal indications associated with a particular plant species.

Traditional healers also applied criteria other than known medicinal indications when gathering plants. Sometimes 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. Collection of plants was preferred 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*. One spokesperson (24) said that the gatherer's shadow should not fall on medicinal plants while they were being gathered. It would also result in the plants being stepped on and cause them to lose their *maatla*.

Time of day played a role in the collection of medicinal plants. Three traditional healers were unwilling to go on field walks during the middle of the day. They said that the *badimo* rested during the middle of the day and would be angered if medicinal plants were collected during that period. The *badimo* could also make some medicinal plants invisible during the middle of the day so that people who wanted to gather them would not find the plants. One traditional healer (16) gathered the wood of *Spirostachys*

africana for medicinal purposes only at the break of dawn. He stated that the remedy would be ineffective if the wood was collected at a different time.

Seasons did not play a role in the collection of plants apart from affecting the availability of plant material.

Aloe marlothii was one of the most widely known and used medicinal plants for use in animals in the study area. Mature leaves were harvested by cutting them off at their bases, leaving younger leaves at the top of the plant. Plants from which leaves were cut were commonly encountered, but the plants appeared to remain healthy.

Medicinal plant collection tended to occur sporadically and the amounts needed were mostly low. Most plants were collected only when they were needed. The frequency with which a person collected plants depended mostly on the number of cattle required to be treated and the extent to which ethnoveterinary remedies were used. Some plants, however, which were used often for commonly occurring problems were gathered and stored for later use. One commercial farmer gathered large amounts of *Withania somnifera* roots at the beginning of the calving season in order to have plant material available to treat expected outbreaks of calf diarrhoea.

Plants that were not easily obtainable during certain seasons, such as *Senna italica*, were also collected and stored for later use.

One traditional healer gathered medicinal plants with the purpose of selling it to other traditional healers. Except for traditional healers, no spokespersons gathered medicinal plants for commercial purposes.

No shops that sell medicinal plants were encountered in the study area, but such shops did exist in larger towns in neighbouring districts. Two traditional healers stated that the plants that were obtainable from shops that sell medicinal plants could be dangerous

because they were of uncertain origin and shop-owners were usually more interested in profit than in the quality of their products.

3.3.7.2 Medicinal plant storage

Medicinal plant material that was unavailable or difficult to find during winter were often collected, dried and stored in various forms for use during winter months.

Most spokespersons stated that medicinal plants could be stored indefinitely as long as it was stored correctly. Only spokesperson 17 maintained that plants would lose their medicinal activity even if they were stored correctly, but that correct storage would increase the length of time that it remained effective.

Medicinal plants were 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.

The correct way to store medicinal plant material, according to spokespersons who stored these it, was to keep it out of direct sunlight and wind in a cool, dry place. They achieved this by storing plants in cool parts of a house out of direct sunlight in plastic or paper bags, newspaper and glass-, metal- or plastic jars.

3.3.8 Preparation and dosage forms

3.3.8.1 Preparation

The majority of ethnoveterinary remedies (64 %) utilised single ingredients, alone or with a vehicle for administration. Spokespersons who utilised mixtures of active components stated that it made their remedies more potent. Non-plant material utilised in mixtures included salt, sodium permanganate, donkey faeces and orthodox medicines.

Plant parts that were commonly utilised in remedies, such as roots, bulbs, tubers, root-stocks and corms (Figure 3.8) were available throughout the year. A high proportion of remedies (20,7 %) utilised leaves. This high proportion is due to the frequent use of leaves of *Aloe* spp., especially *Aloe marlothii*, which are available throughout the year. The proportion of remedies in which plant parts were used that was not available during some periods of the year, such as fruits and seeds, was comparatively low.

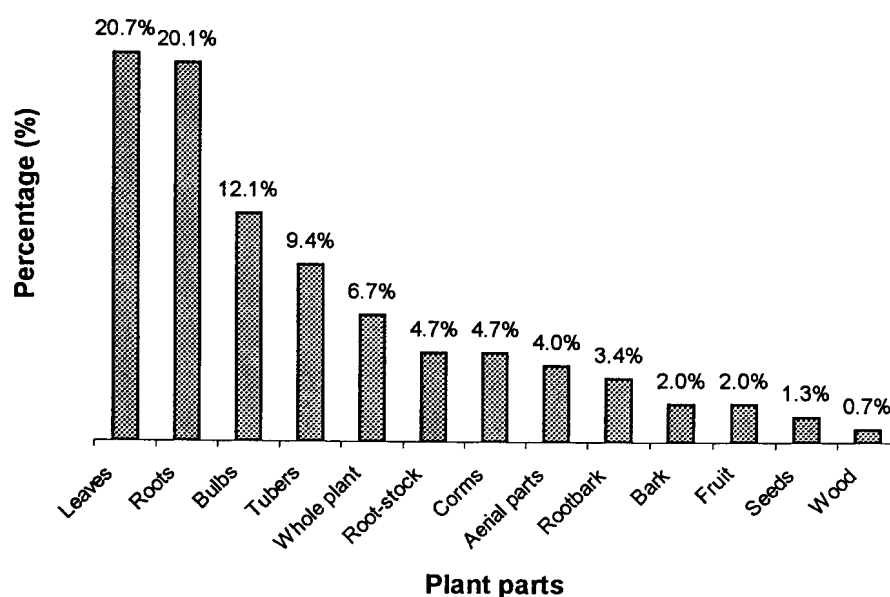


Figure 3.8: Proportions of remedies containing specific plant parts (n=137)

Watery extracts were the most commonly utilised preparation method (Figure 3.9). Infusions and decoctions comprised 82 % of the total number of remedies. In 13 % of remedies, either an infusion or a decoction could be used depending on the circumstances. Infusions generally took longer to prepare than decoctions. Decoctions could be prepared in a few minutes if boiling water was available, while infusions usually required plant material to be soaked for hours. Infusions, however, were easier to prepare, because it was not necessary to warm water to boiling point to make infusions. Infusions were therefore preferred when rapid preparation of a remedy was unnecessary or when it was inconvenient to heat water to boiling point for the preparation of a decoction. Infusions and decoctions were preferably made from fresh material. When fresh plant

material was not available, dried material was used using the same preparation methods as that used for fresh material.

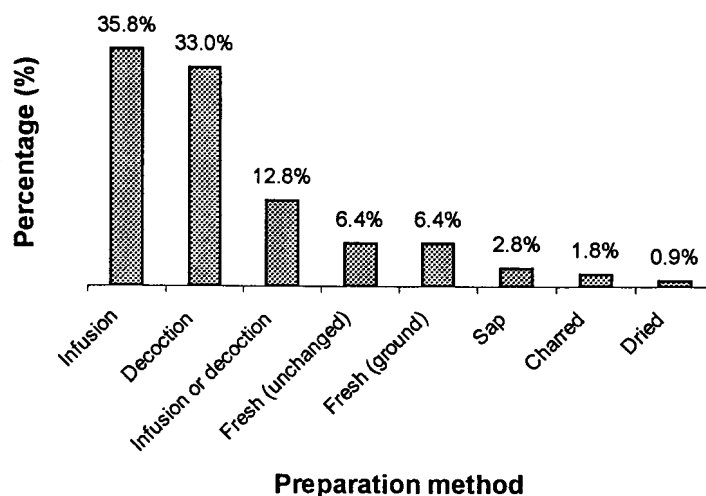


Figure 3.9: Proportions of remedies utilising specific preparation methods (n=109)

Fresh material was utilised unchanged when using bark for making splints to treat fractures and aloe leaves were used unchanged to cover burns except for cutting the fleshy leaves open. Aloe leaf sap and the sap of *Solanum* fruit were expressed by hand. Ground fresh material was mixed with coarse salt to form licks.

Charring was used to prepare remedies for the treatment of fractures. Roots were charred directly in a fire or were placed on a piece of corrugated iron over a hot fire until totally blackened. It was then ground to a fine powder and used as a powder or mixed with a vehicle such as cream or fat to make an ointment.

3.3.8.2 Dosage forms

Liquid dosage forms intended for oral dosing were utilised in 83 % of the recorded ethnoveterinary remedies (Figure 3.10). Dosing was usually done per os using a bottle, but Spokesperson 12 dosed liquids through the nose, also using a bottle. These remedies

were all watery extracts made by infusion or decoction of plant material and other ingredients.

Ground plant material was mixed with coarse salt and other ingredients such as molasses to form licks. All licks contained a large proportion of salt. Molasses was used to improve the palatability of licks, but it was only used when it was available.

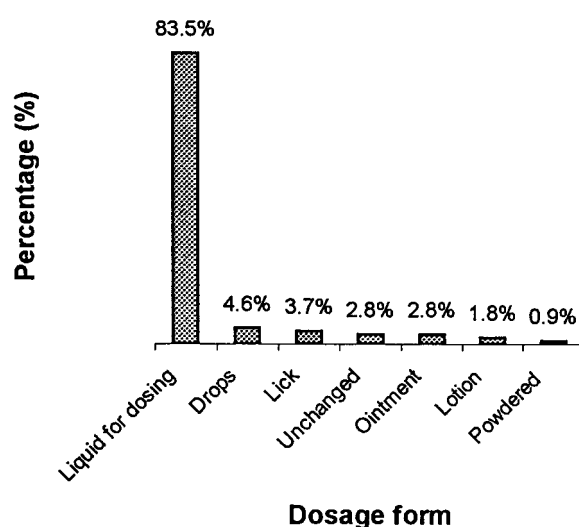


Figure 3.10: Proportions of remedies utilising specific dosage forms (n=109)

All parenteral dosage forms were applied topically. Liquid dosage forms were applied as lotions or eye drops. Powders were used topically in eye treatments. Other topical dosage forms were ointments and the topical application of aloe leaves to burns.

3.4 DISCUSSION

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 (Beebe 1995 and Chambers 1992). It is often superior to traditional methods

of investigation in rural communities and is recognised as a powerful approach to surveys in rural communities. It has been used successfully in the fields of agroecosystem analysis, farming systems research and applied anthropology (Chambers 1992).

The main strength of RRA is based on its simplicity and adaptability. Traditional methods rely on questionnaires that are prepared in advance. The deficiency of traditional methods is that all the 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 (Beebe 1995).

In this study, ethnoveterinary information was collected through three techniques: interviews, observations and guided field walks. According to the findings of Maundu (1995), a combination of techniques increased the accuracy and detail of information obtained from spokespersons.

Group interviews had a higher rate of information generation. The accuracy of information is 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 (Maundu 1995). Individual interviews with particularly knowledgeable participants of group interviews minimised the disadvantages of group interviews.

Guided field walks were an exceptionally valuable technique for gaining information about ethnoveterinary plant use. There may be several reasons for this:

- Spokespersons often learned about ethnoveterinary plant use from their teachers

through guided field walks. They were therefore familiar with the concept.

- Spokespersons were often more at ease while walking through the veld and tended to share information more readily.
- Seeing the plants often resulted in spokesperson's remembering things about the plants that were omitted during interviews.

The range of indications for the use of traditional remedies and the description of animal health problems by spokespersons was similar to that reported by farmers in general. The range of indications was also similar to that found among Zulu-speakers (Cunningham & Zondi 1991). During a recent survey to determine the adequacy of veterinary drug supply in the study area, farmers mentioned a number of health problems affecting their cattle including gallsickness, anaplasmosis, heartwater, redwater, botulism, shoulder stiffness, stiffness, 3-day stiffsickness, blackquarter, lumpy skin disease, mastitis, abscessation of the udder, brucellosis, abortions, dystocia, retained placenta, preputial prolapse, external abscesses, internal abscesses, calf diarrhoea, corynebacterial abscessation, calves not gaining weight, footrot, hard nodules in the skin, warts, sweating sickness, sudden death of cattle, eye problems, swollen liver on post mortem and pasteurellosis.

Descriptions of typical symptoms associated with diseases were, however, vague or variable in many instances (R Gehring, University of Pretoria, pers. com., 1999). Vagueness and variability in the way disease terms were used by spokespersons in the study area were often a complicating factor when information given by spokespersons were interpreted. The Setswana term: "*gala*", was probably derived from the Afrikaans names for bovine anaplasmosis: "*galsiekte*" or "*droë galsiekte*" (Potgieter & Stoltz 1994). It was used for most conditions that lead to poor appetite, lethargy and weight loss without any obvious cause. It was sometimes used to describe a disease accompanied by constipation. This disease was likely to be bovine anaplasmosis – which is often characterised by poor appetite, rumen stasis and dryness of the faeces (Potgieter & Stoltz 1994). Bovine anaplasmosis is known to occur in the area (Directorate of Veterinary Services 1998). Heartwater, referred to as *semê* by most spokespersons, were often stated

to be a cause of both morbidity and mortality in goats and cattle. Heartwater (cowdriosis) usually leads to the death of untreated animals (Bezuidenhout, Prozesky, Du Plessis & Van Amstel 1994). It is therefore likely that conditions that lead to nervous system abnormalities in livestock in the study area without mortality are not due to heartwater. The term *semê* therefore does not necessarily refer to cowdriosis.

The sources of the ethnoveterinary knowledge of spokespersons in the study were similar to the sources of knowledge for practitioners of traditional human medicine among Tswanas (Reyneke 1971) viz. verbal teaching from members of the community who have knowledge of traditional healing, experience gained through the use of traditional healing methods and information obtained from ancestors. Information obtained from ancestors was less important among farmers and other laypersons than among traditional healers. The occasional inclusion of modern, orthodox medicines in a traditional remedy is an indication of the changeable and dynamic nature of ethnoveterinary knowledge and practice.

Traditional disease theories, as described by Kriel (1992) and Reyneke (1971), were similarly applied to animal diseases by only two spokespersons. Natural causes of disease and the allopathic use of herbal remedies was the norm among spokespersons. It differs fundamentally from the dominant traditional disease theories of professional practitioners of human traditional healing. It could also indicate that younger generations are abandoning some traditional beliefs or that traditional disease philosophies are generally not applied to animals.

Change in the Tswana traditional knowledge system is illustrated by the medicinal use of *Schkuhria pinnata*. It was introduced to South Africa during the last century (Bromilow 1995). The medicinal use of this herb by Tswana people is therefore a relatively recent addition to their cultural knowledge system. This same principle is illustrated by the use of plant remedies in combination with modern orthodox medicinal drugs and chemicals.

Traditional healers did not perceive orthodox medicine as a threat to their traditional healing practices. It may be indicative of the differences in disease theory and approach between traditional and orthodox healing methods. The two services fulfil different needs within the community, which largely limits competition.

The belief of one spokesperson that it was important to tie medicine bundles with *G. flava* bark, because it prevented medicines from losing its power (*maatla*) is a facet of the traditional belief in the metaphysical power characteristics contained in medicinal plants recorded by Reyneke (1971). It is believed that the power contained in plants may be lost due to improper handling and storage, even if the power is not a physical property of the plant. Associations of traditional healers in South Africa advocate storage conditions for medicinal plants in accordance with those recorded in the study (Van Wyk *et al.* 1997).

Some spokespersons shared the Tswana belief in mythological creatures, sometimes described as “snakes”, “worms” or “crocodiles”, that can inhabit the inside of the body and cause disease described by Reyneke (1971). Remedies reported for use against worms may actually be for the removal of these mythological creatures that cause non-specific disease conditions.

A large proportion (36 %) of remedies consisted of mixtures of different substances perceived by spokespersons to be active, rather than a single active on its own or mixed with an inactive vehicle. Mixtures may alter the biological activity of active substances contained in plants and may have activities that are absent when isolated components are used (Bruneton 1995).

All three plants used in remedies for constipation, viz. *Senna italica*, *Ricinus communis* and *Aloe marlothii* (Table 3.4), are known to have purgative effects (Hutchings *et al.* 1996, Kellerman, Coetzer & Naudé 1988, Mabogo 1990 and Watt & Breyer-Brandwijk 1962). These remedies could provide symptomatic relief of the dry faeces associated with bovine anaplasmosis, but will not necessarily treat its underlying cause.

All parts of *Senna italica* have purgative effects (Hutchings *et al.* 1996). It is used in human traditional medicine for helminthiasis and intestinal complaints including diarrhoea and constipation (Watt & Breyer-Brandwijk 1962). These human uses were also encountered in the study area and it was applied similarly to conditions affecting the gastrointestinal systems of animals. The plant's high tannin content may explain its medicinal uses as an antidiarrhoeal (Bruneton 1995 and Watt & Breyer-Brandwijk 1962). It also contains oxymethylanthraquinone, which is responsible for its purgative effects (Bruneton 1995, Watt & Breyer-Brandwijk 1962). Leaves of *Senna* spp. are used in pharmaceutical laxatives (Watt & Breyer-Brandwijk 1962).

Ricinus communis is a well-known plant, used in human traditional medicine (Van Wyk *et al.* 1997). Castor oil, expressed from the seed, does not contain the toxic toxalbumin, ricin. Ricin is insoluble in the oil and remains behind in the pomace after the oil has been expressed (Kellerman *et al.* 1988). Castor oil is an effective purgative (Iwu 1993 and Van Wyk *et al.* 1997). The laxative effects are due to ricinoleic acid, which is released in the small intestine through hydrolyzation of castor oil. It stimulates intestinal secretion, promotes motility and decreases glucose absorption (Longe & DiPiro 1989). The seeds are also used for their purgative effects (Watt & Breyer-Brandwijk 1962). Veterinary uses include a Zulu remedy for calves that refuse to suckle. Powdered seeds are placed on the calves's tongues (Watt & Breyer-Brandwijk 1962). Remedies that utilise unprocessed seeds include the toxin ricin, cause severe purgation and must be used in small dosages to prevent ricin toxicity. The plant's rootbark is used to treat colic in horses (Iwu 1993).

Aloes of various species were extensively used as cure-alls since ancient times in many parts of the world. It still forms the bases of a large commercial industry in health-care products (Van Wyk *et al.* 1997). *Aloe marlothii* was the most important ethnoveterinary medicinal plant used in the study area. The range of indications for which it was utilized was diverse and sometimes apparently contradictory, such as its use for both diarrhoea and constipation. *A. marlothii* is used widely in southern Africa for stomach complaints. It is also used by the Zulus as a remedy for roundworm infestation. Leaf decoctions are used for horse sickness (Hutchings *et al.* 1996). 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 (Hutchings *et al.* 1996). 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 (Bruneton 1995). Aloe extracts inhibit histamine release from rat mast cells. It offers an explanation for the anti-inflammatory use of aloe extracts (Hutchings *et al.* 1996).

The use of plants to treat retained placenta in cows was recorded throughout the study area and showed a high degree of uniformity between spokespersons, as indicated by an unusually high number of spokespersons using a limited number of remedies (Figure 3.5). The relative uniformity of remedies used to treat retained placenta may be related to the uniformity of the symptoms associated with the condition and the relative ease with which retained placenta can be diagnosed without specialised knowledge or equipment. 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. This belief is prevalent in Tswana culture (Reyneke 1971). Reports also indicate the use of *D. eriocarpum* for retained placenta in cows and in women (Mabogo 1990 and Watt & Breyer-Brandwijk 1962) and as an aid to parturition in cows (Watt & Breyer-Brandwijk 1962). The Vhavenda use it as a soap substitute (Mabogo 1990).

Spokespersons 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 (Eiler & Hopkins 1993). 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 (Eiler and Hopkins 1993). The normal variation of time to release of the placental membranes of cows in an untreated population is similar to the variation in time to placental membrane release reported by spokespersons using traditional remedies. It is therefore possible that the confidence of spokespersons regarding the effectiveness of their remedies is not due to the biological effects of their remedies. This is not to say, however, that these plants are devoid of biological activity. Saponins 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. Not all saponins show all the listed effects and specific saponins have their own specific range of effects (Bruneton 1995). Controlled studies to evaluate the biological activities of saponins contained in plants used for retained placenta in cows are necessary.

Two species utilized to treat redwater, *Rhoicissus tridentata* and *Urginea sanguinea* (Table 3.16), have reddish coloured underground parts. This is possibly an example of the “doctrine of signatures”, where the reddish colour of the urine is linked to a haematological (blood) condition. The colour of the plant parts used to treat the condition should also be red in colour (B-E van Wyk, Rand Afrikaans University, pers. com., 2000).

Withania somnifera, used in the study area to treat calf diarrhoea, is a very important medicinal plant in Ayurvedic medicine in India. It is also used in southern Africa for wide-ranging indications including wound healing, for inflammation, abscesses, rheumatism and syphilis. In Ayurvedic medicine, the plant is considered hypnotic and sedative. The plant is chemically complex, containing more than 80 compounds and has been the subject of numerous studies. Its biological effects include antibiotic, cytotoxic and anti-inflammatory activities (Bruneton 1995 and Van Wyk *et al.* 1997). Its effects in cases of calf diarrhoea could be worth investigating.

The use of *Tribulus terrestris* to treat bloat was reported by one spokesperson. The presence of saponins in the plant stabilises foam in watery extracts (Prof C. Botha, University of Pretoria, unpublished observations, 2000). When introduced into the rumen of cattle, plant extracts may therefore worsen cases of frothy bloat. *Pouzolzia mixta* roots were also used by one spokesperson to treat bloat. Watery extracts of the roots have a markedly soapy character which, when dosed to an animal, may help to dislodge objects that block the oesophagus in cases of free gas bloat due to oesophageal obstruction. Cases of frothy bloat, however, could be worsened. Its use to treat bloat by persons who are unable to differentiate between frothy and free gas bloat should therefore be discouraged.

Plants that are known to contain high amounts of tannin formed an important group of ethnoveterinary medicinal plants in the study area. Tannins are naturally occurring phenolic compounds of plant origin, which can form cross-linkages between macromolecules (Griffiths 1991 and Leffler 1973). The medicinal properties of tannins rely on the ability of tannins to bind to macromolecules and to form bonds between macromolecules. Bonding between macromolecules in solution causes precipitation. Macromolecules that can be precipitated by tannins include cellulose, pectins and proteins (Bruneton 1995). The most important functions of tannins in the plant are protection against herbivores by reducing digestibility and palatability of plant material (Griffiths 1991), protection of damaged plant tissues and protection against penetration of pathogens (Salisbury & Ross 1978). Most biological properties of tannins are due to their ability to form complexes with proteins (Cooper & Owen-Smith 1985). These proteins may include viral-, fungal- and bacterial proteins as well as enzymes, such as digestive enzymes, and proteins associated with skin or mucous membranes (Bruneton 1995). The rationale for the use of tannins in the treatment of diarrhoea is its antimicrobial- and astringent effects, which limit fluid loss. In the case of damage to skin and mucous membranes, tannin-protein complexation limits fluid loss and forms a physical barrier to further tissue insult. They also have a vasoconstrictive effect on small blood vessels that limits bleeding and oozing of fluids through damaged skin or mucous membranes (Bruneton 1995).

Spokespersons used tannin-containing plants with a high degree of confidence to treat diarrhoea and burns in animals. The potential benefit of using these plants is well established (Bruneton 1995, Van Wyk *et al.* 1997 and Watt & Breyer-Brandwijk 1962). Remedies prepared from these plants may offer a viable alternative to the use of orthodox medicines, if the plants used do not induce toxic effects and the plants are utilised in a sustainable manner.

Medicinal uses included:

- Diarrhoea (*Acacia tortilis*, *Sclerocarya birrea*, *Senna italica*, *Rhus lancea*, *Peltophorum africanum*, *Elephantorrhiza elephantina* and *Ziziphus zeyheriana*),
- Burns (*Ziziphus mucronata*), and
- Blood cleansing (*P. africanum* and *S. birrea*).

These uses are similar to the most important uses of tannins in human medicine, which include the treatment of diarrhoea, to protect against burns, abrasions, and other conditions where the protection of underlying tissues by skin or mucosa is compromised (Bruneton 1995). Tannins are, however, not the only active constituents in plants that are used against diarrhoea. Other compounds may have biological effects, which are unrelated to the effects of tannins, which could have beneficial effects in cases of diarrhoea (Frost 1941 and Galvez, Crespo, Zarzuelo, De Witte & Spiessens 1993).

Splints were made from sheets of bark, cut from *Sclerocarya birrea* and *Acacia karroo*, to treat longbone fractures. Bark sheets were wrapped around the affected limb with the inner bark facing the patient's skin. The bark's suitability for the making of splints is due to its 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 (Els 1996 and Watt & Breyer-Brandwijk 1962). Strips of bark from *Grewia flava* were used to tie plant parts that are to be used medicinally into bundles after it is harvested. The bark of *G. flava* is tough and pliable and can be tied into tight knots without breaking.

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 (Pooley 1998 and Van Wyk *et al.* 1997). *A. zebrina* proved ineffective in a test for antibacterial activity (Watt & Breyer-Brandwijk 1962). 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 (Van Wyk *et al.* 1997).

The diuretic effect of *Asparagus* tuber extracts in humans reported in the study area could be similar to the effect of *Asparagus officinalis*, which has diuretic effects, possibly due to saponins with steroidal genins (Bruneton 1995).

The use of *Jatropha zeyheri* to treat transmissible venereal tumour (TVT) in dogs was reported by only one spokesperson. *Jatropha* species, in common with many other members of the Euphorbiaceae, contain diterpenoids (Kinghorn 1984 and Van Wyk *et al.* 1997). Diterpenoids are cytotoxic, with proven anti-tumour properties. They are also severe irritants and may promote tumour formation under certain conditions (Kinghorn 1984). Further investigation of the anti-tumour effects of compounds in *J. zeyheri* could be fruitful.

A number of plants that were used medicinally in the study area have potentially dangerous toxic effects *viz.*:

- *Boophane disticha* (Forbes 1986, Gordon 1947 and Van Wyk *et al.* 1997)
- *Croton gratissimus* (Bryant 1966, Hecker & Schmidt 1974, Kinghorn 1984 and Watt & Breyer-Brandwijk 1962)
- *Jatropha zeyheri* (Kinghorn 1984 and Van Wyk *et al.* 1997)
- *Phyllanthus* spp. (Watt & Breyer-Brandwijk 1962)

- *Ricinus communis* (Kellerman *et al.* 1988)
- *Spirostachys africana* (Els 1996, Gelfand, Mavi, Drummond & Ndemera 1985, Palmer & Pitman 1972 and Watt & Breyer-Brandwijk 1962)
- *Solanum incanum* and *S. panduriforme* (Steyn 1949)
- *Urginea sanguinea* (Hutchings *et al.* 1996, Kellerman *et al.* 1988 and Watt & Breyer-Brandwijk 1962)
- *Withania somnifera* (Arseculeratne, Gunatilaka & Pannabokke 1985 and Watt & Breyer-Brandwijk 1962)

Although side effects or toxicity associated with the medicinal use of these plants in animals in the study area was rarely encountered, it should be used with caution. Its use by laypersons should be discouraged, unless it is used in the context of ethnoveterinary medicine in ways that have been shown to be of benefit or at least not harmful.

CHAPTER 4

THE IMPACT OF ETHNOVETERINARY PLANT USE ON MEDICINAL PLANT POPULATIONS

4.1 INTRODUCTION

Extensive and growing use of medicinal plants in South Africa has placed medicinal plant populations under threat (Cunningham 1990). The social and environmental consequences of over-exploitation of medicinal plant populations affect the rural poor and those who might have used these resources in future (Cunningham 1989).

In the current study, attempts to determine the impact of ethnoveterinary plant use on plant populations through interviews alone were unsuccessful. Spokespersons in the study area were not able to provide reliable estimations of the frequency and extent of medicinal plant gathering. They generally gathered these plants only when needed. Plant use was often intermittent with long periods of little or no plant use followed by short periods of intensive plant use. Spokespersons kept no records of plant use and the estimations made by spokespersons tended to vary widely.

Spokespersons held varied opinions on the impact of the gathering of medicinal plants on plant populations. Professional traditional healers maintained that certain popular medicinal plants for human use were becoming more difficult to find around towns.

Some spokespersons also had difficulty to find medicinal plants during field walks around towns where, according to them, the plants were common in previous years. Farmers claimed that the availability of plants they used for treatment of their animals remain stable. Popular medicinal plants, such as *Aloe marlothii* and *Dicerocaryum* spp. are abundant and are likely to tolerate a degree of harvesting for medicinal purposes.

An objective of the current study was to obtain more reliable data on the impact of ethnoveterinary plant use on medicinal plant populations, through a direct survey of representative vegetation.

4.2 MATERIALS AND METHODS

4.2.1 Study area

The Madikwe Game Reserve and its surrounding area was chosen for a study site because it is situated in an area where the gathering of medicinal plants was confirmed during the earlier phases of the project. The reserve is enclosed within an electrified fence that prevented public access to medicinal plants in the reserve since 1992. Before the establishment of the reserve, the area was used primarily for extensive cattle farming (Hofmeyer 1997).

Zacharias (1994) described the plant communities within the reserve. These plant communities were used as a basis for selecting sample areas. Two plant communities, divided by the fence of the Madikwe Game Reserve on the western border of the reserve, where farmers living in Supingstad had access to grazing land that bordered directly on the reserve fence, were selected.

The sampled vegetation communities represented a broad-leaved and a microphyllous community (Zacharias 1994) (Figure 4.1):

- The broad-leaved plant community occurs on shallow dolomitic soils in a central band across the reserve from West to East. *Combretum apiculatum* with *Vitex zeyheri* and *Tarchonanthus camphoratus* are the dominant tree species. Other tree species include *Grewia* species, *Ximenia americana*, *Rhus lancea*, *Sclerocarya birrea*, *Ozoroa paniculosa* and *Combretum* species. The dominant grasses are *Heteropogon contortus*, *Enneapogon scoparius*, *Panicum maximum* and *Panicum coloratum* and various *Eragrostis* and *Aristida* species (Zacharias 1994).
- The microphyllous plant community occurs in the north-western and north-eastern areas of the reserve. The soil in the sample area is mostly sandy loam interspersed with bands of black turf. The tree layer consists of *Acacia erubescens* associated with *Acacia mellifera*, *Acacia burkei*, *Acacia nigrescens*, *Boscia foetida*, *Boscia albitrunca*, *Dichrostachys cinerea*, *Euclea undulata*, *Grewia flava*, *Pappea capensis*, *Rhus lancea*, *X. americana*, *Ziziphus mucronata* and various *Combretum* and *Maytenus* species. Grasses include *Bothriochloa insculpta*, *Chloris virgata*, *Cymbopogon excavatus*, *Digitaria tricholaenoides*, *Enneapogon scoparius*, *Eragrostis rigidior*, *Heteropogon contortus*, *Panicum maximum*, *Schmidtia papophoroides* and various *Aristida* species (Zacharias 1994).

4.2.2 Trial design

4.2.2.1 Transects

A transect approach was used in the form of belt transects. Transects entail the surveying of vegetation along a line. A belt transect incorporates vegetation surveyed for a specified distance on either side of a line (Kent & Coker 1996).

A stratified sampling design was used. Sampling areas were determined first and then transect sites within the sampling areas were randomly selected (Kent & Coker 1996). Sampling areas were selected to represent typical vegetation of plant communities (Zacharias 1994) containing plant species that are used medicinally in cattle in the area. Sample areas had to have similar soil characteristics, aspect and slope gradient on both

sides of the reserve fence. The presence of medicinal plant species and free access to land directly adjacent to the reserve fence by the Supingstad community served as the main selection criteria. Other criteria were accessibility to the sampling sites by road and vegetation structure that would enable vegetation sampling while walking on foot. Ecotones were avoided.

Two sample areas (Figure 4.1) were chosen. Three sample sites were then selected randomly within each sample area.

Fence poles were used to describe the location of sample sites. A hand held Global Positioning System (GPS) receiver (Garmin GPS 12) was also used to describe the transect locations in terms of their geographical positions (Table 4.1).

Transects were surveyed from fixed positions on both sides of the reserve fence. A pole, two meters in length, was used to determine the width of the belt along transect lines. The pole was also used to determine the direction of the transect from the starting point by letting it fall blindly in a direction away from the reserve fence. The direction in which it fell was followed during the transect. The transect lengths were determined by the density and distribution patterns of medicinal plants. Transect lengths were increased until further increases in transect lengths did not lead to subjectively detectable variations in density estimations for most surveyed plant species. A maximum transect length of 600 m was used on either side of the fence.

4.2.2.2 Survey procedure

Only plant species with ethnoveterinary indications, recorded during the preceding phases of the research project, were surveyed. Floristic data, i.e. species presence/absence and abundance, were recorded rather than physiognomic or structural data.

Data was recorded on standardised field data sheets. Transect site data (Table 4.2) recorded for each site included date, locality, transect name, habitat type (grassland,

savanna, wetland etc.), substrate, basic soil structure (sand, loam, clay), moisture regimen (well drained, poorly drained), slope, aspect (north-, west-, south- or east facing slope) and biotic effects (grazed, burned, trampled etc.). Only medicinal plants rooted within the belt transects were recorded. Plant data included species codes and positions on the transect line. Plant positions were described in terms of their distance (m) along the transect lines from the transect starting points.

4.2.2.3 Statistical analysis

Belt transects were divided into 20 m long portions to form adjacent sample plots of 40 m². The total number of plants of each medicinal plant species within each sample plot was calculated. The numbers of plants per sample plot of sample plots inside the reserve were compared to those outside the reserve. The Mann-Whitney Rank Sum Test was applied in Sigmastat for Windows Version 2.0 (Copyright 1992-1995 Jandel Corporation) to determine if there were true differences in plant densities found inside and outside the reserve (95 % confidence level). The Mann-Whitney Rank Sum Test was applied to each surveyed plant species in both vegetation communities.

Table 4.1: Starting points of belt transects used to determine plant densities inside and outside the Madikwe Game Reserve

Name	GPS* reference	Vegetation community
Abjater 1	24° 47' 798 S, 26° 10' 066 E	Broad-leaved
Abjater 2	24° 47' 686 S, 26° 10' 008 E	Broad-leaved
Abjater 3	24° 47' 527 S, 26° 09' 935 E	Broad-leaved
Suping 1	24° 41' 941 S, 26° 08' 382 E	Microphyllous
Suping 2	24° 42' 156 S, 26° 08' 445 E	Microphyllous
Suping 3	24° 42' 312 S, 26° 08' 502 E	Microphyllous

* GPS = Global Positioning System

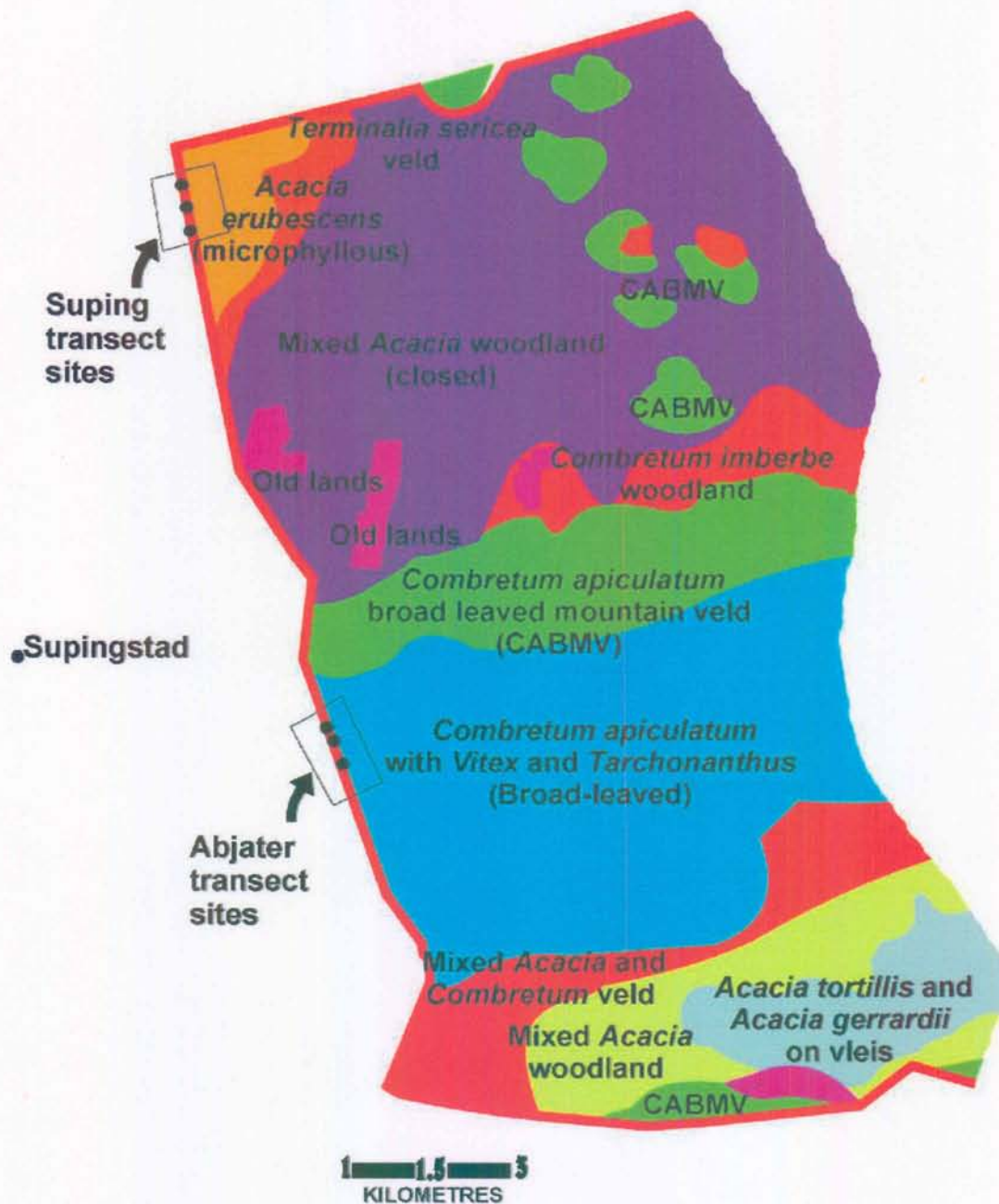


Figure 4.1: Vegetation communities of the western region of Madikwe Game Reserve (adapted from Zacharias 1994) and transect sites

Table 4.2: Transect site data

	Transect name					
	Suping 3	Suping 2	Suping 1	Abjater 3	Abjater 2	Abjater 1
Date	7/4/1999	7/4/1999	7/4/1999	7/4/1999	7/4/1999	7/4/1999
Locality	2 nd supported fencepost south of Suping 2; next to dead Marula tree	3 rd fencepole south of double-fencepole south of Suping 1	5 th fencepost south of the north-western corner of the reserve	1 st fencepole north of large leadwood tree north of Abjater 3	2 nd supported fencepost north of Abjater 1	1 st 3 legged fence post N of Abjaterskop Gate
Habitat type	plateau	plateau	plateau	plateau	plateau	plateau
Substrate	soil	soil	stony soil	rocky soil	rocky soil	rocky soil
Basic soil structure	sand / loam	sand	sand	loam	loam	loam
Moisture regime	well-drained	well-drained	well-drained	well-drained	well-drained	well-drained
Slope	none	none	none	gentle	none	none
Aspect				West		
Biotic effects	none seen	none seen	none seen	none seen	none seen	none seen

4.3 RESULTS

A total area of 3600 m² was surveyed in the broad-leaved vegetation community inside and outside the reserve. In the microphyllous vegetation community 3200 m² was surveyed inside the reserve and 3600 m² outside the reserve. Fifteen plant species with ethnoveterinary indications, recorded during the earlier phases of the research, occurred in the surveyed areas. Their densities in the sampled vegetation are summarised in Table 4.3.

Table 4.3: Average medicinal plant densities (plants per hectare) inside and outside Madikwe Game Reserve

Species	Broad-leaved vegetation community		Microphyllous vegetation community	
	Inside reserve	Outside reserve	Inside reserve	Outside reserve
<i>Acacia tortilis</i>	11	14	53	64
<i>Asparagus laricinus</i>	0	3	35	44
<i>Aloe marlothii</i>	0	3	0	0
<i>Boophane disticha</i>	0	8	0	3
<i>Elephantorrhiza elephantina</i>	325	925	33	0
<i>Grewia flava</i>	0	3	125	183
<i>Jatropha zeyheri</i>	100	39	67	44
<i>Ozoroa paniculosa</i>	86	83	3	0
<i>Rhus lancea</i>	250	58	0	3
<i>Schkuhria pinnata</i>	1005	1222	202	11
<i>Solanum incanum</i>	117	58	2	6
<i>Solanum panduriforme</i>	2194	680	1551	372
<i>Terminalia sericea</i>	83	0	3	14
<i>Ziziphus mucronata</i>	11	3	18	31
<i>Ziziphus zeyheriana</i>	19	0	0	0

Statistically significant differences between plant densities inside and outside the reserve were found for *Elephantorrhiza elephantina* ($p = <0.0001$) in the broad-leaved vegetation community and *Solanum panduriforme* ($p = 0.012$) in the microphyllous vegetation community. *Elephantorrhiza elephantina* occurred in significantly higher densities outside the reserve than inside the reserve (Figure 4.2), while *S. panduriforme* occurred in significantly higher densities inside the reserve than outside (Figure 4.3).

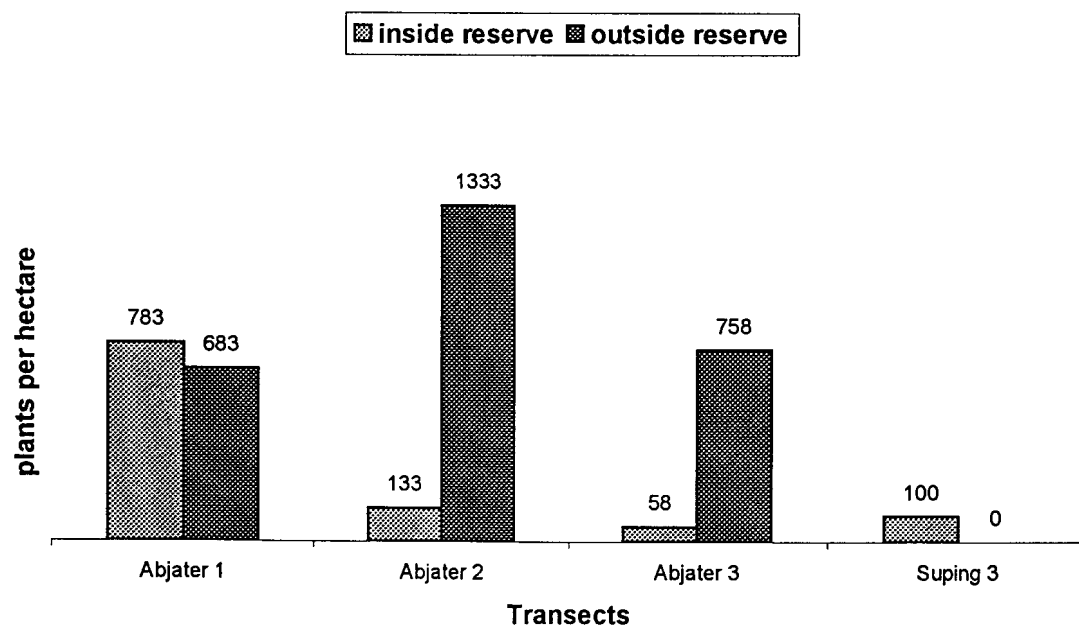


Figure 4.2: *Elephantorrhiza elephantina* - plants per hectare inside and outside the reserve

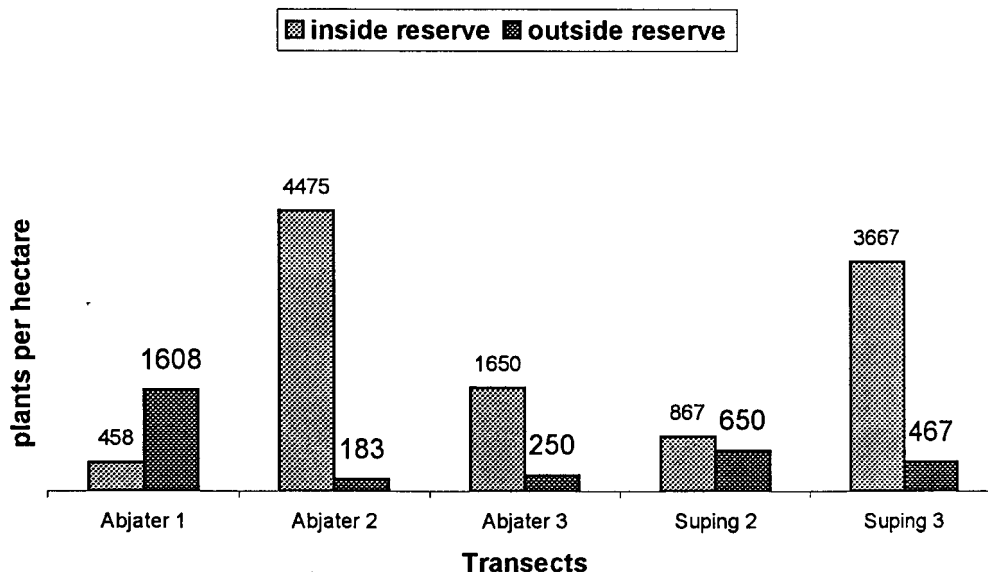


Figure 4.3: *Solanum panduriforme* - plants per hectare inside and outside the reserve

4.4 DISCUSSION

Floristic data is less open to individual interpretation than physiognomic and structural data, enhancing the repeatability of survey data between surveyors (Kent & Coker 1996). The limited number of medicinal plant species simplified the identification of plants and will restrict variation in plant identification between surveyors if the same vegetation is surveyed again in the future.

Plant uses in the area by local communities also include harvesting of plants for human medicines, building materials, firewood and other domestic uses. These factors should be considered if differences in population densities inside and outside the reserve are noted.

The survey determined plant density changes between the inside and the outside of the reserve that developed since the completion of the game fence in 1992 to the date of the survey in April 1999. An absence of significant differences in plant densities, assuming that no poaching occurs, can therefore not be interpreted as a total lack of forces that will lead to differences in plant densities. It can only be concluded that such forces, if any, did

not lead to significant changes in population numbers since 1992. It is unlikely that protection from harvesting for seven years will reflect the potential changes in plant densities – especially regarding woody plant species that are not destroyed through harvesting and with life expectancies far in excess of seven years.

Higher densities of *Elephantorrhiza elephantina* outside the reserve than inside the reserve may be due to the effects of grazing by cattle outside the reserve. Cattle are relatively non-selective grazers. The bulk of the feed intake of cattle consists of grass, which may exert significant grazing pressure on the grass layer of a vegetation community. When wild ungulate densities are low or not present while cattle numbers remain high, the relative herbivore pressure on woody vegetation is low compared to the pressure on the grass layer. Such selective herbivore pressure on vegetation can lead to changes in vegetation composition (Owen-Smith 1999). *E. elephantina* is a strong competitor for moisture and is relatively unpalatable to livestock (Bromilow 1995). In dry areas, where there is also significant grazing pressure from cattle, it can therefore increase in density when competition from grasses is reduced. This could explain its lower density inside the reserve than outside the reserve, where herbivore pressure on the vegetation is less selective due to the presence of a greater variety of herbivore types.

Another factor that may have influenced the density of *E. elephantina*, is the possible higher frequency of veld fires outside the reserve. Being a geophyte, *E. elephantina* may be stimulated to coppice profusely after a veld fire.

Solanum panduriforme tended to form dense stands under spreading tree canopies in the surveyed area. Grazing pressure by cattle generally promotes increased establishment of woody species in southern African savanna plant communities (Smit, Richter & Aucamp 1999). Subjective assessment of the density of woody species revealed an obvious difference in tree densities between the inside and the outside of the reserve, with a higher density outside the reserve. A dense tree layer limits space for spreading tree canopies that could result in fewer ideal micro-habitats for stands of *S. panduriforme*. Objective assessments of tree densities and vegetation structure in the sample areas are

needed to adequately describe the differences in the tree layer of the vegetation inside and outside the reserve.

The survey suggested that the impact of ethnoveterinary medicinal plant gathering around the Madikwe Game Reserve is not a significant determinant of medicinal plant density. A possible explanation could be that limited food resources for cattle in the study area limits cattle numbers. Increases in human populations that leads to increases in demand for medicinal plants for human use therefore do not apply to the same extent to the local use of, and demand for, medicinal plants for use in cattle.

The long-term effects of medicinal plant collection on medicinal plant communities around the reserve could not be established. This can only be determined by regular monitoring over an extended period.

CHAPTER 5

GENERAL DISCUSSION AND CONCLUSION

The Setswana-speaking communities of the North West Province have a rich heritage of ethnoveterinary knowledge. The medicinal use of indigenous flora forms an important part of this knowledge, which includes all aspects of medicinal plant usage. Ethnoveterinary remedies are still an important part of animal health care in the area.

The study reflects prevailing ethnoveterinary uses of plants in the study area, which is the result of the cultural evolution of the Tswana people. The incorporation of plants and substances in traditional remedies that only became available in the modern era indicate the dynamic and progressive nature of ethnoveterinary knowledge.

The use of ethnoveterinary remedies can be shown to be rational in terms of known biological effects of the plants used in some instances. An example is the use of tanni-containing plants to treat diarrhoea. Most cattle owners used traditional remedies allopathically, a small minority perceived the action of their remedies to be due to mystical properties of the remedies. It differs from the view of professional traditional healers recorded by Reyneke (1971), that the action of traditional remedies is primarily mystical in nature. It could be an indication of acculturation among Tswana people in favour of modern Western viewpoints, that animal health is generally viewed differently from human health or that laypersons' viewpoints differ fundamentally from those of professional traditional healers. Cattle owners generally treated their own animals with traditional remedies, without the help of professional traditional healers.

Traditional remedies were recorded for most health problems affecting cattle in the study area. The most common indications for the use of traditional remedies were retained placenta, diarrhoea (especially in calves) and *gala*, a nonspecific term indicating loss of appetite, loss of condition and lethargy. Cattle owners perceived these to be common problems in their cattle and generally expressed great confidence in the efficacy of their

traditional remedies. The range of ethnoveterinary knowledge recorded in the study was similar to that found among Zulu-speakers (Cunningham & Zondi 1991).

Spokespersons with substantial ethnoveterinary knowledge were mostly older, more experienced people. The most important sources of ethnoveterinary knowledge for cattle owners were verbal teaching from older or more experienced members of the community, followed by observations of traditional healing practices by others and their own experience. No written records of ethnoveterinary records were encountered. Most young people seek employment opportunities in urban areas (Bosman 1995), 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.

Medicinal plant densities in surveyed vegetation types to the West of Madikwe Game Reserve, which are used for animal treatment only, do not differ significantly from medicinal plant population densities inside the reserve. This indicates that medicinal plant harvesting is not currently reducing medicinal plant numbers significantly. Populations will probably not suffer from over-exploitation if the current animal numbers do not increase dramatically and habitats are not destroyed. However, this stable situation could change if these plants become commercially valuable, without the establishment of an acceptable and adequate supply of plant material other than the natural vegetation. Medicinal plants could attain a commercial value if an increased demand for these plants is created. Promoting the wide use of these plants for medicinal purposes should therefore not be undertaken if the stability of plant population numbers is not guaranteed.

Plants that are used to treat human health problems and plants that are used in both humans and animals are under more severe threat from over-exploitation – especially in areas close to towns. Growth in human populations that utilise medicinal plants results in increased demand for medicinal plants, and subsequent over-exploitation of sensitive plant populations. As the mismatch between supply and demand grows, the commercial

value of medicinal plants increase. This creates an incentive for resource-poor communities to add to their income through poaching of medicinal plants. Methods to increase the sustainable supply of medicinal plants and/or decrease the demand should be investigated, evaluated and implemented to ensure the sustainable use of medicinal plants.

Research goals that should be adopted to ensure the long-term benefits for people from ethnobotany and traditional medicine in southern Africa were formulated by a working group at the Conference on the Conservation and Utilisation of southern African Botanical Diversity held in Cape Town in 1993 (Cunningham 1994). They stated that research methodologies should be developed through consultative and participatory approaches to:

- Affect policy and policy-makers by making the influence of ethnobotany on development and economics known.
- Develop alternatives to overexploited resources through changes in conservation, agriculture and forestry programmes and appropriate technologies.
- Derive the highest possible economic benefit from the use of indigenous plants in production systems on a regional scale.

In the area of ethnoveterinary knowledge, these goals of ethnobotany will be served best through research programmes that aim at the following objectives:

- Comparative studies should be carried out in other regions of South Africa to provide a comprehensive database on ethnoveterinary medicinal plants and ethnoveterinary practises. It should include other ethnic groups, production systems and vegetation types.
- Pharmacological studies to determine active components, their biological effects, toxicity and interactions; these are needed to make objective assessments of the medicinal potential of plant components.

- 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 and distribution. The aim should be to find and promote viable alternatives to orthodox medicines that will reduce total expenditure on animal health.

Where applicable, intellectual property rights must be respected by researchers and developers. Where intellectual property rights are unclear or undefined, the ethical principles suggested by Cunningham *et al.* (1992) should be followed.

CHAPTER 6

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