Ethnoveterinary Practices and Ethnobotanical Knowledge on Plants Used against Cattle Diseases among Two Communities in South Africa

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Abstract: Ethnoveterinary practices and ethnobotanical knowledge serve as potential therapeutic approaches used to manage and prevent cattle diseases within poor communities in developing nations. Most of the knowledge and practices remain inadequately documented and threatened with extinction in the future. This study aimed to explore the ethnoveterinary practices and knowledge on plants used to treat cattle diseases in two communities of the Ramotshere Molopo local municipality, South Africa. A semi-structured interview guide, snowball, and purposive technique were used to collect data and recruit 90 participants. Three ethnobotanical indices (informant consensus factor (Fic), use-value (UV), and relative frequency of citation (RFC)) were used for quantitative analysis. A total of 64 medicinal plants from 32 families (dominated by Compositae, Fabaceae, and Asparagaceae) were used to treat 27 cattle diseases. The plants with a high frequency of citation and RFC were Gomphocarpus fruticosus (75, 0.83), Opuntia ficus-indica (74, 0.82), Schkuhria pinnata and Portulaca oleracea (73, 0.81), Solanum lichtensteinii (70, 0.77), and Senna italica. In addition, Schkuhria pinnata and Aloe greatheadii (0.077) had the highest UV. About 28.13% of 64 identified plants were documented as ethnoveterinary medicine for treating cattle ailments, for the first time. The remedies were mainly either prepared as a decoction (52.04%), ground, or prepared as an infusion (16.33%). The plants were administered either orally (69.79%) or topically (30.2%). The ailments with a high frequency of citations were: wounds and constipation (76); arthralgia and retained placenta (69); and lumpy skin disease (68). The categories with the highest number of plants used were gastrointestinal problems (53), skin problems (33), respiratory problems (25), and fertility/reproduction disorders (21). The highest Fic score was cited for tick-borne diseases (1), followed by musculoskeletal systems (Fic = 0.89), and general system infection (Fic = 0.88). The current findings contribute to the documentation and preservation of valuable knowledge from indigenous communities for extensive use. Additionally, ethnoveterinary uses of Portulaca oleracea, Securidaca longipeudunculata, and Plumbago zeylanica were recorded for the first time. Further scientific evaluation of the most cited and indigenous/native plants is recommended to establish their therapeutic potential and possible integration into the conventional veterinary sector for the welfare of cattle.

Keywords: Batswana; biodiversity; endemic; gastrointestinal problems; ethnobotanical survey; indigenous diagnostics; indigenous knowledge; wounds
1. Introduction

Cattle production plays a key role in the rural economies of developing countries in terms of food security, poverty alleviation, and diverse cultural activities, particularly in rural communities [1,2]. Due to their use as draft animals and their ability to convert low-quality forage into energy-dense muscle and milk, cattle provide a significant source of food and nutrition, much-needed income, and nitrogen-rich manure for replenishing soils and other uses [3,4]. They also fulfil a wide variety of socio-cultural roles. However, cattle in rural areas are often susceptible to various diseases [5]. Changes in population and climate, technology, lifestyles, consumer demands, markets, and other factors are driving rapid change in cattle production. These factors are influencing the way cattle are being produced, improving the livelihoods of people, and sometimes threatening cattle diversity at the local, national, and regional herd levels [6–8]. Healthy, well-cared-for, and productive cattle contribute to the sustainable, healthier, and inclusive future livelihood of the communities. The clinical service of the public veterinary service is believed to be inefficient and seen to have minimal effect on animal health [9]. Therefore, maintaining and restoring the health and well-being of the cattle is a critical responsibility for the community members who depend on them.

Farmers and cattle herders in rural communities rely on ethnoveterinary medicine (EVM) as a sustainable alternative to western veterinary practices. Ethnoveterinary medicine encompasses a variety of systems and knowledge of maintaining animal health that is based on beliefs, traditional knowledge, skills, methods, medicinal plants, metaphysics, surgical procedures, technologies, and teachings that are used in healing livestock [10]. The popularity of EVM is often attributed to its ability to improve folk pharmacotherapy which is locally available, economically feasible, accessible, and culturally appropriate [11]. Furthermore, the practice includes a set of empirical observations of the environment and self-management [9]. According to McGaw and Eloff [8], studies in EVM are necessary because plants contain a wide range of phytochemicals. These plants can provide the lead candidates for drug discovery and development of active products, which are useful in managing the health of livestock. In South Africa, the rich and unique flora have been well-utilised in traditional medicine, thereby creating more interest in the potential of medicinal plants [12,13]. As a megadiverse country with a rapidly growing population, the incessant loss of biodiversity justifies the need to document the plant resources, especially the native plants which can be considered as endemic or indigenous [14].

Cattle diseases are major veterinary health problems, which are experienced by livestock farmers in developing countries. Recently, the Conventional Veterinary Services and Drug Resistance reported a rise in the number of cattle diseases that are affecting cattle production [15]. The situation has been compounded by the inaccessibility of veterinary services by rural cattle breeders and the escalating cost of veterinary services. Despite the existing efforts [1,8,16–18], there is a paucity of documentation and scientific data regarding the knowledge and practices of ethnoveterinary medicine among different ethnic groups globally.

The majority of indigenous diagnostic and ethnobotanical knowledge methods used in cattle healthcare have been passed down from generation to generation, mainly by word of mouth and apprenticeship [19,20]. Currently, such indigenous knowledge is held by the community’s elders and the limited young members with interest in learning how to use it [21]. Furthermore, EVM is often locally and culturally specific due to differences in disease epidemiology, culture, and biodiversity. Therefore, if not documented, the immense knowledge, skills, and experience accumulated over generations may become extinct in developing countries because of migrations, urbanisation, and technological development [22,23]. Thus, this study explored the indigenous diagnostic and ethnobotanical skills, methods, and processes used to treat cattle diseases and other husbandry indications among Batswana in two communities in the Ramotshere Moiloa local municipality, South Africa.
2. Results and Discussion

2.1. Socio-Demographic Data of Participants in the Study

A total of 90 community members with ages ranging from 18 to 95 years participated in this study (Table 1). The dominant age group, who constituted about 40% of the participants, were aged 61 and above and are regarded as elders in the communities. Generally, indigenous knowledge on the use of EVM is mostly limited to older people in the communities [24–28]. In the current study, all (100%) of the participants acquired knowledge about indigenous diagnostic skills and ethnobotanical knowledge about diseases from elders. This indicates the relative transmission of indigenous practices from one generation to the next one. The environment and experience of others remain two of the most active means to transmit knowledge about the medicinal values of plants [29,30]. This also indicates that the knowledge is facing a threat, which has a negative impact on the use of ethnoveterinary medicine. Likewise, Giday and Teklehaymanot [31] acknowledged that indigenous knowledge is declining among the younger generation in Africa. However, ethnoveterinary medicine is still prevalent in remote villages of the Ramotshere Moiloa local municipality. The need to preserve the indigenous knowledge, which is at risk of being lost due to the modern lifestyle, remains pertinent [23].

Table 1. Demographic information of participants engaged in the study (n = 90).

| Characteristic of Participants | Category          | Frequency | Distribution (%) |
|-------------------------------|-------------------|-----------|-----------------|
| 1. Age group (years)          | 18–30             | 12        | 13              |
|                               | 31–40             | 15        | 17              |
|                               | 41–50             | 12        | 13              |
|                               | 51–60             | 15        | 17              |
|                               | 61 and above      | 36        | 40              |
| 2. Gender                     | Male              | 75        | 83              |
|                               | Female            | 15        | 17              |
| 3. Experience in cattle production (years) | 5–10 | 12 | 13 |
|                               | 11–15             | 9         | 10              |
|                               | 16–20             | 15        | 17              |
|                               | 21–30             | 15        | 17              |
|                               | 31–40             | 15        | 17              |
|                               | 41 and above      | 24        | 27              |
| 4. Form of cattle production  | Subsistence       | 84        | 93              |
|                               | Commercial        | 6         | 7               |
| 5. Method of animal treatment | Medicinal plants only | 40 | 44.4 |
|                               | Combination of medicinal plants and conventional medicine | 50 | 55.6 |

Gender plays a significant part in ethnoveterinary medicine, and the distribution of the participants by gender was 83% male and 17% female. A similar and common pattern indicated that livestock remain mostly in the care of males rather than females [16,32,33]. In Ethiopia, Assefa, and Bahiru [34] indicated that cattle rearing is under the command of males, which influences the imbalanced gender ratio in the practice of ethnoveterinary healthcare. On the other hand, the dominance of females was evidenced in a few studies from countries such as India [35] and China [28].

About 27% of the participants had extensive (more than 40 years) experience in cattle production (Table 1). In the Alaknanda catchment of Uttarakhand in India and the Buyi people of Southwest Guizhou in China, elderly people and male participants were more
experienced and had more traditional knowledge of cattle production [28,35]. In the current study, 93% of participants were practicing subsistence farming, whereas a few (7%) engaged in commercial systems. The participants treated the cattle diseases/conditions using medicinal plants (44.4%) or the combination of medicinal plants and conventional medicine (55.6%). Similar results were reported in Eastern Cape, South Africa [36,37]. The use of both methods depended on the availability of funds to procure the conventional medicine, availability of veterinary services, knowledge of indigenous diagnostic methods and plants, value of the animal, and seriousness of the condition [38].

2.2. Common Cattle Diseases Treated Using Ethnoveterinary Medicine

Based on the Ruminant Veterinary Association of South Africa [39] and the classification in a previous study [40], the identified cattle diseases were classified into nine categories (Table 2). An inventory of disease conditions identified by the participants was recorded in a generated database with descriptions of disease categories, names in English and Setswana (local name), signs, and symptoms, causes, affected sex and age, and seasonality of outbreak. When compared to the western veterinary medical system, the naming of ailments by indigenous people did not always discriminate between ailments and symptoms of diseases. This is due to the fact that indigenous ailment nomenclature focuses on symptoms, but diseases in western veterinary science are based on aetiological knowledge [9].

The participants identified 27 cattle diseases prevalent in the study area (Table 2). The most often cited ailments were wounds and constipation (76); arthralgia and retained placenta (69); and lumpy skin disease (68). The categories with the highest plant species used were gastrointestinal problems (53), skin problem (33), respiratory problem (25), and fertility/reproduction disorders (21). The informant consensus factor (Fic) is determined by the availability of plants in the study area for ailments treatment. The Fic values in this study varied from 0.56 to 1, with an average of 0.80, indicating a high level of agreement among the participants on the use of plants to treat cattle ailments. Tick-borne diseases had the highest Fic (1), followed by musculoskeletal systems (Fic = 0.89), and general system infection (Fic = 0.88). The high Fic values observed in this study show reasonably reliable knowledge of medicinal plants among the participants. A high Fic value is commonly associated with a few specific plants that have high use reports for treating a single disease category, whereas low values are associated with plants that have almost equal or high UR, implying a lower level of agreement among participants on the use of these plants to treat a specific disease category.

2.3. Diagnostic Skills, Treatment Methods, and Endpoint Determination

Participants reported signs and symptoms of cattle diseases/conditions, which they use for diagnosis. Seventy-five distinct clinical signs and symptoms of disease were reported by participants in this study. The most common ones were weight loss, loss of appetite, swelling, weakness and tiredness, breathing problem, distress, restless and discomfort, and blood in the faeces (Table 2). Different clinical signs and symptoms were based on the identified diseases. The current findings suggest a high degree of common perception between ethnoveterinary medicine and conventional veterinary systems. The descriptions of cattle ailments were mostly not like that of the conventional veterinary system, as the participants used signs and symptoms. In some cases, there were some similarities. For example, in terms of tick infestation, participants identified six distinct clinical signs and symptoms corresponding closely to conventional veterinary system concepts of external parasites conditions.
Table 2. Distribution of cattle diseases, causes, seasonality, sex, signs, and symptoms reported by participants in the study area. Nur denotes the number of usage reports for a certain disease category, whereas Nt denotes the variety of plants cited for the treatment of that specific ailment category, Fic = informant consensus factor.

| Disease Categories          | Diseases        | Local Name          | Citation | Nur | Nt | Fic  | Signs and Symptoms                                                                 | Causes                                        | Sex  | Seasonality of Diseases |
|----------------------------|-----------------|---------------------|----------|-----|----|------|------------------------------------------------------------------------------------|-----------------------------------------------|-------|-------------------------|
| Gastrointestinal problems  |                 |                     | 120      | 53  | 0.56 |          | Same as diarrhoea, the difference is the colour, dysentery faeces are reddish       | Unspecified                                   | Both  | All seasons             |
|                           | Dysentery       | Letsholo le lehibidu| 4        | 1   |     |      |                                                                                   |                                               |       |                         |
|                           | Diarrhoea       | Letsholo            | 32       | 23  |     |      | Watery faeces and pass them often, faeces are unusual colour and smell, sometimes blood in the faeces, back legs are dirty with faeces, become weak, tired, loss of appetite, appearing distressed and restless, weight loss, eyes sink into the head | Eating dry or green grass Feeding on grass containing worms (Kgorosane) | Both  | Summer Spring           |
|                           |                 |                     | 8        | 1   |     |      | Gall bladder is large and full of brown/green liquid, loss of appetite, loss of weight, dry nose, drowsy, and brownish sclera               | Green grass                                   | Both  | Summer                  |
|                           | Bile reflux     | Gala                | 76       | 28  |     |      | Passing dry, small, and hard faeces, no sign of faeces passed in the night, little dark urine, looking distressed when it passes faeces or urine, loss of appetite | Low intake of fluids                          | Both  | All seasons             |
|                           | Constipation    | Go shokega mala     | 63       | 8   | 0.88 |          | Weight loss, restless, loss of appetite, weak and tired, and has become very thin. Not eating well | Change of seasons Insects in the grass Heat | Both  | Autumn and Winter       |
|                           | Ear pain        | Bolwetsi jwa disebe | 25       | 3   |     |      | Stiff shoulders, loss of weight, loss of appetite, feeling bubbles under the skin, weak and tired, swelling legs, high fever                  | Change of seasons Insects in the grass Heat | Both  | Autumn and Winter       |
|                           | Malnutrition    | Sekwepe             | 10       | 1   |     |      | Saliva comes from the mouth, high fever, loss of appetite, blood in the urine, faeces, or milk, swelling under the jaw, neck, chest, and abdomen, become sick suddenly, difficulty breathing, collapse and die, dark blood comes from the mouth, nose, or anus when it is dead | Insects in the soil Too much blood            | Both  | All seasons             |
| Disease Categories | Diseases | Local Name | Citation | Nur | Nt | Fic | Signs and Symptoms | Causes | Sex | Seasonality of Diseases |
|-------------------|----------|------------|----------|-----|----|-----|---------------------|--------|-----|------------------------|
|                    | Blackquarter | Serotswana | 5        | 1   | 1  |     | Difficulty in breathing, looking distressed and restless, lame, and cannot walk normally | Unknown | Both | All seasons             |
|                    | Anthrax    | Lebete     | 5        | 1   | 1  |     | Painful shoulders, isolation, stiff shoulders, loss of appetite, losing weight, walking with head down looking like it is carrying a heavy load, breathing heavy | Kicking stones Heat | Both | All seasons             |
|                    | Heart problems | Bolowetsi jwa pelo | 10 | 1 | | Tilt the affected ear downwards and may roll or lean to the affected side. | Unknown | Both | All seasons             |
|                    | Aphosphorisis | Mokokomalo/ Magetla/ lamsiekte | 8 | 1 | | Weight loss, restless, loss of appetite, weak and tired, and has become very thin | Not eating well | Both | All seasons             |
|                    | Fertility/ Reproduction disorders | | 81 | 21 | 0.75 | | | | |
|                    | Pain afterbirth | Ditlhabi tsa morago ga pelegi | 1 | 1 | | Redness around vulva, swelling, warmth | Dystocia process of pulling the dead calf | Female | Summer–Autumn |
|                    | Retained placenta | Motlhana | 69 | 10 | | Placenta hanging from the vulva for a long time, smell bad if stay for a long time, restless | Unknown | Female | Summer–Autumn |
|                    | Dystocia | Go farelwa | 11 | 10 | | Breathing fast and heavily, moves from time to time/restless, unable to give birth | Not eating well Not enough water Running | Female | Summer–Autumn |
|                    | Skin problem | | 190 | 33 | 0.83 | | | | |
|                    | Foot rot | Dintho tsa dikgato | 5 | 1 | | Swelling between the two hooves and legs, limping and lifting the affected leg, the flesh between the two claws that looks damaged, hard, or cut, wound or cut is smelling bad | Cow walking in the rainwater | Both | Summer |
|                    | Abscess | Ditlhagala/ Knopsik | 41 | 14 | | Hard, hot, and painful swelling on the body but often just under the skin, that becomes soft, grey/white/green/yellow fluid comes out when it bursts, foot smells or is hot and painful, loss of appetite | Rainwater Dirty blood | Both | Summer Spring Autumn |
### Table 2. Cont.

| Disease Categories       | Diseases            | Local Name  | Citation | Nur | Nt | Fic | Signs and Symptoms                                                                 | Causes                      | Sex      | Seasonality of Diseases |
|--------------------------|---------------------|-------------|----------|-----|----|-----|------------------------------------------------------------------------------------|-----------------------------|----------|------------------------|
|                          | Lumpy skin disease  | Ditompola   | 68       | 1   |    | 1   | Lots of saliva, clear discharge comes from the eyes and grey/white mucus from the nose, weak and tired, hard lumps appear on the body, hair around and on the lumps stands up, loss of appetite | Change of seasons            | Both     | Summer                 |
|                          | Wounds              | Dintho      | 76       | 17  |    |    | A cut on any outside part of the body, loss of appetite                              | Cut from objects            | Both     | All seasons             |
|                          | Internal and external parasites |           | 91       | 12  |    | 0.87 |                                                                                    |                             |          |                        |
|                          | Worms               | Dibokwana   | 50       | 10  |    |    | Weight loss, loss of appetite, skin rough, swelling throat, breathing problem, bloody diarrhoea with mucus, dehydration | Bad food                    | Both     | All seasons             |
|                          | Ticks               | Dikgoa      | 41       | 2   |    |    | Licking and rubbing at the bite sites, lack of energy, loss of condition, tick sores and ulceration, pale parts around the eyes due to anaemia | Exposed to the cattle with ticks | Both     | All seasons             |
| Musculoskeletal systems  | Muscle pain         | Ditlhabi    | 10       | 4   |    |    | Facial expressions                                                                  | Diseases                    | Both     | All seasons             |
|                          | Arthralgia          | Ditlhabi tsa malokololo | 69   | 8   |    |    | Facial expressions                                                                  | Diseases                    | Both     | All seasons             |
|                          | Fracture            | Go robega   | 45       | 2   |    |    | Lame and limp, hold a broken leg off the ground and does not put any weight on that leg, when pressed under the foot it feels the pain, and swelling around the broken leg when touched you can feel broken ends of the bone, look distressed and restless, you can hear a grinding noise of the broken bones | Objects Kicking stones Losing step when running | Both     | All seasons             |
| Disease Categories       | Diseases                           | Local Name                      | Citation | Nur | Nt | Fic | Signs and Symptoms                                                                                                                                                                                                 | Causes       | Sex     | Seasonality of Diseases |
|-------------------------|------------------------------------|---------------------------------|----------|-----|----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------|------------------------|
| Respiratory problems    |                                    |                                 |          |     |    | 0.76| Lost weight, looks weak and tired, cough most of the time, loses appetite, sneeze, white/yellow mucus coming out of the nose, the problem with breathing                                                                             | Change of seasons | Both    | Summer–Winter           |
| Cough                   | Go gotlhola                        |                                 | 42       | 100 | 25 |     |                                                                                                                                                                                                                     | Cold         | Both    | Winter                 |
| Lung diseases           | Lamsik/makgwafako bothoko          |                                 | 9        | 1   |    | 1   | Loss of appetite, appearing distressed and restless, weight loss, has become thin, breathing problems                                                                                                                  | Heat         | Mostly Female | Spring                |
| Lung congestion         | Galbater/metsi mo mafatlheng       |                                 | 45       | 1   |    | 1   | Not eating as much as normal, weight loss, looking distressed and restless, breathing problems                                                                                                                        | Eating dry grass | Both    | Autumn–Winter           |
| Tick-borne              |                                    |                                 |          |     |    | 1   |                                                                                                                                                                                                                     |              |         |                        |
| Heartwater              | Bolwetsi jwa metsi mo pelo         |                                 | 5        | 1   |    | 1   | Diarrhoea and signs of bleeding from the anus, move-in violent and convulsive, blood in faeces, grinding their teeth, lifting their legs up very high when they walk, loss of appetite, the sac around the heart, chest, and abdomen is full of fluid, collapse and die | Ticks        | Both    | All seasons             |
| Eye problem             |                                    |                                 |          |     |    | 0.83|                                                                                                                                                                                                                     |              |         |                        |
| Eye infection           | Botlhoko jwa matlhlo               |                                 | 55       | 10  |    | 10  | Walks into objects, quick movement when an object comes towards the eye, the eye is red, and the eyelids are swollen, it blinks a lot and avoids bright sunlight, watery/yellowish discharge that smell bad comes out of an eye, look distressed and restless, the skin under the eyelids turn red, loss of appetite | Sharp objects pricking, insects, flies, or dust | Both    | All seasons             |
2.4. Plants identified as Ethnoveterinary Medicine for Treating Cattle Diseases

In this study, 64 plants were documented as medicine used against cattle diseases (Table 3). The current inventory was higher when compared to those documented in previous studies conducted in the North West Province [25,33,40]. This study reports on new plants that were not documented in earlier studies [25,33]. Particularly, 18 plants (28.13%) were described as ethnoveterinary medicine in treating cattle for the first-time (Table 3). The RFC indicates the local importance of plant species with reference to the participants, who cited the uses of these plants [41]. In the study, the RFC ranged from 0.12 to 0.83. Based on the RFC values, the most cited plant species were *Gomphocarpus fruticosus* (L.) W.T.Aiton (0.83), *Opuntia ficus-indica* (L.) Mill. (0.82), *Schkuhria pinnata* (Lam.) Kuntze ex Thell. and *Portulaca oleracea* L. (0.81), and *Solanum lichtensteinii* Willd. (0.77).

The use-value (UV) is a measure of the types of uses attributed to a particular plant species. In the present study, *Schkuhria pinnata* (Lam.) Kuntze ex Thell., *Senna italica* Mill., and *Aloe greatheadii* Schönland had the highest UV (0.077) followed by *Cleome gynandra* L., *Harpagophytum procumbens* (Burch.) DC. ex Meisn., *Ximenia caffra* Sond. (0.066), and *Ziziphus mucronata* Willd., *Senna italica* Mill., *Portulaca oleracea* L., and *Opuntia ficus-indica* (L.) (0.055) (Table 3). The extent to which a species may be employed is determined by its UV; hence, plants with a high UV are more exploited in the research area to treat more diseases than those with a low UV. Plants with a higher number of use reports (UR) had higher UV, whereas plants with fewer UR by participants had lower UVs, whereas plants with fewer Ui reported by participants had lower UV. Generally, plants that are utilised repeatedly are more likely to be physiologically active [42]. Given that UV and RFC values are dynamic and alter with location and people’s awareness, UV and RFC values may vary from area to area and even within the same study area [43]. Plants with lower UV and RFC values are not necessarily unimportant, but their low values may indicate that the participants are unaware of the uses of these plants and, as a result, that understanding of their use is at risk of not being passed down to future generations, and thus this knowledge may eventually disappear. Some of the documented plants are indigenous to the study area and are well-known to the participants. As a result, their specialised qualities for healing various ailments have become well-known and well-established among the participants. Plants with higher UV and RFC are likely to be good candidates for future research. It will be essential to subject these plants to pharmacological, phytochemical, and biological investigation to establish their therapeutic potential and the potential development of low-cost products [44].

In the current study, the recorded medicinal plants consisted of indigenous (native) and non-endemic plants used against various cattle diseases by the participants of Ramotshere Mola local municipality. Among the plants, 50 (78.1%) were indigenous/native while 14 (21.8%) were introduced/cultivated/naturalised (Table 3). High levels of usage of these indigenous/native species, particularly those with high use categories, might be of conservation concern if conducted in an unsustainable manner [14]. Thus, there is a great need to discover new biologically active compounds from herbal plants and develop novel drugs. Few studies are available about EVM plants and their constituents with antimicrobial activities [1,8], and these indigenous plants may contain pharmaceutically essential compounds. To further understand the uniqueness of this EVM, a more in-depth study of how these indigenous plants is used and selected, as well as a comparison study with other sites/locations within South Africa is required. In addition, a closer look at the local conservation status is required to build a sustainable use plan for these valuable plant resources [23].
Table 3. Medicinal plants used to treat various cattle ailments in the Ramotshere Moiloa local municipality (FC = number of participants who reported using a certain species, UV = use-value, Ui = the number of uses stated by each participant for a specific species, RFC = relative frequency of citation, * = plants possibly identified for the first time used for treating cattle diseases as no records were found). The nomenclature of all the collected plant species has been updated using The World Flora Online (http://www.worldfloraonline.org/, accessed on 22 March 2022). 1 Indigenous and 8 introduced/cultivated/naturalised plants were based on Plants of Southern Africa (POSA) (http://posa.sanbi.org/, accessed on 16 June 2022) and the African Plant Database (https://africanplantdatabase.ch/, accessed on 22 June 2022).

| Scientific Name | Voucher Specimen Number | Local Name | Family | FC | Ui | UV   | RFC | Plant Part(s) | Disease/ Ailments Treated | Mode of Preparation | Administration Route |
|-----------------|------------------------|------------|--------|----|----|------|-----|--------------|------------------------|----------------------|----------------------|
| 1 Acrotome inflata Benth. MVCHA 01 | Mogato | Lamiaceae | 15 | 2 | 0.022 | 0.16 | Leaves | Cough | Decoction | Oral |
| 1 Aloe greatheadii Schönland MVCHA 02 | Kgopane e nyane | Xanthorrhoeaceae | 20 | 7 | 0.077 | 0.22 | Leaves | Constipation, diarrhoea, retained placenta | Decoction or infusion | Oral |
| 8 Aloe vera (L.) Burm.f. MVCHA 03 | Kgopane ya thaba | Xanthorrhoeaceae | 67 | 3 | 0.033 | 0.74 | Leaves | Abscess, wounds | Ground | Topical |
| 6 Asparagus africanus Lam. (Asparagus cooperi Baker) MVCHA08 | Thokabotsware | Asparagaceae | 15 | 1 | 0.011 | 0.16 | Roots and stems | Malnutrition | Infusion | Oral |
| 1 Asparagus laricinus Burch. MVCHA 09 | Lesitwane | Asparagaceae | 20 | 1 | 0.011 | 0.22 | Whole plant | Muscle pain | Decoction | Oral |
| 1 Asparagus suaveolens Burch. MVCHA 010 | Motantanyane | Asparagaceae | 15 | 1 | 0.011 | 0.16 | Whole plant | Dystocia | Decoction | Oral |
| Scientific Name | Voucher Specimen Number | Local Name | Family | FC | Ui | UV | RFC | Plant Part(s) | Disease/ Ailments Treated | Mode of Preparation | Administration Route |
|----------------|-------------------------|------------|--------|----|----|----|-----|---------------|------------------------|---------------------|------------------------|
| Babiana hypogea Burch. MVCHA 011 | Thuge | Iridaceae | 20 | 2 | 0.022 | 0.22 | Leaves | Abscess, muscle pain | Infusion | Oral |
| Boerhavia diffusa L. MVCHA 018 | Moetapele | Nyctaginaceae | 45 | 3 | 0.033 | 0.5 | Leaves and stems | Eye infection, abscess, wounds | Decoction | Topical |
| Boophone disticha (L.f.) Herb. MVCHA 012 | Lesoma/ Mathubadudifala | Amaryllidaceae | 45 | 1 | 0.011 | 0.5 | Leaves, roots, and bulb | Constipation | Decoction | Oral |
| Bulbine abyssinica A.Rich. MVCHA 013 | Makgabenyane | Xanthorrhoeaceae | 30 | 3 | 0.033 | 0.33 | Leaves | Abscess, wounds | Grounded | Topical |
| Cassine transvaalensis (Burtt Davy) Codd [Elaeondendron transvaalense (Burtt Davy) R.H. Archer] MVCHA 014 | Mojelemane | Celastraceae | 12 | 1 | 0.011 | 0.13 | Barks | Diarrhoea | Decoction | Oral |
| Centella asiatica (L.) Urb. MVCHA 015 | Setimamolelo | Apiaceae | 12 | 4 | 0.044 | 0.13 | Leaves | Wound, abscess, eye infection | Poultice | Topical |
| Cleome gynandra L. MVCHA 016 | Rothwe | Cleomaceae | 35 | 6 | 0.066 | 0.38 | Flower | Eye infection, ear problem | Grounded | Topical |
| Combretum hereroense Schinz MVCHA 017 | Tsholakhudu | Combretaceae | 25 | 4 | 0.044 | 0.27 | Leaves | Cough, constipation, intestinal worms | Infusion or decoction | Oral |
| Croton gratissimus Burch. MVCHA 019 | Moooga | Euphorbiaceae | 22 | 2 | 0.022 | 0.24 | Flower | Eye infection, ear problem | Grounded | Topical |
| Diceroscarum seneoides (Klotzsch) Abels (Sesamum seneoides (Klotzsch) Bung & Christenh. MVCHA 020 | Tshethiyo ya mamitiwa a mabedi | Pedaliaceae | 57 | 3 | 0.033 | 0.63 | Leaves | Blackquarter | Poultice | Topical |
| Dichrostachys cinerea (L.) Wight & Arn. MVCHA 021 | Moselesele | Fabaceae | 23 | 4 | 0.044 | 0.25 | Barks | Retained placenta, dystocia, fracture, arthralgia | Poultice and infusion | Oral |
### Table 3. Cont.

| Scientific Name Voucher Specimen Number | Local Name | Family | FC | Ui | UV  | RFC | Plant Part(s) | Disease/ Ailments Treated | Mode of Preparation | Administration Route |
|----------------------------------------|------------|--------|----|----|-----|-----|--------------|--------------------------|---------------------|-----------------------|
| 1 Dicoma macrocephala DC. MVCHA 022    | Tlhonya    | Compositae | 34 | 1  | 0.011 | 0.37 | Roots        | Diarrhoea                | Infusion            | Oral                  |
| 1 Drinia sanguinea (Schinz) Jessop MVCHA 023 | Sekanane  | Hyacinthaceae | 45 | 3  | 0.033 | 0.5  | Bulb         | Retained placenta, intestinal worms, constipation | Infusion            | Oral                  |
| 5* Dypshania ambrosioides (L.) Mosyakin & Clements MVCHA 024 | Tlhatlabadimo | Amaranthaceae | 56 | 2  | 0.022 | 0.62 | Whole plant | Cough, constipation | Infusion            | Oral                  |
| 1 Elephantorrhiza burkei Benth. MVCHA 026 | Mositsane | Fabaceae | 68 | 4  | 0.044 | 0.75 | Roots        | Cough, constipation, retained placenta | Decoction | Oral                  |
| 1 Dysphania ambrosioides (L.) Mosyakin & Clements MVCHA 024 | Tlhatlabadimo | Amaranthaceae | 56 | 2  | 0.022 | 0.62 | Whole plant | Cough, constipation | Infusion            | Oral                  |
| 1 Eleuterorhiza burkei Benth. MVCHA 026 | Mositsane | Fabaceae | 68 | 4  | 0.044 | 0.75 | Roots        | Cough, constipation, retained placenta | Decoction | Oral                  |
| 1 Dysphania ambrosioides (L.) Mosyakin & Clements MVCHA 024 | Tlhatlabadimo | Amaranthaceae | 56 | 2  | 0.022 | 0.62 | Whole plant | Cough, constipation | Infusion            | Oral                  |
| 1 Euclea undulata Thunb. MVCHA 070 | Morobe | Ebenaceae | 67 | 6  | 0.066 | 0.74 | Leaves       | Wounds, retained placenta, cough, bile reflux | Infusion | Oral                  |
| 1 Dysphania ambrosioides (L.) Mosyakin & Clements MVCHA 024 | Tlhatlabadimo | Amaranthaceae | 56 | 2  | 0.022 | 0.62 | Whole plant | Cough, constipation | Infusion            | Oral                  |
| 1 Euclea undulata Thunb. MVCHA 070 | Morobe | Ebenaceae | 67 | 6  | 0.066 | 0.74 | Leaves       | Wounds, retained placenta, cough, bile reflux | Infusion | Oral                  |
| 1 *Euphorbia balbisii Boiss (Euphorbia serpens Kunth) MVCHA 027 | Lwetsane | Euphorbiaceae | 12 | 2  | 0.022 | 0.13 | Leaves and roots | Diarrhoea, intestinal worms | Decoction | Oral                  |
| 1 Gomphocarpus fruticosus (L.) W.T.Aiton MVCHA 028 | Motimola/ sebegamasswi | Apocynaceae | 75 | 4  | 0.044 | 0.83 | Whole plant | Constipation, retained placenta, cough, bile reflux | Infusion | Oral                  |
| 1 Gomphocarpus fruticosus (L.) W.T.Aiton MVCHA 028 | Motimola/ sebegamasswi | Apocynaceae | 75 | 4  | 0.044 | 0.83 | Whole plant | Constipation, retained placenta, cough, bile reflux | Infusion | Oral                  |
| 1 *Grewia flavescens Juss. MVCHA 030 | Motsojane | Malvaceae | 34 | 3  | 0.033 | 0.37 | Leaves       | Pain, wounds, diarrhoea | Infusion | Oral                  |
| 1 Harpagophytum procumbens (Burch. DC. ex Meissn. MVCHA 031 | Lemafia/ Sengaparile | Pedaliaceae | 45 | 6  | 0.066 | 0.5  | Tuber        | Dystocia, pain after birth | Decoction | Oral                  |
| 1 Harpagophytum procumbens (Burch. DC. ex Meissn. MVCHA 031 | Lemafia/ Sengaparile | Pedaliaceae | 45 | 6  | 0.066 | 0.5  | Tuber        | Dystocia, pain after birth | Decoction | Oral                  |
| 1 Helichrysum candolleanum H.Buek MVCHA 032 | Phateyangaka | Compositae | 56 | 1  | 0.011 | 0.62 | Roots, leaves and fruit | Retained placenta | Decoction | Oral                  |
| 1 Helichrysum candolleanum H.Buek MVCHA 032 | Phateyangaka | Compositae | 56 | 1  | 0.011 | 0.62 | Roots, leaves and fruit | Retained placenta | Decoction | Oral                  |

* denotes new entries.
Table 3. Cont.

| Scientific Name | Voucher Specimen Number | Local Name | Family | FC | Ui | UV | RFC | Plant Part(s) | Disease/ Ailments Treated | Mode of Preparation | Administration Route |
|-----------------|--------------------------|------------|--------|----|----|----|-----|---------------|--------------------------|---------------------|----------------------|
| Hypoxis hemerocallidea Fisch., C.A. Mey. & Avé-Lall. MVCHA 034 | Maledu/Tshuku ya poo Hypoxidaceae | 69 | 4 | 0.044 | 0.76 | Whole plant | Cough, dystocia, arthralgia, constipation | Decoction | Oral |
| Jatropha zeyheri Sond. MVCHA 035 | Seswagadi Euphorbiaceae | 67 | 3 | 0.033 | 0.74 | Root | Eye infections, constipation | Maceration | Topical |
| Kleinia longiflora DC. MVCHA 036 | Mosimama Compositae | 65 | 1 | 0.011 | 0.72 | Whole plant | Eye infection | Poultice | Topical |
| Lippia scaberrima Sond. MVCHA 037 | Mosukutsane Verbenaceae | 54 | 1 | 0.011 | 0.6 | Leaves | Cough | Decoction | Oral |
| Malva neglecta Wallr. MVCHA 038 | Tikamotse Malvaceae | 43 | 4 | 0.044 | 0.47 | Leaves and flowers | Constipation, wounds, abscess, cough | Decoction | Oral |
| Malvastrum coromandelianum (L.) Garcke MVCHA 054 | Thobega Malvaceae | 12 | 4 | 0.044 | 0.13 | Leaves | Diarrhoea, abscess, wounds, ear pain | Decoction | Oral |
| Mentha aquatica L. MVCHA 039 | Kgobedimetsing Lamiaceae | 32 | 1 | 0.011 | 0.35 | Leaves | Cough | Decoction | Oral |
| Opuntia ficus-indica (L.) Mill. MVCHA 040 | Toorofeye Cactaceae | 74 | 5 | 0.055 | 0.82 | Leaves and stem | Diarrhoea, constipation, eye infections | Decoction | Oral |
| Phyllanthus maderaspatensis L. MVCHA 044 | Mositwane Phyllanthaceae | 30 | 3 | 0.033 | 0.33 | Whole plant | Eye infection | Decoction | Oral |

1 Hypoxis hemerocallidea Fisch., C.A. Mey. & Avé-Lall. MVCHA 034
2 Jatropha zeyheri Sond. MVCHA 035
3 Kleinia longiflora DC. MVCHA 036
4 Lippia scaberrima Sond. MVCHA 037
5 Malva neglecta Wallr. MVCHA 038
6 Malvastrum coromandelianum (L.) Garcke MVCHA 054
7 Mentha aquatica L. MVCHA 039
8 Opuntia ficus-indica (L.) Mill. MVCHA 040
9 Phyllanthus maderaspatensis L. MVCHA 044

* Denotes plants used traditionally in Botswana.
Table 3. Cont.

| Scientific Name Voucher Specimen Number | Local Name | Family | FC | Ui | UV  | RFC  | Plant Part(s) | Disease/ Ailments Treated | Mode of Preparation | Administration Route |
|----------------------------------------|------------|--------|----|----|-----|------|--------------|---------------------------|---------------------|----------------------|
| *Plumbago zeylanica* L. MVCHA 045     | Masegomabe | Plumbaginaceae | 57 | 2  | 0.022 | 0.63 | Whole plant | Constipation, diarrhoea | Decoction | Oral               |
| Portulaca oleracea L. MVCHA 046       | Selele     | Portulacaceae | 73 | 5  | 0.055 | 0.81 | Whole plant | Constipation, eye infection, muscle pain, wounds, intestinal worms | Decoction | Oral               |
| *Pouzolzia mixta* Solms MVCHA 047     | Mongololo  | Urticaceae | 68 | 3  | 0.033 | 0.75 | Roots and leaves | Retained placenta | Decoction | Oral               |
| *Ricinus communis* L. MVCHA 048       | Mokhura    | Euphorbiaceae | 13 | 2  | 0.022 | 0.14 | Leaves | Constipation, eye infection | Infusion | Oral               |
| *Sansevieria hyacinthoides* (L.) Druce [Dracaena hyacinthoides (L.) Mabb.] MVCHA 049 | Moshokelatebe | Ruscaceae | 24 | 2  | 0.022 | 0.26 | Leaves | Retained placenta | Poultice | Topical             |
| *Schkuhria pinnata* (Lam.) Kuntze ex Thell. MVCHA 050 | Santlhoko | Compositae | 73 | 7  | 0.077 | 0.81 | Whole plant | Eye infection, wounds, abscess | Ground | Topical             |
| *Searsia lancea* (L.) E.A.Barkley MVCHA 051 | Moshabela | Anacardiaceae | 30 | 3  | 0.033 | 0.33 | Roots, leaves, and stem | Abscess | Infusion | Roots, leaves and stem |
| *Searsia pyroides* (Burch.) Moffett MVCHA 052 | Bohitlha | Anacardiaceae | 57 | 6  | 0.066 | 0.63 | Leaves | Cough | Infusion | Roots               |
| *Securidaca longipedunculata* Fresen. MVCHA 053 | Mmaba | Polygalaceae | 68 | 4  | 0.044 | 0.75 | Roots | Cough, Dystocia, constipation, muscle pain | Ground | Topical             |
| Scientific Name Voucher Specimen Number | Local Name | Family | FC | Ui | UV | RFC | Plant Part(s) | Disease/ Ailments Treated | Mode of Preparation | Administration Route |
|----------------------------------------|------------|--------|----|----|----|-----|--------------|--------------------------|----------------------|------------------------|
| Senecio consanguineus DC. MVCHA 033   |            | Compositae | 67 | 3  | 0.033 | 0.74 | Whole plant | Cough, wounds, constipation | Decoction | Oral |
| Senecio italica Mill. MVCHA 055       | Sebetebete | Fabaceae | 55 | 7  | 0.077 | 0.61 | Leaves     | Constipation, abscess, anthrax, arthroporosis, lung diseases | Decoction | Oral |
| Senecio lichtensteinii Wild. MVCHA 059 | Tolwane    | Solanaceae | 70 | 1  | 0.011 | 0.77 | Whole plant | Ticks                  | Poultice | Topical |
| Solanum nigrum L. MVCHA 060          | Makgonatsothe | Solanaceae | 33 | 1  | 0.011 | 0.36 | Roots     | Intestinal worms         | Infusion | Oral |
| Solanum campylacanthum A. Rich. MVCHA 071 | Tolwane enyane | Solanaceae | 44 | 2  | 0.022 | 0.48 | Roots     | Diarrhoea                | Infusion | Oral |
| Tarchonanthus camphoratus L. MVCHA 061 | Mohatlha | Compositae | 33 | 1  | 0.011 | 0.36 | Roots     | Intestinal worms         | Infusion | Oral |
| Terminalia sericea Burch. ex DC. MVCHA 062 | Mogonono | Combretaceae | 44 | 1  | 0.011 | 0.48 | Leaves and stem | Cough                  | Decoction | Oral |
| Teucrium sessiliforum Benth. MVCHA 063 | Lethe la noga | Lamiaeae | 55 | 3  | 0.033 | 0.61 | Leaves and roots | Cough, diarrhoea, constipation | Decoction | Oral |
| Tribulus terrestris L. MVCHA 064      | Tshetlho   | Zygophyllaceae | 66 | 5  | 0.055 | 0.73 | Leaves     | Arthralgia               | Ground   | Oral |
| Turbina oblongata A. Meeuse MVCHA 065 | Mokatelo   | Convolvulaceae | 11 | 4  | 0.044 | 0.12 | Roots     | Cough, wounds, muscle pain, diarrhoea | Decoction | Oral |
| Vachellia karoo (Hayne) Banfi & Galasso MVCHA 066 | Mooka | Fabaceae | 67 | 1  | 0.011 | 0.74 | Bark     | Lumpy skin disease         | Decoction | Oral |
| Ziziphus mucronata Willd. MVCHA 068   | Sekgalo    | Rhamnaceae | 40 | 6  | 0.066 | 0.44 | Roots     | Dystocia, diarrhoea, arthralgia | Decoction | Oral |

Note: FC, Ui, UV, RFC, and Mode of Preparation refer to specific values or conditions for each entry.
2.5. Therapeutic Uses of Combined Medicinal Plants

Participants in the current study reported nine (14.1%) plants from the inventory that had numerous indications (uses), as poly-plant remedies. These results reflect the diversity of ethnic knowledge and heterogeneity in cultural practices. For example, participants reported using a combination of the leaves of Artemisia afra Jacq. ex Willd., Mentha aquatica L., Dicomia macrocephala DC., and Lippia scaberrima Sond., and mixing them with donkey milk to cure cough, intestinal worms, and joints pain. A decoction of Drimia sanguinea (Schinz) Jessop bulb and the roots of Elephantorrhiza burkei Benth. and Senna italica Mill. was administered orally to treat intestinal worms. To treat constipation, a decoction of the roots of Elephantorrhiza burkei Benth., Peltrophorum africanum Sond., and Jatropha zeyheri Sond. is administered orally. The potency of using a combination of different plants or plant parts increased compared to using a single plant to cure a disease is well-recognised [25,40,45]. Validation and transmission of this knowledge to livestock raising farmers all over the world so that they know the best plant material near them for the specific ailment will benefit people not only in impoverished nations but also in the developed world [46]. The use of two or more plants exemplifies the notion of synergy, which highlights that the combination of plants might result in higher therapeutic efficacy [32,47].

2.6. Plant Families Used to Treat Cattle Diseases

In terms of family diversity, 32 families were used to treat and manage cattle diseases in the study area (Figure 1). The families with the largest number of plant species used to treat cattle were Compositae with seven species and Fabaceae and Asparagaceae (five species). Compositae and Fabaceae are the most widely used families in ethnoveterinary studies [18,48–50]. Similar studies have been reported where participants mostly used the members of Compositae for the preparation of EVM for the treatment of different livestock diseases [40,51,52]. Furthermore, the widespread use of plants from these dominant families might be attributed to strong traditional beliefs, availability, ease of harvesting, and storage, as well as the evidence of bioactive compounds with therapeutic effect against cattle ailments. However, the trend for plant families utilised to cure cattle ailments in the selected communities differs from those used in other locations in South Africa [33,53].

Figure 1. Frequency of the 32 plant families used in the treatment of cattle diseases in the Ramotshere Moiloa local municipality, North West Province, South Africa.
2.7. Distribution of Plant Parts Used to Treat Cattle Diseases

In the study area, different plant parts were used for the preparation of remedies for treating cattle diseases (Figure 2). The most frequently used plant parts were the leaves (34.55%), roots (25.45%), and whole plant (19.09%). The preference of leaves in treating cattle ailments is due to their easy availability, easy harvesting, and simplicity in remedy preparation. Leaves are the storage site of diverse pools of phytochemicals, the renewable parts of plants, and for a conservation perspective, their collection may not result in the fatality of the mother plants [54]. A similar trend whereby the leaves were the dominant plant part used in medicine preparation for treating cattle diseases was reported in other studies [51,55–58]. However, in some cases, the roots were identified as the commonly used plant parts [9,33,40]. Roots were the second most commonly utilised plant part, which might be attributed to the fact that roots remain in the soil and are easily accessible even during extended dry seasons in arid and semi-arid environments [59]. However, this is frequently not suggested because it is harmful and unsustainable, putting plant species at risk of extinction [60].

![Figure 2. Distribution (%) of plant parts value used in the treatment of cattle diseases in Ramotshere Moiloa local municipality, North West Province, South Africa. (n = 110).](image)

2.8. Method of Preparation and Route of Administration of Medicinal Plants Used to Treat Cattle Diseases

As depicted in Figure 3, the herbal remedies were mainly prepared as decoction (52.04%), ground, and infusion (16.33%). Other ways of preparation were maceration, poulticing, and burning which cumulatively accounted for 31.63%. Decoction is the process of boiling plant components in water and then allowing the liquid to cool before administering. Decoction is a popular preparation method that has been mentioned in several different research studies [48,61,62]. The preparation method differs from other study areas including Karamoja in Uganda [63], the Mana Angetu district of south-eastern Ethiopia [64], and Yalo Woreda in the Afar regional state, Ethiopia [65], where crushing and pounding were the most common methods. The widespread usage of decoction might be attributed to the fact that boiling can accelerate biological processes, resulting in the greater availability of several active compounds [66]. However, preparation procedures vary based on the type of sickness being treated, the location of the condition, and the medicinal components to be extracted [67].
Furthermore, the local communities use a variety of methods to administer the plants when treating cattle diseases (Figure 4). The route of administration for the plants was oral (69.79%) and topical (30.2%). Oral administration is a simple and non-invasive form of systemic treatment. The route allows for the rapid absorption and distribution of the prepared medicines and allowing for sufficient curative power to be delivered [68]. Across many African cultures, oral administration of medicinal plants is the most common route used to treat disease in cattle, as this ensures fast and direct interaction with different plant compounds at the site of action [69–71].

3. Materials and Methods

3.1. Study Area

This study was conducted in the Gopane (25.3175° S, 25.8231° E) and Dinokana (25.456° S, 25.8799° E) villages of the Ramotshere Moiloa local municipality (25.5623° S, 26.1001° E) located in the Ngaka Modiri Molema district municipality, North West Province
of South Africa (Table S1 and Figure 5). Dinokana and Gopane are bordered to the north by Botswana, to the east by Moses Kotane and Kgetleng River local municipalities, and to the south by Ditsholotla and Mafikeng local municipalities [72]. The two communities are dominantly rural area under the leadership of traditional leader and municipality councillors. The area is rich in floras with potential diverse applications [73]. The total surface of both communities is 104,882 km$^2$. Livestock and agricultural productions provide a significant contribution to the rural economy in the study region, and most rural farming systems transport and generate money both directly and indirectly.

Figure 5. Location of the Dinokana and Gopane villages in the Ramotshere Moiloa local municipality, North West Province, South Africa.

The households are active in agricultural activities such as livestock (16,443) and vegetable (1110) production. Particularly, cattle production, consisting of 11,892 households, remains the highest agricultural activity in these communities. The annual income category of agricultural household heads starts from R1 to above R1 228,800 [72], and according to the Ruminant Veterinary Association of South Africa [39], the most prevalent animal diseases in the study are internal parasites, external parasites, tick-borne diseases, insect transmittable diseases, venereal diseases, bacterial diseases, and protozoal diseases. The two communities were selected due to the rich plant biodiversity which serves as an important medicinal resource [74]. Increased population growth, cultural changes such as the rapid shift toward allopathic medicine, and the spread of modern education contribute to the destruction of medicinal plant habitats and the increasing loss of indigenous knowledge due to changes in community inhabitants. Previously, Van der Merwe, Swan, and Botha [33] documented the ethnoveterinary medicine knowledge of the Madikwe community and Ndou [40] focused
on the EVM in Mahikeng, whereas another study focused on the medicinal plants used for retained placenta [25].

3.2. Ethnobotanical Survey

An ethnobotanical field survey was conducted from August 2019 to October 2020 (Spring until Summer) in the Dinokana and Gopane villages of the Ramotshere Moiloa local municipality, South Africa (Figure 5). Snowballing was used to recruit and screen eligible participants [75,76]. Ninety participants (83% were male and 17% female) were purposively selected to participate in the study. The age of participants ranged from 18 to 95 and the participants consisted of indigenous knowledge holders, farmers, and cattle herders. The experience and knowledge of participants on the theme of the study, and their interest in participating, were applied as the inclusion criteria [77].

A face-to-face interview using a semi-structured interview guide prepared in English and translated to Setswana (local language) was used to collect data, after presenting the purpose of the study to the participants, and data was subsequently translated to English. The semi-structured interview guide yielded insightful knowledge for the researcher to develop and generate a rich understanding of the knowledge and skills related to ethnoveterinary [78]. The data collection questionnaire was divided into three sections to obtain required information. Two phases were followed to collect data. The first phase was interviews, and the second involved a field walk and the collection of plants. Following the Alexiades and Sheldon [79] technique, responses of participants that contradicted each other were not considered for analysis. The data generated from individual interviews were cross-checked with other participants in the same villages to obtain reliable information in the study area [80].

The Faculty of Natural and Agricultural Sciences Research Ethics Committee (FNASCERC) at the North-West University reviewed and approved the study (Ethics approval number: NWU-01228-19-S9). Traditional authorities in the local municipality granted permission and access to conduct the study in the communities. Prospective participants were approached to seek their consent to participate in the study following detailed and clear explanation on the purpose of the research. The North West Department of Rural, Environmental, and Agricultural Development (NW-READ) granted authorisation for plants collection in the two villages (Permit number HQ 26/01/18-006 NW).

Field observations were conducted in study areas to collect the plants mentioned during interviews. Plants were identified by participants and collected by researchers during field walks. Plants used to treat cattle diseases were collected using standard procedures/techniques [81]. Voucher specimens for the plants were prepared and deposited in the SD Phalatse (UNWH) and AP Goossens Herbarium (PUC) at the North-West University. The nomenclature of all the collected plants was verified using The World Flora Online (http://www.worldfloraonline.org/, accessed on 22 March 2022).

3.3. Data Analysis

Thematic content and ethnobotanical indices were used to analyse the data collected on indigenous diagnostic skills and ethnobotanical knowledge provided by participants. Thematic content analysis was used to analyse qualitative data [82]. Following the interviews, the data was transcribed and verified for coherence and saturation. The information from various participants was compared to each other to uncover trends and themes. The emergent themes were linked to data sections with corresponding codes such as participant socio-demographic information, frequently identified cattle ailments, diagnostic procedure, and medicinal plant usage process. When no new data, codes, or themes came from the material, it was considered that saturation had been reached. The ethnobotanical knowledge data were analysed using informant consensus factor (Fic), use-value (UV), and relative frequency of citation (RFC) as described below:
Informant consensus factor (Fic): relevant for the categories of diseases to identify the agreement of participants on the reported cures for the group of diseases [83], which was calculated as follows:

\[ \text{Fic} = \frac{\text{Nur} - \text{Nt}}{(\text{Nur} - 1)} \]

where Nur denotes the number of usage reports for a certain ailments category and Nt denotes the number of plants listed for the treatment of that ailment category.

Use value (UV): denotes the relative significance of species recognized locally [84]. The UV was used to identify the plants with the highest utilisation translating to the most frequently mentioned in the treatment of cattle disease [85]. It was calculated as follows:

\[ \text{UV} = \frac{\text{Ui}}{\text{N}} \]

where Ui: is the number of uses stated by each participant for a specific species and N: denotes the total number of participants. If a plant secures a high UV score, that indicates that there are many use reports for that plant, whereas a low score indicates fewer use reports cited by the participants.

Relative frequency of citation (RFC): as described by Tardío and Pardo-de-Santayana [86], this measures the agreement among participants on the reported plants. This index calculates the local relevance of each species by dividing the number of participants who mention the species’ use, also known as frequency of citation (FC), by the number of target participants included in the study (N). The RFC index was calculated using the following formula:

\[ \text{RFC} = \frac{\text{FC}}{\text{N}} \quad (0 < \text{RFC} < 1) \]

where FC is the number of participants who reported using a certain species and N denotes the total number of participants in the research. The factor has a value range of 0 to 1, with a high value indicating a high rate of participant consensus.

4. Conclusions

The selected communities are primarily rural in nature, and cattle farmers are exploring their biodiversity and indigenous knowledge practices for meeting the animal health needs and productivity. Based on the current findings, an inventory of 64 medicinal plants from 32 families with a specific indigenous/native rate of 78.1% used to treat 27 cattle ailments from nine categories was documented, with 18 new plants. Three diagnostic skills, 75 distinct clinical signs and symptoms of disease, and two endpoint determinations were reported to understand cattle diseases. Leaves as a plant part, decoction as a preparation method, and oral as an administration route were found to be the most frequently used systems in treating cattle diseases. The plants were prepared as monotherapy and combination. Even though the research area in the Ramotshere Moiloa local municipality was shown to be rich in medicinal plant variety, efforts to study the plants and the indigenous knowledge connected with them are currently limited. To avert additional losses, local communities and responsible entities must conserve therapeutic plants. Furthermore, plants with a high potential based on the applicable ethnobotanical indices should be selected for additional research, such as phytochemical analysis and pharmacological and toxicological studies.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/plants11131784/s1, Table S1: Demographic information of the study areas.

Author Contributions: Conceptualization, M.V.C., M.M. and A.O.A.; methodology, M.V.C.; formal analysis, M.V.C., J.A.A. and M.S.; investigation, M.V.C., J.A.A. and M.S.; resources, M.M. and A.O.A.; writing—original draft preparation, M.V.C.; writing—review and editing, J.A.A., M.S., M.M. and A.O.A.; supervision, M.M. and A.O.A.; project administration, A.O.A.; funding acquisition, A.O.A. All authors have read and agreed to the published version of the manuscript.
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Institutional Review Board Statement: The Faculty of Natural and Agricultural Sciences Research Ethics Committee (FNASREC) of the North-West University reviewed and approved (NWU-01228-19-S9) the research. In compliance with the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity.

Informed Consent Statement: Informed consent was obtained from all the participants involved in the study. The study participants from the Gopane and Dinokana villages of the Ramotshere Moiloa local municipality retain the authorship of traditional knowledge documented in this publication. Therefore, any use of the documented information, other than for scientific publications, requires the prior consent of the traditional knowledge holders and their agreement on access to benefits resulting from any commercial use.

Data Availability Statement: Primary data collected during the survey are available upon request to the corresponding author of this manuscript.

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