

Ethnobotanical survey of medicinal plants used in treatment of ticks

Plantas medicinales de Sudáfrica usadas en el tratamiento de ácaros

Magwede K¹, MP Tshisikhawe¹, D Luseba², RB Bhat¹

Abstract. The documentation of traditional knowledge on medicinal use of plants has provided many important drugs that are used worldwide on a daily basis. Traditional remedies had been (and still are) the main source of livestock ailment treatments, especially in regions of poor resources of the Vhembe District, South Africa. In many rural areas of the Republic of South Africa, traditional medicine is sometimes the only available modern orthodox health care for managing both human and animal health. Much work remains to be done regarding the documentation of the existing ethnobotanical knowledge. In this work, we report an inventory list of ethnoveterinary, medicinal plants used in treatment of tick infested wounds. Sampling was made in the Vhembe District, Limpopo Province, South Africa through interview surveys. A list of 25 medicinal plants was compiled from 4 local municipalities within the District. Some plants were more frequently mentioned than others. Knowledge about the ethnoveterinary plant use differed between sex and age groups within the municipalities.

Keywords: Traditional knowledge; Traditional remedies; Ethnobotanical; Orthodox health care; Ethnoveterinary; Medicinal plants.

Resumen. La información disponible del uso de las plantas con propósitos medicinales ha provisto muchas drogas importantes que son usadas diariamente a escala mundial. Varios remedios tradicionales han sido (y son) usados como la fuente principal para el tratamiento de enfermedades del ganado, especialmente en regiones pobres en recursos del Distrito Vhembe, Sudáfrica. En muchas áreas rurales de la República de Sudáfrica, la medicina tradicional es a veces la única disponible para el tratamiento de la salud tanto humana como animal. Queda mucho por hacer con respecto a proveer información del conocimiento etnobotánico existente. En este trabajo, informamos una lista de especies vegetales medicinales etnoveterinarias, utilizadas en el tratamiento de heridas infestadas por ácaros. El muestreo se efectuó en el Distrito Vhembe, Provincia de Limpopo, Sudáfrica efectuando entrevistas. Se obtuvo una lista de 25 plantas medicinales a partir de cuatro municipalidades de dicho Distrito. Algunas especies vegetales fueron mencionadas más frecuentemente que otras. El conocimiento acerca del uso vegetal etnoveterinario difirió entre grupos de edad y sexo en humanos, y entre las municipalidades.

Palabras clave: Conocimiento tradicional; Remedios tradicionales; Etnobotánica; Cuidado ortodoxo de la salud; Etnoveterinaria; Plantas medicinales.

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INTRODUCTION

In South Africa, as in many other developing countries, the rich cultural diversity is reflected in the use of plants as medicines. It has been estimated that up to 60% of South Africa people consult traditional healers, in addition to making use of orthodox, medical services (Van Wyk et al., 1997). The World Health Organization estimates that 80% of the people living in developing countries use almost exclusively traditional medicines (Eloff, 1997). For animal healthcare in South Africa, it appears that the owners of livestock generally treat their animals using their own medicinal plant knowledge, rather than consulting traditional healers (Masika & Afolayan, 2002). Many plants are used for ethnoveterinary purposes in South Africa, particularly in rural areas (McGaw et al., 2007). South Africa has a large percentage of the global floral diversity and a long cultural tradition on the use of medicinal plants (McGaw et al., 2008). Eloff (1997) reported that South Africa contains 10% of the world plant diversity, but little chemical work has been done on medicinal plants. On other hand, ethnobotanical studies have been more often significant in revealing locally important medicinal plant species. In recent years, South African researchers have ventured into ethnoveterinary medicine investigations with promising results (McGaw & Eloff, 2008). Natural products continue to play the most significant role in the drug discovery and development processes (Eloff 1997; Newman & Gragg, 2007). Through ethnobotanical surveys, about 122 drugs from 94 plant species have been discovered (Fabricant & Farnsworth, 2001). There is an encouraging potential for the discovery of structurally diverse metabolites with useful pharmacological activities from South African plants (McGaw & Eloff, 2008). The documentation of traditional knowledge on medicinal plant use has provided many important drugs that are used worldwide on a daily basis. Traditional remedies had been, and still are, the main source of livestock ailment treatments, especially in regions of poor resources such as the Vhembe District. Traditional medicine is sometimes the only available modern orthodox health care for the management of both human and animal health in many rural areas of the Republic of South Africa (Luseba & Van der Merwe, 2006). Much work remains to be done regarding the documentation of the existing ethnobotanical knowledge in such areas (McGaw et al., 2008).

South Africa boasts of a unique and diverse botanical heritage with over 30000 plant species of which 3000 are used therapeutically (Van Wyk et al., 1997). Not only is the South African flora rich in diversity, but it is also mostly endemic (Mulholland, 2005). In addition to this unique botanical heritage, South Africa has a cultural diversity on traditional healing, which belongs to each ethnic group (Van Vuuren, 2008).

Most indigenous people in Vhembe district have valuable information on the use of traditional plants for treating livestock

(cattle) ailments and their parasites. This valuable knowledge could be of great importance for obtaining new antibiotics with fewer side effects, when compared with novel synthetic chemicals already in use. It can also contribute to reduce use of expensive novel synthetic chemicals by offering more choices for medication in poor-resource countries where livestock parasitism is an issue. This knowledge has been developed through observation and trial and error techniques developed over long period. It has been passed from one generation to the next through oral presentation without being documented.

In many cases, these indigenous societies become extinct at an even faster rate than the ecosystems of the region they have traditionally inhabited (Tshisikhawe, 2002). Much of the information is under threat of being lost, as traditional social patterns are disturbed and many young people move away to cities, thereby breaking the cycle of oral and visual transfer of this specialized knowledge (Schillhorn Van Veen, 1997). If this information is not collected on time, it will be lost as the older generations disappear. Maintenance of such knowledge is part of the Indigenous Knowledge effort, as well as part of an overall move toward protecting biodiversity (Schillhorn Van Veen, 1997). The Veterinary Faculty in Debre Zeit (Ethiopia), for example, has initiated a systematic study with the major objective of collecting baseline information on traditional practices and beliefs, to identify and characterize (veterinary) medicinal plants, and to establish a garden for further use of such plants in validation studies (Schillhorn Van Veen, 1997). Such ideas could also be applied in the Vhembe District.

The current antibiotics are facing the challenge of microbe resistance strains due to long-term exposure to such antibiotics. The antimicrobial compounds from plants may inhibit bacteria by different mechanisms than those currently present in the antibiotics, and may have clinical value in the treatment of resistant microbial strains (Eloff, 1997).

This study aimed at recording information on the traditional practices of plant use as an alternative cattle acaricide and antibiotic in the Vhembe District. Objectives included: to (1) document the botanical name of the used plants, (2) record the plant part used, and (3) register the preparation and administration techniques for the plant extracts obtained. In this study, only people with knowledge of ethnoveterinary plant usage were included in the survey, except where the age group was not represented.

MATERIALS AND METHODS

Study area. The study was conducted in the Vhembe district municipality in South Africa, within Limpopo Province (Fig. 1). The Province was named after Limpopo River, which constitutes the border line between South Africa and Zimbabwe. The district name was also adopted from the Limpopo river local name in Tshivenda (“Vhembe”) given by the Vhav-

enda people. The district is comprised of four local municipalities, namely: Makhado, Thulamela, Messina and Mutale. There are also conservation areas close to international borders like the Gonarezhou Nature Reserve in the Republic of Zimbabwe, and other smaller reserves in Botswana and Mozambique.

The vegetation of the area includes two vegetation types within the savannah biome; mixed Lowveld Bushveld and Mopani Bushveld (Low & Rebelo, 1998). The area has a wet and hot summer with a mean temperature of 30 °C, and a dry and cool winter with a mean temperature of 18 °C (Luseba & Van der Merwe, 2006).

The Vhembe district is comprised of three ethnic groups: Vhavenda, Pedi and Tsonga. These ethnic groups form an integral part of the traditional medicine practice in the Vhembe District. The Vhavenda people are the main ethnic group of the district, followed by Tsonga and lastly the Pedi.

Data collection. The information on indigenous medicinal use was collected from all four local municipalities through interviews. The systematic sampling method was used only on those candidates who owned or were taking care of cattle; the elders within such communities were also interviewed. Participants were interviewed using open ended questions through

administration of a semi-structured questionnaire. The informants were asked about the importance of ticks and the problems they caused. Also, they were asked on how they treated their cattle after the negative effects of ticks (especially, the wounds inflicted by ticks) using plant materials. Further, they were asked about the timing for plant material collection, preparation, administration and the reason why they selected to use plant extracts. Elders of the community that were having cattle in their household were also interviewed. This was made to check if there was ever a change in the plant use pattern due to age gaps between the elders and the young people who were herding the cattle.

Detailed information on interviewee age, sex, village and the municipality were recorded. From the mentioned plant species, only those most frequently used were sampled and collected for testing. Plant parts were collected following research assistant recommendations. All information regarding the plant species used was recorded including local name, plant part used, and the preparation and administration, respectively. All plant species were identified with the help of a knowledgeable member of the community. Plants were botanically identified in the Department of Botany Herbarium at the University of Venda, where voucher specimens were deposited.

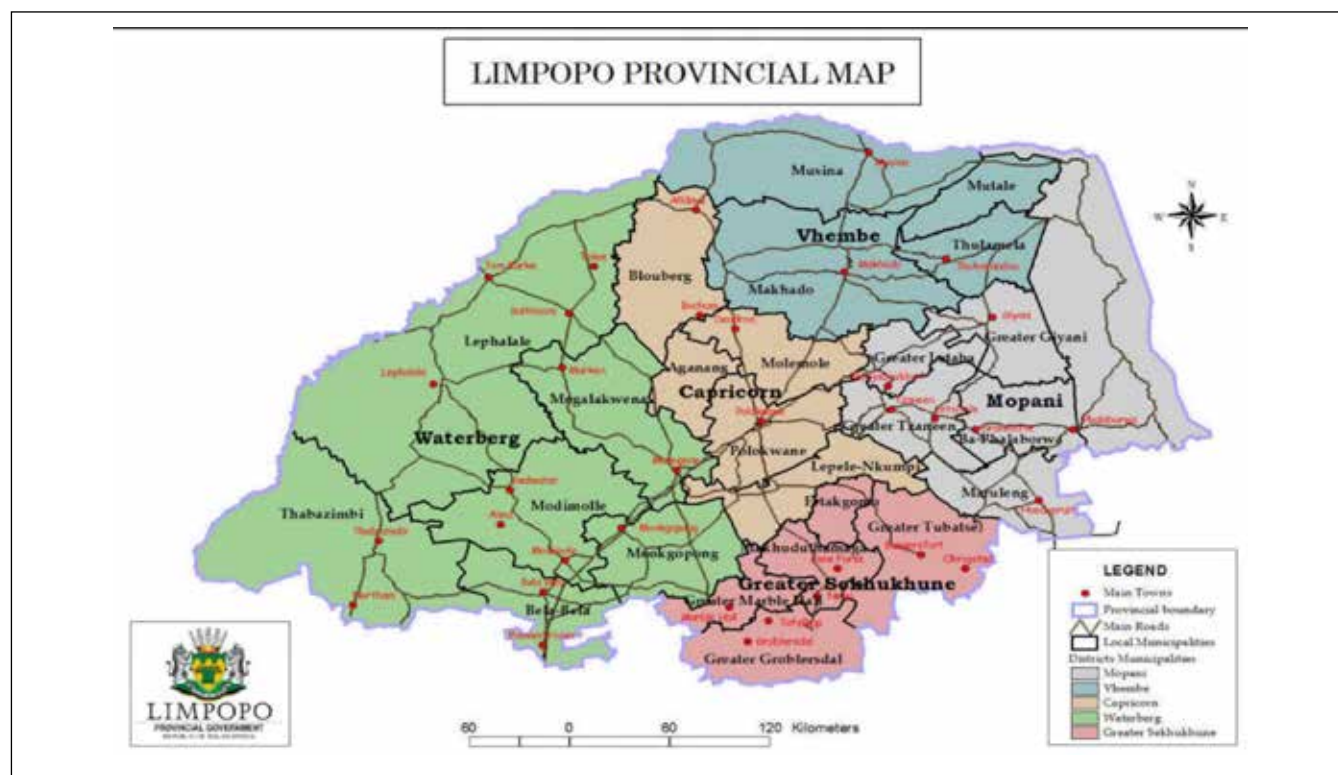


Fig. 1. A map of Limpopo Province showing the Vhembe District study area as part of the five District Municipalities (Courtesy of Thulamela Municipality).

Fig. 1. Mapa de la provincia Limpopo que muestra el área de estudio como parte de las cinco Municipalidades del Distrito (cortesía de la Municipalidad de Thulamela).

RESULTS

Informants profile. The information gathered shows that some farmers are still relying on plant extracts as a source of medication for their livestock. Figure 2 indicates the general percentage contribution of information given by interviewees on plants used for the treatment of tick-infested cattle wounds.

Most of the information for use of indigenous medicinal plants for treatment of tick-caused diseases increased with age of people (Fig. 2). The older the age group, the more the information recorded. A group that also contributed information, other than that of >65-year-old, included the males between 15-25 years of age. This is because people in this younger group act as collectors of medicinal plants. This young group sometimes escort elders, and help with digging and collecting plants difficult for the reach of elders. During this process, the young group gains knowledge on how to use ethno-veterinary medicine and the type of plant used. People from 26 to 35-year-old are working far away from home with insignificant contribution (Fig. 2) towards livestock rearing or herding. Knowledge of 46-55 years of age group might be attributed to the fact that they are working closer to their homesteads or mainly looking after the livestock. Females <15 years of age did not provide any information since they are not yet involved with livestock rearing (Fig. 2). Also, females between 26 and 35 years old are mainly involved with household chores, with very little or no interest in ethnoveterinary plant medicine practices.

In general, males showed more knowledge than females (Fig. 2). This might be attributed to the fact that they spend more time learning on livestock management in the household. Females have other responsibilities like taking care of the household activities.

Males contributed 69% of the information given about ethnoveterinary medicine plant use compared to 31% coming from the females (Fig. 3). This suggests that males have more knowledge on the treatment of cattle tick infested wounds. This 69% might also be attributed to the fact that cattle is critical for the subsistence of farmers, and some works during treatment of cattle wounds can only be done by males because of their greater strength compared to that of females. Females might have the knowledge but they still need male strength to aid in the administration of plant extract medications. Since males can perform such activities by themselves, the information about used plants remains unknown to women. Women only take care of cattle when

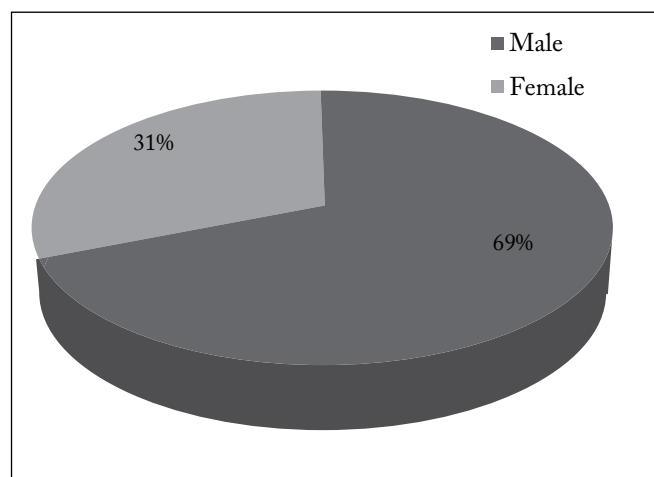


Fig. 3. Percentage information contributed by sex groups.
Fig. 3. Contribución porcentual de hombres y mujeres en relación a la información dada del uso de plantas como medicina veterinaria.

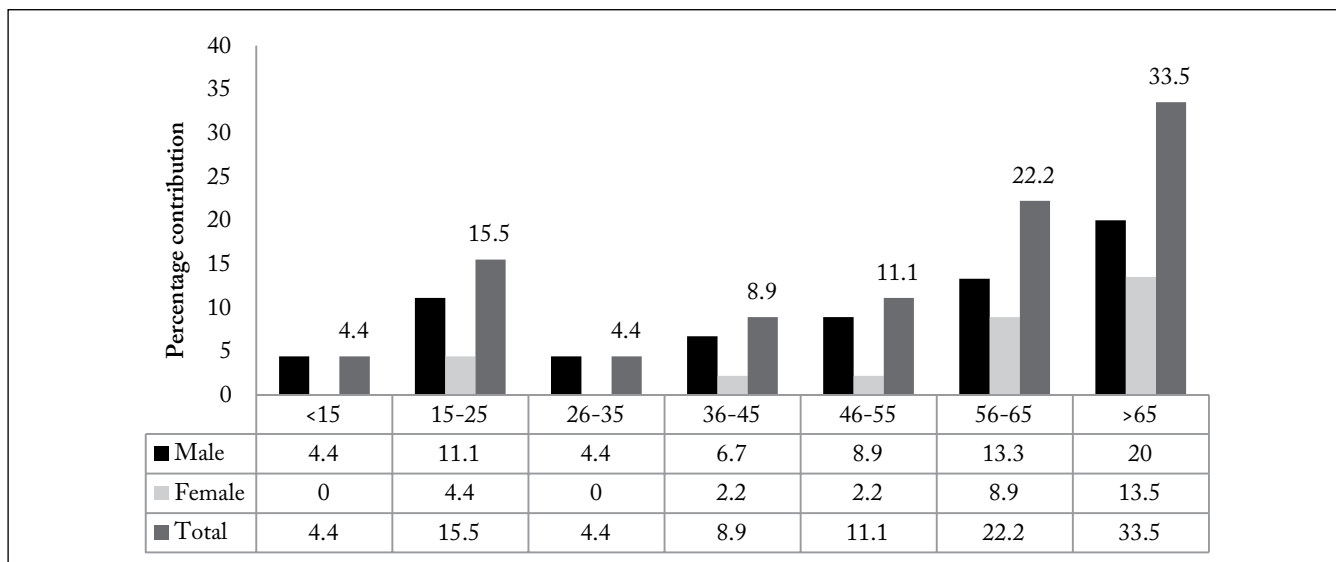


Fig. 2. Percentage contribution between different age groups.
Fig. 2. Contribución porcentual de hombres y mujeres de distintos grupos de edad que usan plantas para el tratamiento de heridas en ganado vacuno causadas por ácaros.

there is no male member in the family. Otherwise, cattle care is a responsibility of males.

Males contributed most of the information data (Fig. 3, Fig. 4). Different age groups contributed differently to make up the overall 69% of information obtained.

There was a steady increase of knowledge acquisition from >25 to >65 age groups. The exception was the male group interval of 15-25. This age group showed more knowledge than three other male groups, older than them (between 26 and 55 years old). This could be due to the fact that the 15-25 year-old group is at the disposal of much senior age groups ranging from 56 to >65. Members at senior level use group members of younger age for sample collection and helping with administration works, as they are always available and easier to work than any other age group. The age groups between 26 and 55 years old often have other jobs and have very little time to spend with the knowledgeable senior members or looking after the cattle. The information studied or acquired for these age groups deteriorates as they become more engaged with other activities (e.g., starting a family and providing for it at the same time). As they grow older, their responsibilities increase and their interest is influenced by the dynamic culture which provides new conventional approaches to solve problems of cattle ailments. It is this group that will opt to use conventional medicines if affordability is out of question. Most members of this group will grow to the age of 65 with very little information on cattle wounds infested by ticks.

The elderly age group has the best medicinal plant use knowledge for treatment of cattle infested wounds using plant extracts (Fig. 4). Most plants mentioned by elders over the age of 65 were mainly plants found far away from their homestead, and most of them were indigenous.

Girls <15 years old are keener on learning household responsibilities, and have little or no time to spend on looking after the cattle. Thereafter, they have no knowledge on plants used for the treatment of cattle tick infested wounds. Females at the age group

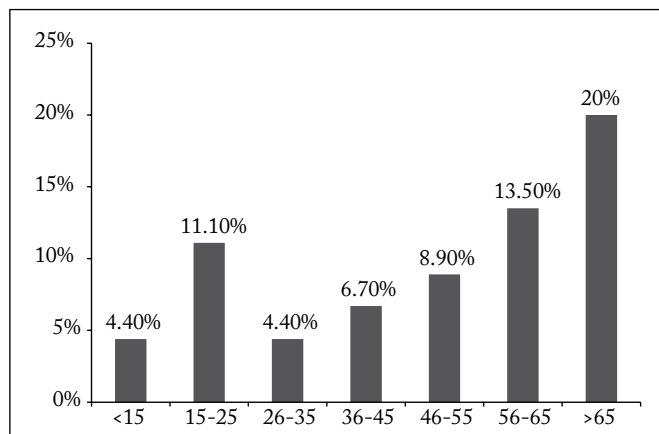


Fig. 4. Information percentage contributed within males.

Fig. 4. Porcentaje de información proveniente de grupos de hombres de distintas edades.

of 26-35 are (1) focused on rearing up their children and (2) responsible for household chores. The 16-25 year-old group contributed more information than groups between 26 to 55 years old. Females between age groups of 36-45 and 46-55 contributed the same information percentage because most of their acquired information was accidentally obtained through observation from the older age groups during administration.

Usage of plant species showed an insignificant degree of difference from one area to another, and within ethnic groups. It was influenced by the availability of plant species and of diseases or parasites. However, most interviewees mentioned the same plant species on several occasions. There was a similar usage of medicinal plants, showing consistency across ethnic groups in the Greater Giyani Municipality in the Limpopo province forming border with Vhembe District (Luseba & Van der Merwe, 2006). The same phenomenon was observed in the Vhembe District.

Medicinal plant knowledge within the Vhembe Municipalities. The amount of information contributed among the municipalities had some degree of difference in the usage of plant extracts for treatment of cattle wounds.

Interviewees around Mutale Municipality showed to be more knowledgeable than all other municipalities (Fig. 6). The lowest information was provided by the Musina Municipality (Fig. 6). This could be attributed to the fact that Mutale Municipality had more cattle farmers practising subsistence farming than any other municipality in the Vhembe District. Most of the land is used for local people dwellings, with little land left for commercial farming. In the Musina Municipality, most of the land comprised of agricultural, game and domestication livestock farms. Makhado Municipality is the second least contributing because of the same reasons. Most land in the Thulamela Municipality is predominantly occupied by dwellings, with very little land left for pasture grazing.

Plant species mentioned by the Vhembe District farmers (Table 1) were common from one area to another, with few plant species called differently at different municipalities, but used in the same way.

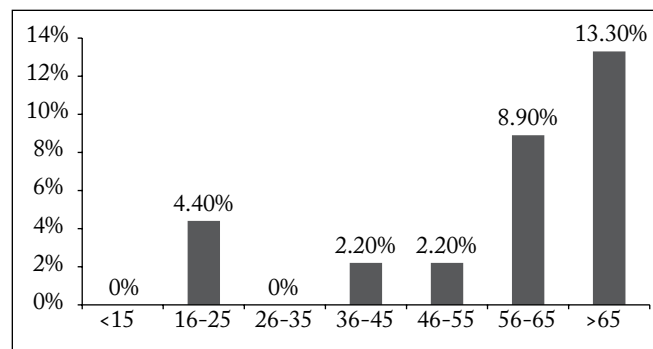


Fig. 5. Percentage contribution of information provided by the female age groups.

Fig. 5. Contribución porcentual de información provista por los grupos de edad femeninos.

Medicinal plant species most commonly mentioned during the interviewing process were only 13 (Fig. 7).

Cissus quadrangularis was the most mentioned plant species followed by *Synadenium cupulare*, and both were mentioned in all four municipalities as indicated in Figure 7. *Terminalia sericea*, *Solanum supinum*, *Tagetes minuta*, *Cassytha filiformis*, *Cassia sophera*, *Diospyros lycioides*, *Phlebotera violacea*, *Rauwolfia caffra* and *Rothmannia capensis* were variably mentioned from one municipality to another. The other plant species were only mentioned once per municipality.

Collection of medicinal materials. Most plant extracts are personally collected from the bush or homesteads by the

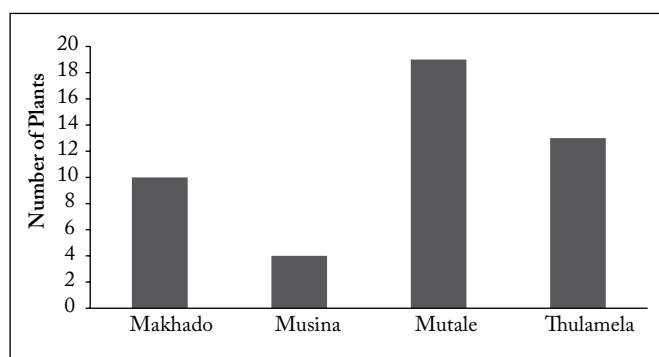


Fig. 6. Use of medicinal plant species mentioned per municipality.
 Fig. 6. Uso de especies de plantas medicinales por municipalidad.

farmers themselves. Some plant species are planted around the kraal as part of the fence for easy accessibility, and most are applied to cattle wounds as fresh paste or squeezed sap from crushed or ground material.

On plants parts used, bark was the most preferred form of plant material, followed by leaves, aerial parts, fruits, latex, tuber and roots (Fig. 8).

Methods of material preparation. One of the methods involved preparation of infusions, where plant materials are soaked in water and left for some time to allow the active ingredients to be exuded into water. Other plant materials were prepared as decoctions whereby the plant materials were boiled in water. Other plant materials were first allowed to dry, then ground to powder. Some others were freshly mashed to form paste, which is immediately applied on cattle wounds. Other plant extracts were obtained as juices after squeezing freshly broken leaves, twigs or bark. Juices were obtained by pressing the sap out of any plant part. Some infusions and decoctions involved mixing several different plants resulting in forming concoctions.

Administration techniques. Topical application of plants materials as paste or sap from freshly collected plant parts was found to be a common practice. Plant sap and paste were easily administered since they could be applied anywhere at any given time, provided the plant material was present. Infusions and plant decoctions were used only when the cattle was in the kraal, as they take time to prepare and administer.

Table 1. Medicinal plant species list used in the treatment of cattle wounds produced by ticks in the Vhembe district.

Table 1. Lista de especies vegetales tradicionales usadas en el tratamiento de heridas producidas por ácaros en ganado vacuno en el Distrito Vhembe.

Family	Botanical name	Common names [Venda (V) / English (E)]	Plant part used	Preparation and administration	Herbarium voucher plant specimen number
Apiaceae	<i>Cyclospermum leptophyllum</i> (Pers.) Sprague	Lufhelele (V) Fir-leaved celery (E)	Aerial parts	Ground and add water, then squeeze the liquids on wounds.	KMV004
Apocynaceae	<i>Rauwolfia caffra</i> Sond.	Munadzi (V) Quinine tree (E)	Bark	Applied as powder on wounds.	KMV018
Asteraceae	<i>Tagetes minuta</i> L.	Mushashathuri (V) Khakhi weed (E)	Leaves	The leaves are crushed and mixed with peri-peri (hot paper). Then applied on the wounds.	KMV001
Asteraceae	<i>Helichrysum kraussii</i> Sch.Bip.	Tshitambatshedzi (V) Straw Everlasting (E)	Aerial parts	The material is crushed. Then an infusion is prepared by stirring the solution to form foam, which is applied on wounds.	KMV017
Asteraceae	<i>Vernonia colorata</i> (Wild.) Drake	Phethane (V) Lowveld tree vernonia (E)	Leaves	Macerated with water, then ground and the liquid squeezed on wounds.	KMV002

Asteraceae	<i>Acanthospermum hispidum</i> DC.	Muvhavhanyane (V) Bristly Strabur (E)	Aerial parts	Ground the dried aerial material to powder and then applied on wounds.	KMV013
Combretaceae	<i>Terminalia sericea</i> Burch. ex DC.	Mususu (V) Silver cluster-leaf (E)	Roots	Roots are ground to pulp and mixed with water. The mixture is applied on the ticks and wounds.	KMV019
Ebenaceae	<i>Diospyros lycioides</i> Desf.	Muthala (V) Karoo blue bush (E)	Leaves	The leaves are crushed and mixed with water. The mixture is applied on the wounds.	KMV012
Euphorbiaceae	<i>Synadenium cupulare</i> (Boiss.) Wheeler ex A.C. White, R.A. Dyer & B. Sloane	Muswoswo (V) Dead-man's tree (E)	Latex	The latex is collected from leaves and stems, and then freshly applied on wounds.	KMV014
Euphorbiaceae	<i>Spirostachys africanus</i> Sond.	Muonze (V) Tamboti (E)	Bark	The bark is ground to pulp, and then applied on wounds.	KMV024
Euphorbiaceae	<i>Jatropha curcas</i> L.	Mupfure (V) Purging nut (E)	Latex	Latex from fresh twigs/leaves is topically applied on wounds.	KMV026
Fabaceae	<i>Peltophorum africanum</i> Sond.	Musese (V) African wattle (E)	Bark	The bark is ground into powder, and then topically applied on wounds.	KMV016
Fabaceae	<i>Cassia abbreviata</i> Oliv.	Munembenembe (V) Long-tail cassia (E)	Bark	The bark is ground and then mixed with water. The solution is applied on wounds.	KMV015
Fabaceae	<i>Cassia sophera</i> L.	Mutsheketsheke (V)	Aerial parts	Materials are ground to pulp while still fresh. Then squeeze pulp sap onto the wounds. Dry powder materials are topically applied as a wound dresser.	KMV005
Fabaceae	<i>Philenoptera violacea</i> (Klotzsch) Schrire	Mufhanda (V) Apple-leaf (E)	Bark	Bark is boiled in water. The solution is then used to wash the wounds.	KMV020
Fabaceae	<i>Pterocarpus angolensis</i> DC.	Mutondo (V) Kiaat (E)	Bark	Bark is ground to pulp, and then applied on wounds.	KMV010
Fabaceae	<i>Erythrina lysistemon</i> Hutch.	Muvhale (V) Common coral tree (E)	Bark	Fresh bark is crushed into pulp. The squeezed juice from the pulp is applied on the wounds.	KMV009
Fabaceae	<i>Xanthocercis zambesiaca</i> (Baker) Dumaz-le-Grand.	Mutshato (V) Nyala tree (E)	Bark	Ground bark is applied topically on the wounds.	KMV022
Fabaceae	<i>Elephantorrhiza elephantina</i> (Burch.) Skeels	Tshisesane (V) Sumach bean (E)	Tuber	The tuber is ground, and then pulp is applied on the wounds.	KMV021 (endangered species)
Lauraceae	<i>Cassytha filiformis</i> L.	Luangalala (V) Love vine (E)	Aerial parts	The fresh plant is ground to pulp. The pulp is smeared on the wounds.	KMV023
Ochnaceae	<i>Ochna bolstii</i> Engl.	Tshipfurenyana (V) Red-ironwood (E)	Leaves, twigs and bark	Leaves are ground, boiled and the solution is then used to wash the wounds.	KMV088
Rhamnaceae	<i>Ziziphus mucronata</i> Wild.	Mukhalu (V) Buffalo thorn (E)	Bark and leaves	Bark is soaked in water, ground into pulp and then used as a wound dresser.	KMV011
Rosaceae	<i>Prunus persica</i> (L.) Batsch	Muberegisi (V) Peach (E)	Leaves	Ground to pulp, then mixed with hot paper, and liquid squeezed on wounds.	KMV003
Rubiaceae	<i>Rothmannia capensis</i> Thunb.	Muratha mapfene (V) Wild gardenia (E)	Fruit	Fresh fruits are ground to pulp, and then applied on the wounds.	KMV027
Solanaceae	<i>Solanum aculeastrum</i> Dunal	Mututulwa (V) Goat bitter-apple (E)	Fruit	Fresh fruits are ground to pulp, and then applied on the wounds.	KMV025
Solanaceae	<i>Solanum supinum</i> Dunal	Mututulwa (V) Toothache bush (E)	Fruit	Fresh fruits are ground to pulp and then applied on the wounds.	KMV007
Vitaceae	<i>Cissus quadrangularis</i> L.	Malongekanye (V) Veld grapes (E)	Aerial parts	The fresh plant is ground to pulp, and smeared on the wounds.	KMV006

Plant families with most species in descending order were as follows: Fabaceae with eight species; Asteraceae with four species; Euphorbiaceae with three species, and Solanaceae with two species. The rest of the families had only one species each.

Las familias vegetales con más especies en orden descendente fueron: Fabaceae con 8 especies; Asteraceae con 4 especies; Euphorbiaceae con 3 especies, y Solanaceae con dos especies. El resto de las familias tuvo una especie cada una.

DISCUSSION

None of the subsistence farmers was recorded consulting or buying any extracts from the market or herbalists. Males were found to be more knowledgeable (Fig. 3) using plant products from higher plants that are found far away from the homesteads. On the other hand, females preferred to use herbaceous plant materials that are mostly found closer to the dwelling areas if not within homesteads. This shows that knowledge of plant extracts usage is not confined to a certain group of traditional professional, but distributed to all levels of the community member's strata. When there is lack of such information, it can be attributed to lack of interest or poor knowledge sources as the community members become older.

Within subsistence livestock farmers (mostly breeding cattle) in the Vhembe district, the use of medicinal plants extracts remains a common practice for treatment of cattle wounds (Table 1). Some farmers rejected using ethnoveterinary medication either based on the weakness of plant extracts or lack of knowledge (as indicated by most interviewees). Out of 87 cattle farmers interviewed, only 42 (28 males and 14 females)

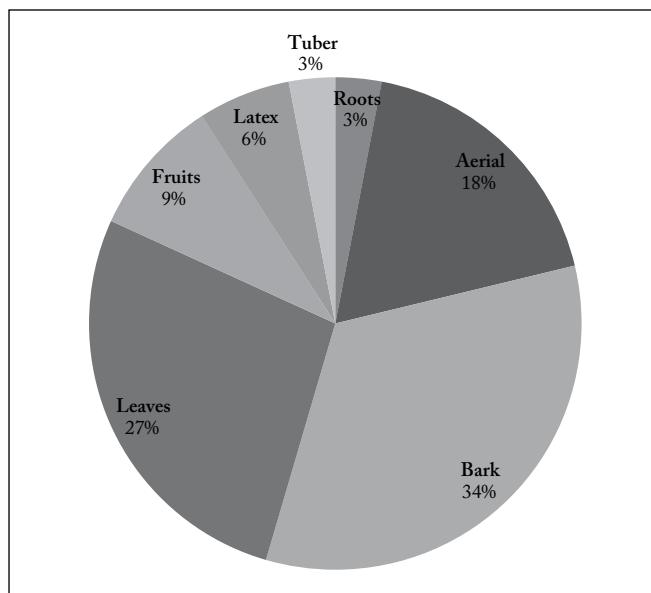


Fig. 8. Preferred plant parts as a percentage.

Fig. 8. Partes vegetales preferidas expresadas en porcentaje.

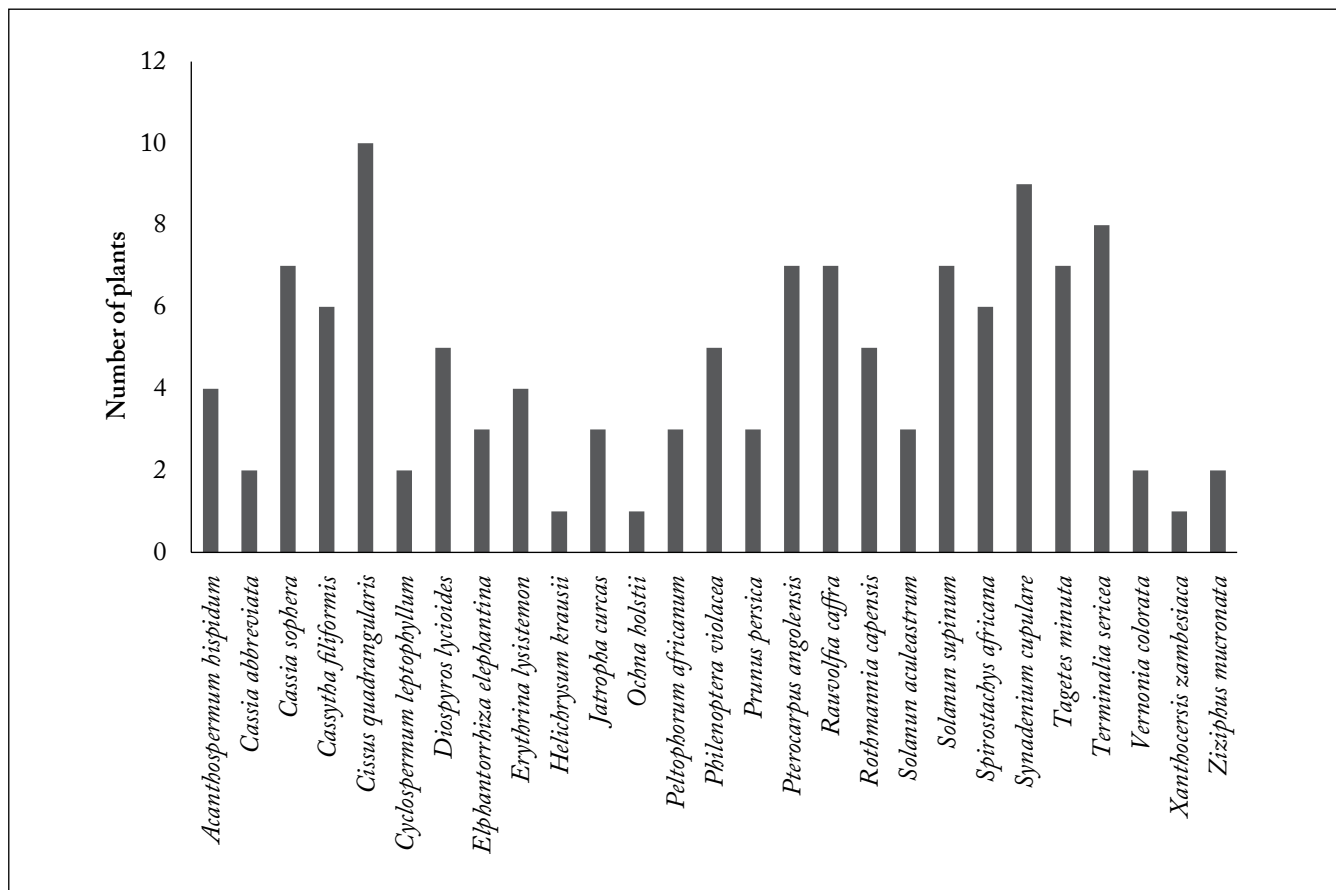


Fig. 7. Number of medicinal plant species mentioned during the interview.

Fig. 7. Número de especies de plantas medicinales mencionadas durante la entrevista.

were found knowledgeable. The number of knowledgeable members of the community was less than the total number of farmers approached. Amongst the 42 interviewees (Fig. 2), different reasons were stated as the driving force behind usage of plant extracts: (1) the low cost of medicinal plant extracts, (2) ineffectiveness of some conventional medicines used as unique drugs, and (3) the lack of knowledge in understanding the effects that use of the conventional medicines could cause. On extract preparation, certain farmers preferred to mix different plants together. For example, females reported mixing *Cassia sophera* and *Prunus persica* with ground, ripe, dry fruits of hot peppers. Another group amongst males mixed plant extracts with conventional medicine. For example, certain farmers reported a decoction prepared from the bark of *Philenoptera violacea* to have shown a stronger effect when mixed with the conventional acaricide. Both groups (i.e., males and females) claimed the synergistic effect of the mixed medications. Few of the plant extracts were reported to have been administered alone (e.g., *Terminalia sericea*).

During the interviews, several plant species were mentioned depending on their abundance from one area to another (Fig. 7). Users preferred certain plant species over others due to their availability, abundance and knowledge about them. For example, use of *Cissus quadrangularis* is widely spread within the Vhembe District, and most people obtained knowledge about its use. From all the species mentioned, certain families were more preferred than others (e.g., Fabaceae with eight species, Euphorbiaceae with three species, Solanaceae with two), most likely because of their effectiveness.

Bark (37%) was the most preferred plant material used while tubers and roots were the least preferred (Fig. 8). It appeared that the preference of the plant part used for animal health care differed from that used in human ethnobotanical usage. Plants traded at shops in the Thohoyandou and Sibasa areas (towns within the Vhembe District) consisted mostly of roots (61% of traded plants parts), and leaves (1%) and fruits (1%) were the least preferred (Tshisikhawe, 2002). In our study, roots (3%) were found to be the least preferred, while leaves (27%) and bark (34%) were the most used. The use of more leaves and bark than roots might be seen as a sustainable way of using plant material (unless the plant is ring-barked, which was quite rare during observations at the field), and should be encouraged in ethnobotanical human health care.

Most rural farmers only started to consider ticks as problematic when cattle developed wounds around skin areas that were heavily infested with ticks. In most areas of the district, people claimed to have bred Nguni cattle resistant to tick borne diseases (TBDs). They claim that the Nguni cattle have developed enzootic stability over long time periods of exposure to TBDs. Immunity or resistance to TBDs can be displayed as (1) a reduction in the number of ticks engorging on resistant hosts, (2) reduction in the weight of engorging ticks (especially on females), (3) prolongation of feeding time,

and (4) reduction in tick fecundity (Willadsen & Jongejan, 1999). It is recommended that the idea of incorporating immunity to cattle affected by tick-transmitted diseases deserves serious examination (Willadsen & Jongejan, 1999). This is because local farmers in the Vhembe District have claimed an increased TBDs resistance on cattle from earlier times to date. The nature of naturally acquired (protective) immunity against ticks is poorly understood, particularly on important domesticated ruminant hosts (Willadsen & Jongejan, 1999). Most of the tick-repellent plant extracts were discovered on the process of treating tick-infested cattle wounds. They have observed a reduction in tick numbers or tick load after plant extracts had been administered as medication. Most farmers believed that ticks bites were responsible for the softening of cattle hide. Ticks make small pore perforations during feeding on cattle skins. This can give way to the presence of other infective agents like microbes and fly larvae (resulting in maggot infection causing myiasis), which force opening the hide resulting in wounds.

Other areas in South Africa with conducted similar studies are: northern Kwazulu Natal (Cunningham & Zondi, 1991), Greater Giyani Municipality (Luseba & Van der Merwe, 2006), and Central Eastern Cape Province (Masika et al., 2000). In all these studies, ethnoveterinary medicine was an important part of animal's health care.

This is the first study on ethnoveterinary treatment of cattle tick-infested wounds within the Vhembe District. In the Eastern Cape, small scale farmers regard ticks as the main cause of cattle wounds (Moyo & Masika, 2009). The same attributes were found amongst the Vhembe District subsistence farmers. They claimed that when the same skin area (or hide) is over-infested by ticks over a long time period, it leads to wound formation. Tick bites were also recognised by farmers as the major cause of wounds on cattle skin in the Greater Giyani Municipality (Luseba & Van der Merwe, 2006).

Most subsistence farmers use indigenous medicinal plant extracts for treatment of livestock parasites, diseases and wounds. This is due to low cost of traditional remedies as compared with high price of synthetic, antimicrobial drugs and acaricides. Farmers claim that medicinal plants are more effective than pharmacy products for treatment of chronic pathologies. Medicinal plants have also the reputation of having no side effects and no waiting periods before meat consumption from treated animals, since plants are thought to be non-toxic (Luseba et al., 2007).

The World Health Organisation (WHO, 2001) reported that about 80% of the World's population, especially those in developing countries, rely on medicinal plants to treat various ailments. Results from the survey shown in Figure 7 indicate that subsistence farmers still rely on plants extracts since they are cost effective and easy to reach, when immediate responses are needed. In all four municipalities, some plant species might be discovered with a greater frequency than that men-

tioned by several interviewees from different municipalities. This highlights the effectiveness and the importance of such plant species in the treatment of cattle wounds (e.g., *Cissus quadrangularis*, *Synadenium cupulare*, *Tagetes minuta*, *Solanum supinum* and *Terminalia sericea*). These plant species were mentioned in all four municipalities under different names within one or between municipality villages. The rest of plant species were either mentioned in one or two municipality villages by one or more than one interviewees.

A similar study conducted in the Madikwe area amongst the Tswana Speaking people indicated the common use of some plant species reported in the Vhembe District: *Elephantorrhiza elephantina*, *Peltophorum africanum*, *Spirostachys africana*, *Terminalia sericea* and *Ziziphus mucronata* (Van der Merwe et al., 2001). This shows that the activity of such plants or knowledge about their use is known beyond the Vhembe District borders.

Most of the information in this study was transferred orally or through observation from generation to generation. Older generations provided more information and are keen on further using plant extracts. This explains their relatively high percentage contribution (33%) to knowledge of using plant extracts for the treatment of tick-caused wounds on cattle (Fig. 2). However, the younger generation are no longer keen on learning or using this knowledge. Our results agree with the report of Van der Merwe et al. (2001) in a study conducted at the Madikwe area. A major concern is that the information given orally might become distorted; thus, the oral transfer from one generation to the next might be soon broken (Soyelu & Masika, 2009). This adds to the fragility of knowledge about traditional medicine practices in Africa, and hence in the Vhembe District.

In medicinal plant usage, one cannot dismiss the conservation of the renewable natural resources (i.e., plants). Some farmers had recognised a need for medicinal plant conservation, and started to plant some of the medicinal plants around the cattle enclosures. That effort is not yet enough as only a handful of farmers are involved in that practice. Conservation of plant communities and species is not possible without scientifically documenting what plants are used, and the purpose of those. This indicated that intensification of research on this regard is urgent (Masika et al., 2000).

Results of this survey adds to our understanding of the various innovations and practices that subsistence farmers put into use to improve the health of their livestock (Soyelu & Masika, 2009).

CONCLUSION

Our results showed that use of plant extracts is still a common practice amongst subsistence farmers in the Vhembe District for treatment of cattle tick infested wounds. This is mostly due to their low cost, convenience and easy administration.

Some of the plant species had been reported to be effective as indicated by their high frequent use. However, little is known about their safety regarding toxicity level. Therefore, the need of further research on the techniques used by local people or farmers in redeeming plant extract use to lower, but still effective levels is eminent. It is known that indigenous people have used toxic plants over long time periods, developing techniques to reduce the toxic potential of plant extracts. These techniques need to be considered on further studies rather than only relying on conventional ways of determining plant extract toxicity. In determining the toxicity level of such plants, implementing conventional techniques that focus on only one plant species at a time is not good enough to make judgements on results of such techniques. All techniques used by indigenous people in manipulating plant extracts must be considered to understand the whole concept of plant toxicity redemption.

Vhembe District communities are not immune to the potential loss of indigenous medicine practices in favour of those conventionally used in Western Europe for health care. This warrants a need for an immediate scientific validation on the efficacy of the used plant extracts.

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