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An ethno-veterinary survey of medicinal plants used to treat bacterial diseases of livestock in three geographical areas of the Eastern Cape Province, South Africa.

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An ethno-veterinary survey of plants used to treat certain bacterial diseases of livestock in three geographical areas of the Eastern Cape was conducted during 2013 to 2014. A purposive sampling technique was carried out using a semi-structured questionnaire and field observations to document indigenous knowledge in 48 communal households. From the respondents of the 48 households, 64.6% men and 35.4% women were interviewed regarding their knowledge on the use of plants for the treatment of bacterial diseases in livestock. Ten, eighteen and twenty respondents were surveyed at Goso, Ciko and Upper Ngqumeya, respectively. Six plants species, belonging to 6 families were documented and claimed by farmers to be used for the treatment of black quarter and paratyphoid in cattle. Results obtained showed that *Agapanthus praecox Willd.*, *Sarcophyte sanguinea* and *Olea europaea* subsp. *africana* were used to treat black quarter, while *Strychnos henningsii*, *Acokanthera oppositifolia* and *Dalbergia obovata* were used to treat "perceived" paratyphoid in calves. Bark and leaves were the commonly used plant parts. Decoction and infusion were the main methods of preparation, while oral administration was the common route for treatment. Determination of the dose was done by using certain size bottles and plant parts by the handful as measurements. In the light of the present data, it can be concluded that, medicinal plants play a role in healthcare of livestock in rural communities.

Key words: Cattle diseases, communal, farmers, Eastern Cape, medicinal plants.

INTRODUCTION

The Eastern Cape holds huge and diverse livestock wealth, estimated to be composed of 7, 085 million sheep, 5, 867 million goats and 3, 300 million cattle of which seventy percent is owned by small-scale resource limited farmers (Livestock Statistics, 2015). Livestock are widely distributed in different agro-ecological zones where they are reared for products such as milk, meat, skin, mohair, hides and wool. They have great importance

as a source of income, draught power, fertilizer and cultural functions for small and landless farmers in rural areas (Githiga et al., 2005).

Farmers in communal production systems do not regularly apply recommended livestock management practices. The high prevalence of diseases in the communal sector poses serious problems for livestock development (Kiff et al., 1999). In different regions in Africa, livestock production is threatened with disease from various origins (Basheir et al., 2012). Diseases not only affect production but also affect import and exports of animal products. In order to get better returns on investment, animals under communal production systems need to be kept healthy and productive through the effective use of mobile veterinary services (Basheir et al., 2012).

In the past centuries, many ethno-veterinary medicines and their uses have been neglected due to the development of conventional drugs. However, as a result of the high cost of conventional medicines, unavailability and poor or lack of health care services in rural areas, traditional healers have made use of alternative methods of controlling livestock diseases (Harun-or-Rashid et al., 2010) and thereby complementing the commercial use of veterinary drugs (Shen et al., 2010). Use of ethno-veterinary medicine to control livestock diseases has been cited by the World Health Organization (2010), who estimated that 80% of people in developing countries depend on traditional medicine to treat livestock diseases. In the 19th century, medicinal plants have gained importance in the management of animal health care in African countries (Njoroge and Bussmann, 2006) and led to the discovery of some effective ethno-veterinary products (Lans et al., 2007). In developing countries, traditional medicines are considered to be cheap, safe and readily available to the resource limited farmers (Jabbar et al., 2005; Teklehaymanot and Giday, 2007).

Diseases caused by bacteria have been reported to cause high livestock morbidity and low production in many developing countries (Duguma et al., 2012). Research has been conducted, by various institutions, leading to the identification, utilization, and documentation of medicinal plants used in ethno-vetarinary practices (Masika et al., 2000; Van der Merwe et al., 2001; Masika and Afolayan, 2003; Moyo and Masika, 2009; Dangwal et al., 2011; Luseba and Tshisikhawe, 2013; Mahwasane et al., 2013, Asiimwe et al., 2014; Dragoeva et al., 2015). Considering the frequent cases of bacterial resistance to conventional drugs used around the world, farmers have resorted to medicinal plants to treat livestock diseases especially bacterial diseases in South Africa and other parts of the world.

This study was conducted to document the indigenous knowledge of plants used in ethno-veterinary practices by resource-limited farmers, in certain parts of the Eastern Cape Province of South Africa. The purpose was to provide some baseline information, which could be used in the future development of drugs and make contribution to the conservation of this valuable knowledge and biological resources.

MATERIALS AND METHODS

Study area

The study was carried out in three Local Municipalities (LM) of the Eastern Cape Province (Figure 1), which is spread across three agro-ecological zones. It was conducted from November 2013 to February 2014. Letters seeking approval for assistance and co-operation from local offices of agriculture in mobilizing livestock farmers and community leaders, who have knowledge of medicinal plants, were submitted to the relevant authorities. The three areas surveyed were Upper Ngqumeya, Ciko and Goso.

Upper Ngqumeya is located 10 km south of the town of Keiskammahoek and falls under the administration of Amahlathi Local Municipality. It is located at 32°43'08.87"S longitude and 27°07'42.14"E latitude. The vegetation surrounding Upper Ngqumeya is a mixture of thicket, forests, savanna and grassland. Southern Mistbelt Forests occur as fragments within surrounding Buffels Thicket and Bhisho Thornveld (Mucina and Rutherford, 2006). Amathole Mountain Grassland is restricted to higher mountain plateaus.

Ciko is located 7 km east of the town of Willowvale and falls under the administration of Mbhashe Local Municipality. It is located at 32°16'11.18"S Longitude and 28°32'03.22"E Latitude. Semi-deciduous woodland and thicket of the Eastern Valley Bushveld characterizes the vegetation of the Shixini River Valley. Whereas the southern slopes are wetter and cooler the steep northern slopes are typically hotter and drier. Along the upper slopes and plateau of the Shixini River, the vegetation is open thornveld associated with Bhisho Thornveld. Scattered forest fragments of the Southern Mistbeld Forest occur in sheltered south-east facing valleys within the Eastern Valley Bushveld.

Goso is located 15 km south of the town of Lusikisiki and falls under the administration of Ingquza Hill Local Municipality. Goso is located at 31°22'49.38"S longitude and 29°35'48.57"E latitude. The vegetation is associated with the Indian Coastal Belt and patches of Scarp Forests. To the interior the vegetation becomes Ngongoni Veld. Goso occurs within a significant region of floristic endemism namely the Pondoland Centre (van Wyk and Smith, 2001).

Data collection

A semi-structured questionnaire, observations and guided field

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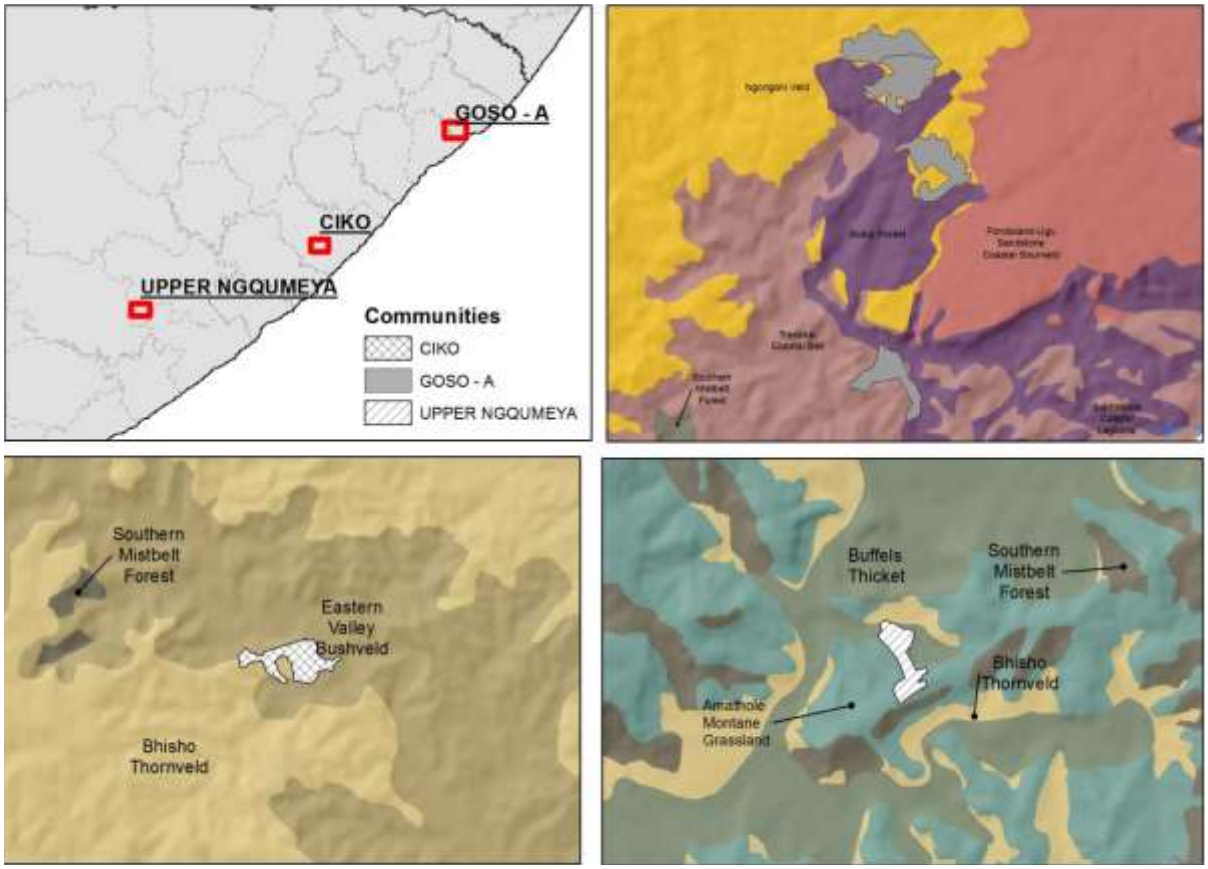

Figure 1. Selected local municipalities in the Eastern Cape Province.

walks with knowledgeable informants selected by elders were employed to obtain ethnobotanical data. A total of 48 respondents from 48 households (31 males and 17 females) were selected purposively with the assistance of extension officers, community elders and local authorities, based on their traditional knowledge of medicinal plants and willingness to participate. Each participant was separately interviewed in their vernacular language (IsiXhosa) and later translated to English by the research team from Dohne Agricultural Development Institute. The data collected from livestock owners included; household demographics, local name of medicinal plants, disease treated, dosage used and route of application, and the way respondents acquired the knowledge.

Plant specimens were identified and collected at Goso, Upper Ngqumeya and Ciko. The three study sites were selected purposely and due to the fact that they have many small-scale livestock farmers who have traditional knowledge on the use of medicinal plants. Plant specimens were preserved according to standard botanical practices and mounted on standard herbarium sheets (Victor et al., 2004) and later identified by pasture scientists in the Department of Rural Development and Agrarian Reform. These specimens are currently kept in the Herbarium, based at the Dohne Agricultural Development Institute.

Statistical analysis

Data were captured on Microsoft Excel 2013 and analyzed using the Statistical Package for Social Science (SPSS, 2000) to generate descriptive statistics.

Plant taxonomy

Species names follow the plant list Ver 1.1 (http://www.theplantlist.org/) except for *Olea europaea* subsp. *africana/Olea Africana,* where the species name by Green and Kupicha (1979) sub-specific rank of *O. europaea* subsp. *africana* is retained.

Species distribution data was obtained via the Botanical Database of Southern Africa (SANBI, 2016). Distribution maps display quarter degree square (QDS) centroids for botanical records within the Botanical Database of Southern Africa.

RESULTS AND DISCUSSION

Demographic characteristics of respondents

The study revealed that out of forty-eight (48) respondents who had knowledge of medicinal plants, 31 (64.6%) were males and 17 (35.4%) were females (Table 1). The age of the respondents varied between 20 to 73

Table 1. Demographic characteristics of respondents.

Variables	Male		Female
Gender	31 (64.6%)		17 (35.4%)
	A	B	C
Age group (years)	20-40	41-60	>60
	14 (29.2%)	24 (50%)	10 (20.8%)

years and the majority were in the older age group (41 to 60 years).

A substantial percentage of younger people (29.2%) were involved in traditional livestock treatment. The results indicated that all the respondents (100%) were literate and more than 50% had primary education, 39.58% were junior high scholars and 4.16% had tertiary level education.

Plant species identified and collected

A total of six species of medicinal plants were collected and identified for the treatment of 2 bacterial cattle diseases (Table 2).

Identification of disease and associated symptoms

Various symptoms were reported for the two prevailing bacterial diseases. According to the farmers, bad smell from the carcass and stiff shoulder were symptoms related to Blackquarter, while lack of appetite and diarrhea were signs of perceived paratyphoid.

Sources of traditional medicinal knowledge

It was observed that inheritance of traditional knowledge of medicinal plants was a major source of knowledge acquisition (Figure 2). Vertical knowledge transmission from grandparents and parents was mentioned by 81% (39 respondents). However, horizontal transmission from uncle/aunt and neighbors was reported by 19% of the respondents (9).

Plant parts used

Among the plant parts used (Figure 3), leaves were the most commonly used (63.6%), followed by bark (26.4%) and roots (10%) in the preparation of traditional veterinary medicine. The method of preparation varied from individual to individual.

Preparation and application for specific diseases

Blackquarter

Different disease types were reported amongst which, blackquarter (75%) and perceived paratyphoid (25%) were the most common. Farmers reported that *Agapanthus praecox*, *Sarcophyte sanguinea* and *O. europaea* subsp *africana* are used to treat Black-quarter. *A. praecox* has the widest distribution of *Agapanthus* within the Eastern Cape. The geophyte habitat is typically on rock plates or rock outcrops in montane grassland (Pooley, 1998).

S. sanguinea is a root parasite on *Acacia* species resembling more a fungus than a flowering plant. It has a scattered distribution in Eastern Cape Savanna's. *O. europaea* ssp *africana* is one of the most widely occurring trees in South Africa and is associated with a variety of habitats from rocky hillsides, forest margins and riverine bush (Figure 4).

In the present study, a full hand of leaves and roots of *A. praecox* (Amaryllidaceae) were crushed, mixed and soaked on five cups of water overnight to make an infusion. On the following day the mixture was sieved into 750 ml bottles (daily dosage) and administered orally for 2 to3 days to treat blackquarter in Lusikisiki. In Keiskammahoek, a handful of *S. sanguinea* (Balanophoraceae) stems were dried, crushed and soaked on 5 L of warm water overnight and administered orally using a 750 ml bottle (dosage) fortnightly until the animal show some improvement, whereas the leaves of *O. europaea subsp. africana* (Oleaceae) in Mbhashe were crushed and mixed with 2 L of water for a day, later the mixture was sieved and drenched orally using 750 bottle (dosage) over a period of 3 days to treat black quarter.

The literature study also established that the same plants species used to manage blackquarter were also used to treat other diseases and conditions of man and livestock. For instance, Dold and Cocks (2001), reported that roots of *Agapanthus africanus* were used to treat diarrhoea in goats and sheep. The entire plant of *S. sanguinea* was used to treat diarrhoea and dysentery (Olajuyigbe and Afolayan, 2012). A study conducted by

Table 2. Plants used for treatment of bacterial diseases, plant parts(s) and mode of preparation and administration.

Disease treated and area collected	Botanical name	Family name	Vernacular name	Part(s) used	Mode of preparation and administration
Black quarter					
Goso (Lusikisiki)	*Agapanthus praecox*	Amaryllidaceae	Mavumbula	Roots and Leaves	Roots and leaves of *Agapanthus* were crushed and soaked with water and administered orally
Ciko (Mbhashe)	*Olea europaea africana*	Oleaceae	Umkhondo	Bark	Bark of *O. europaea africana* crushed and soaked with warm and administered orally
Upper Ngqumeya (Keiskammahoek)	*Sarcophyte sanguinea*	Balanophoraceae	Umnquma	Whole plant	Whole plant of *S. sanguinea* crushed with water and administered orally
Paratyphoid					
Goso (Lusikisiki)	*Dalbergia obovata*	Fabaceae	Izungu	Leaves	Leaves and bark crushed and mixed with water and administered orally
Ciko (Mbhashe)	*Strychnos henningsii*	Loganiaceae	Umnonono	Bark	
	Acokanthera oppositifolia	Apocynaceae	Isihlungusehlathi	Leaves	Leaves crushed with water and administered orally

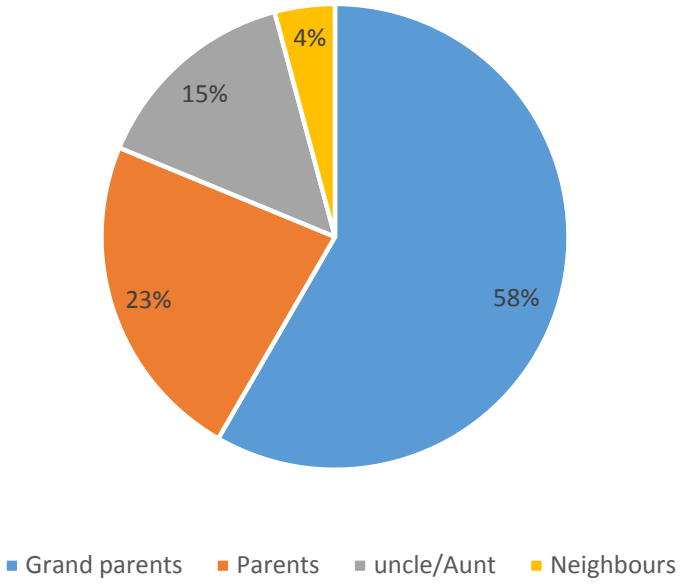

Figure 2. Source of knowledge acquisition.

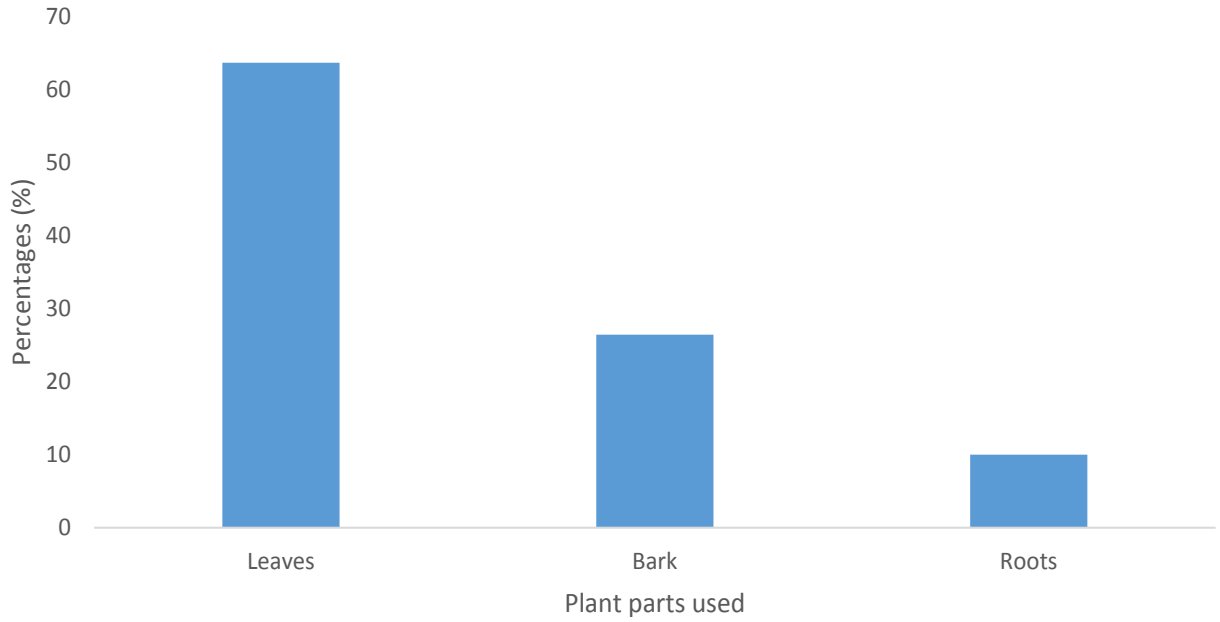

Figure 3. Plant parts used by the communities of Upper Ngqumeya, Ciko and Goso.

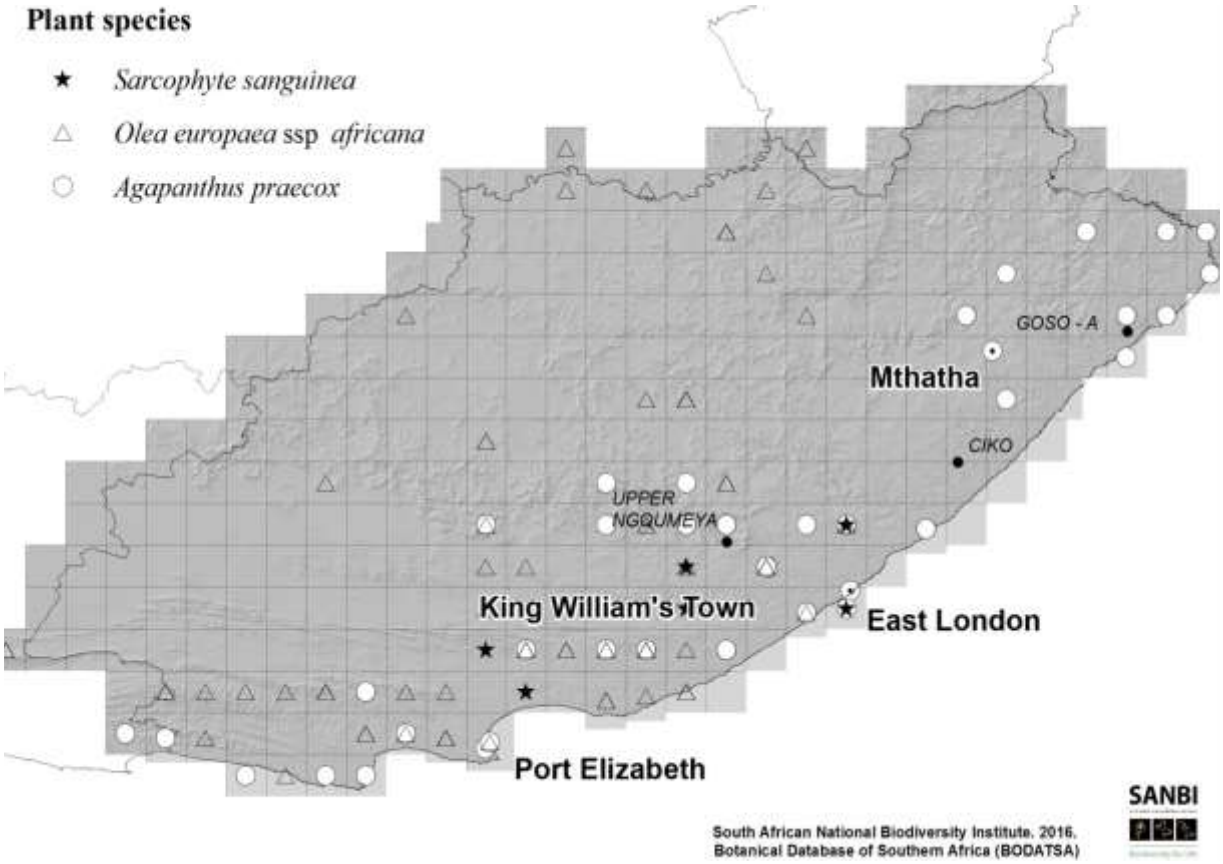

Figure 4. Species distribution for *Sarcophyte sanguinea*, *Olea europaea* ssp *africana* and *Agapanthus praecox* used to treat Back-quarter as ethno-veterinary by livestock farmers at Upper Ngqumeya, Ciko and Goso villages in the Eastern Cape. Localities represent QDS centroids based on the Botanical Database of Southern Africa (SANBI, 2016)

Hutchings et al., (1996). reported that *O. europaea* species were used in humans to treat diuretic problems, lowering blood pressure, urinary and bladder infections and sometimes used as a tonic for sore throat in humans. Veale et al. (1999) found that leaves of *A. africanus* exhibit agonistic activity on uterine muscarinic receptors and promote the synthesis of prostaglandins in the oestrogenised rat uterus. The use of *O. europaea* ssp *africana* to manage antibacterial diseases is consistent with the findings of Masoko and Makgapeetja (2015) that leaf extracts of *O. europaea* ssp *africana* contain compounds with antioxidant, antibacterial and antifungal activities.

Paratyphoid (as perceived by farmers)

Farmers indicated that *Strychnos henningsii*, *Acokanthera oppositifolia* and *Dalbergia obovata* are used by different communities to treat Paratyphoid. *S. henningsii* a potentially tall tree occurring in forests while dense bush occur from around the Kei River northwards with one of the six *Strychnos* species occurring in the Eastern Cape.

A. oppositifolia is a small tree or shrub growing along the Eastern seaboard and escarpment in various scrub, thicket or forest habitats up to 2000 m (Boon, 2010). *Dalbergia obovata* is a woody climber within medium altitude or coastal forest from East London northwards.

The leaves and bark of *S. henningsii*, *A. oppositifolia* and *D. obovata* were orally administered to treat paratyphoid in some district municipalities of the Eastern Cape. In Lusikisiki, a handful of leaves and bark of *S. henningsii* and *D. obovata* were crushed and mixed with water for 5 h and later drenched in 30 ml to manage paratyphoid in calves for 3 days. In Mbhashe, ten leaves of *A. oppositifolia* were crushed with water and drenched at 375 ml per day for a period of 1 to 2 days.

In some studies, the bark of *S. henningsii* was crushed into a powdered form and half a cup of the decoction was administered orally to cure diabetes mellitus (Oyedemi et al., 2009). In other studies, *S. henningsii* was used for various ailments in traditional medicine including rheumatism, gynaecological complaints, abdominal pain, snake bite, gastrointestinal pain, malaria and diabetes (Hutchings, 1989; Bisset, 1970). Due to retuline-like alkaloids present in the plant, *S. henningsii* could be used for the development of new antinociceptive (anti-inflammatory and analgesic) and antispasmodic drugs (Tits et al., 1991).

The extract of leaves and bark of *D. obovata* were used to treat paratyphoid disease as recorded in the study. This differs from the findings of Louppe et al. (2008), who recorded that the root infusion was used to cure stomach-ache and toothache in humans. Pooley (1993), reported that bark was used to treat mouth sores topically in babies. Other studies reported that the dried leaves or roots and wood were used as anthelmintics in animals (Hutchings et al., 1996; Van Wyk et al.,1997). Root decoctions of *A. oppositifolia* were used to treat pain and diarrhea (Maphosa et al., 2010). Van Wyk et al., (2002) reported that *A. oppositifolia* and *A. oblongifolia* contain major toxic components of cardiac glycosides and Acovenoside.

Conclusion

Six plant species were recorded and reported to be used for the treatment of bacterial livestock diseases in certain areas of the Eastern Cape. This study showed that traditional medicine, which mainly involves the use of medicinal plants do play an important role in addressing the healthcare needs of developing farmers in the Eastern Cape. The use of medicinal plants to control and manage livestock diseases in most rural areas of the Eastern Cape need to be quantify based on the efficacy, active ingredients and standardization of dose and dosing protocol in order to be used effectively. These plants were collected form the wild and the exploitation and over-harvesting thereof may lead to the loss of certain plant species if not managed responsibly.

The study also indicates that communities use specific species to treat veterinary diseases although plants species used by other small scale farmers may also be present in the area. With the exception of *O. europaea* ssp *africana* which has a wider habitat distribution, other five species are habitat specific and in some cases less common e.g. *S. henningsii*. Further studies are needed to substantiate the potential use of these 6 species ethno-veterinary medicine.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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