An ethnoveterinary survey of medicinal plants used in livestock ethnomedicine in selected communities in Makoni district, Zimbabwe

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Research

Abstract

Background: The application of ethnoveterinary medicine plays a vital role in the treatment of livestock in Zimbabwe despite the advent of contemporary medicine. However, documentation of this knowledge remains fragmented since ethnoveterinary surveys have not covered all the tribes in the country.

Methods: An ethnoveterinary survey was carried out in Makoni district of Manicaland Province in Zimbabwe in order to document plants used in veterinary complementary medicine. Sixty questionnaire-based interviews were conducted in selected villages. The main areas of investigation were livestock health problems, livestock rearing and ethnobotanical expertise in animal health care. Frequencies of citations were obtained and informant consensus factors (F_{ic}) for different health problems were calculated.

Results: A total of twenty-six (26) plant species were recorded as being useful in the management of 13 categories of livestock health constraints in Mutanda and Domborembizi villages. The medicinal plants belonged to 20 families with the Fabaceae being the predominant family. The oral mode of administration had the highest percentage of citation (78.1%) followed by the topical method (17.3%) and application of medicinal plants to floors of poultry houses had the least citation (4.6%). All the animal health problems had informant consensus factors of greater than 0.9 except snake bites which had a very low F_{ic}.

Conclusion: The survey revealed that most farmers (83%) in the study area still relied on using ethnomedicine for the management of livestock health problems. The high F_{ic} for most of the conditions shows that farmers agreed on plants used in the management of specific conditions. *Aloe vera*, *Erythrina abyssinica*, *Melia azedarach* and *Pouzolzia mixta* were the most cited plant species.

Keywords: Ethnoveterinary, livestock, poultry, ruminant, traditional, conventional, plants

Background

Livestock rearing is a crucial element in the livelihoods of 70% of the world's resource-challenged population, the bulk of which live in rural areas (Nyahangare *et al*. 2015). Livestock has also been used as a symbol of wealth in rural communities since time immemorial. However, livestock population is always at risk from diseases and people in resource marginalized areas have always depended on ethnoveterinary medicine (EVM) to manage livestock health problems. This knowledge was developed over time through trial-and-error experiments on animals. Therefore, it is less methodical, less institutionalized and not universally accepted as a treatment modality for livestock diseases (Wanzala *et al*. 2005).

According to the World Health Organization (WHO) approximately eighty percent or more people living in developing countries heavily rely on ethnomedicine to manage healthy constraints affecting livestock and humans in their communities (Parasuraman *et al*. 2014). EVM is a traditional approach to animal health care that encompasses a lot of information, beliefs, methods and techniques of livestock management among members of a community (Bekele & Musa 2009). The knowledge differs from one region to another, and it also differs among members of the same community.

The use of these plants is mostly for symptomatic treatment rather than targeting the specific disease, as some of the farmers would not have much diagnostic information on the disease. The active ingredients are extracted mainly using water as an extractant from the roots, stems, and leaf parts of the plant before administering through appropriate routes (Velavan 2015).

Many smallholder farmers in Zimbabwe have limited access to professional services of a veterinarian due to shortage of veterinarians in remote areas and in most cases the smallholder farmers face serious cash flow problems meaning they cannot afford conventional medicines. These are some of the reasons why ethnoveterinary medicine is entrenched in rural-based populations. Medicinal plants are also cheap, easily accessible, easy to prepare and are eco-friendly (Ritter *et al*. 2012, Batool *et al*. 2022). Priority is always given to conventional synthetic drugs, yet their availability is limited in rural areas of Zimbabwe and dependent on donor funds (Masimba *et al*. 2011). In the past years, the erratic nature of donor funds has resulted in massive livestock deaths mostly from tick-borne diseases because most communal dip tanks have been unfunctional as the government has been failing to supply acaricides (Mwale *et al*. 2005, Manyenyeka *et al*. 2022).

In Zimbabwe some internal parasites have developed resistance against deworming drugs such as benzimidazole, levamisole and even ivermectin (Marandure 2016). EVM offers a solution in the management of ectoparasites and endoparasites in livestock production systems. Some herbal remedies have multiple biological activities and may provide a solution to the emergence of pathogen resistance to allopathic veterinary medications (Mwale *et al*. 2005). However, as ethnobotanical knowledge has been transmitted by word of mouth from one generation to another, it is facing a threat of extinction due to the embracement of contemporary culture and practices, death of elderly people, migration of the younger generation in search of greener pastures and the general negative attitude of young people towards the use of EVM and practices.

Only a handful of surveys on the use of ethnoveterinary medicine to manage ruminant diseases have been conducted in Zimbabwe. Most studies in Zimbabwe have focused on the use of EVM in the management of poultry diseases. In 2005, Mwale and co-workers investigated the use of herbal plants in the management of poultry diseases in Mushagashe in Masvingo. An ethnosurvey which also focused on medicinal plants used for treatment of poultry diseases was conducted in Bindura, Murehwa and Chipinge recently (Jambwa *et al*. 2022). The use of ethnobotanical plants in the control of ectoparasites in livestock in Kadoma and Chiredzi has also been investigated (Nyahangare *et al*. 2015). A survey which explored plants used of dermatophilosis and control of ticks was also done in Zhombe (Ndlovu & Masika 2013). Another ethnosurvey which focused on diverse livestock species was also carried out in the Midlands province (Maroyi 2011). The surveys that have been done have not covered the entire breadth of the country and therefore they have been limited to particular tribes. Ethnoveterinary medical knowledge depends on tribe and therefore its application is different amongst different tribes. The purpose of this study was to document plants used in livestock ethnomedicine by people of the Manica tribe in Zimbabwe.

Materials and Methods

Study area

The survey was conducted in Makoni district in Zimbabwe which is situated in Manicaland province in the north-eastern parts of the country (Fig. 1). It sits at an altitude of 1410m above sea level. The district lies in agro-ecological regions 2b, 3 and 4 and its climate is subtropical (www.mindat.org). The annual rainfall ranges from 450mm-850mm (www.fnc.org). There are mixed farming activities namely cattle ranching, wildlife and crop production (semi-intensive). Most of the soils in the

district were formed from the granite rock which is highly acidic and requires liming for higher productivity (www.fnc.org). Makoni's population is primarily composed of speakers of the Manyika and Chiungwe languages. Before commencing the interviews, permission was sought from the highest authority in the selected villages.

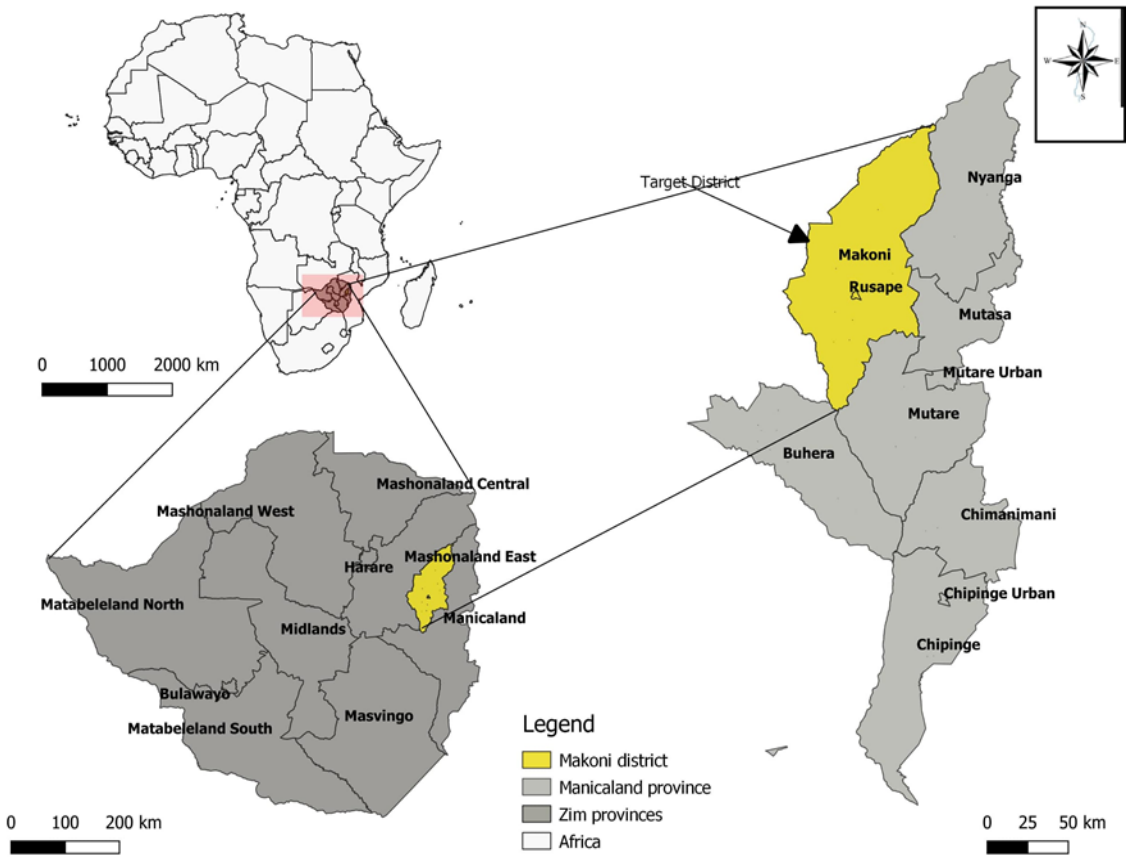

Figure 1**.** Map of Zimbabwe and that of Manicaland province showing the location of Makoni district.

Data collection

The authorities and participants were given an explanation, of the study objectives and goals. A total of 60 farmers were interviewed using a semi-structured questionnaire. Purposive sampling was used to select the participants for the study from four villages (Domborembizi Village 31, Domborembizi Village 35, Domborembizi Village 57 and Mutanda Village) depending on whether they reared livestock. The participants were asked for information on plants used in alternative medicine for the treatment and management of specific livestock health problems. Information on the parts of the plant used, method of preparation and the mode of administration was collected. The participants were asked to identify the specific plants they would have mentioned and specimens were collected. The plants specimens were collected and were later identified by a botanist from the National Herbarium in Harare and voucher specimens were deposited.

Data analysis

Data analysis was done using Statistical Package of Social Science (SPSS) version 24.0 (SPSS Inc., IBM, Armonk, NY, USA). Frequency and percentages were used for descriptive statistics. The Chi-square test was used to analyse associations. The ***Relative frequency of citation*** was calculated using the formula; RF = $\frac{f}{n}\ x\ 100$. F is the number of times a particular species is mentioned, and n is the total number of times that all species were mentioned. ***The Informant consensus factor*** **(F_{ic})** was used to find the most frequently used plants and their homogeneity of usage in different villages. The F_{ic} score was determined using the formula: $F_{ic}= \frac{Nur-Nt}{Nur-1}$. N_{ur} is the number of user records in a particular category, and N_t is the number of species utilized as medication for that category (Heinrich *et al*. 2009).

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Results

Socio-demographic characteristics of the informants

There were more male participants (73.3%) than female participants (26.7%). From the study population, 76.7% were above 40 years of age with 30% being in the 41- 55 age group, 35% in the 56-70 age bracket whilst 11.7% were above 70 years of

age. Only 23.4% of the respondents were less than or equal to 40 years of age, with 16.7% being in the 26-40 age bracket and a paltry 6.7% being below the age of 26 (Table 1). Most of the respondents were Christians (75%) and only a quarter of the respondents (25%) practised the African traditional religion. A large number of the participants had completed some type of formal education (78.3%), with 31.7% having gone to school up to primary level, 33.3% having undergone secondary education and only 13.3% having a tertiary-level qualification. Less than a quarter of the respondents (21.7%) had not attained any form of formal education (Table 1).

Table 1. Demographic data of the informants

Category		Frequency	%
Gender	Males	44	73.3
	Female	16	26.7
Religion	Christianity	45	75
	African Traditional Religion	15	25
Education	Primary	19	31.7
	Secondary level	20	33.3
	Tertiary	8	13.3
	Never Attended	13	21.7
Residence	Domborembizi village 31	9	15
	Domborembizi village 35	15	25
	Domborembizi village 57	8	13.3
	Mutanda village	28	46.7
Age	≤ 25	4	6.7
	26- 40	10	16.7
	41- 55	18	30
	56- 70	21	35
	>70	7	11.7

Ruminant populations

Mutanda village had the lowest livestock (ruminant) mean values compared to Domborembizi resettlement villages (Fig. 2). Domborembizi village 57 had the highest mean number of cattle per household followed by Domborembizi village 35 whilst Mutanda village had the lowest mean number of cattle per household. In terms of goat population, Domborembizi Village 31 had the lowest mean whilst Domborembizi Village 57 had the highest mean number of goats per household. Sheep was the least reared ruminant species in all four villages, as the average population per household for the four villages was less than 1 (Fig. 2). The Chi-Square test showed that there was no association between the age or gender to different species of ruminants kept (p values >0.05).

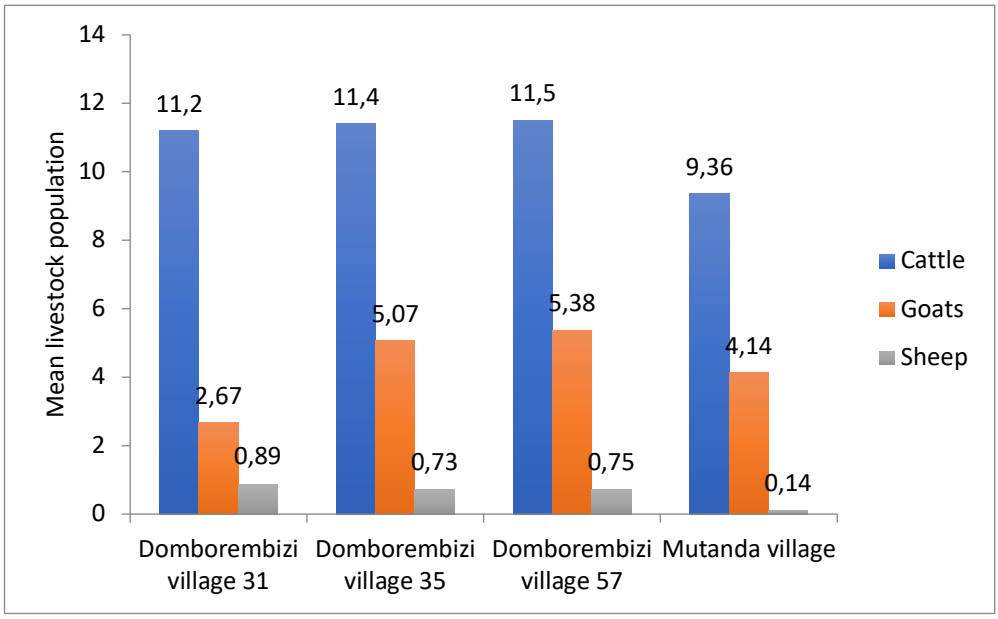

Figure 2. Average number of ruminant animals for Mutanda village, Domborembizi village 31,35 and 57.

Poultry populations

Nearly 98% of the respondents kept indigenous landrace chickens (Fig. 3). The second most cited poultry species were turkeys, with 30% of the respondents rearing them. The least-reared poultry species were broilers. The majority of the respondents were small scale poultry producers with most of them keeping 1- 50 birds (Fig. 3). All avian species were kept as free-ranging backyard chickens.

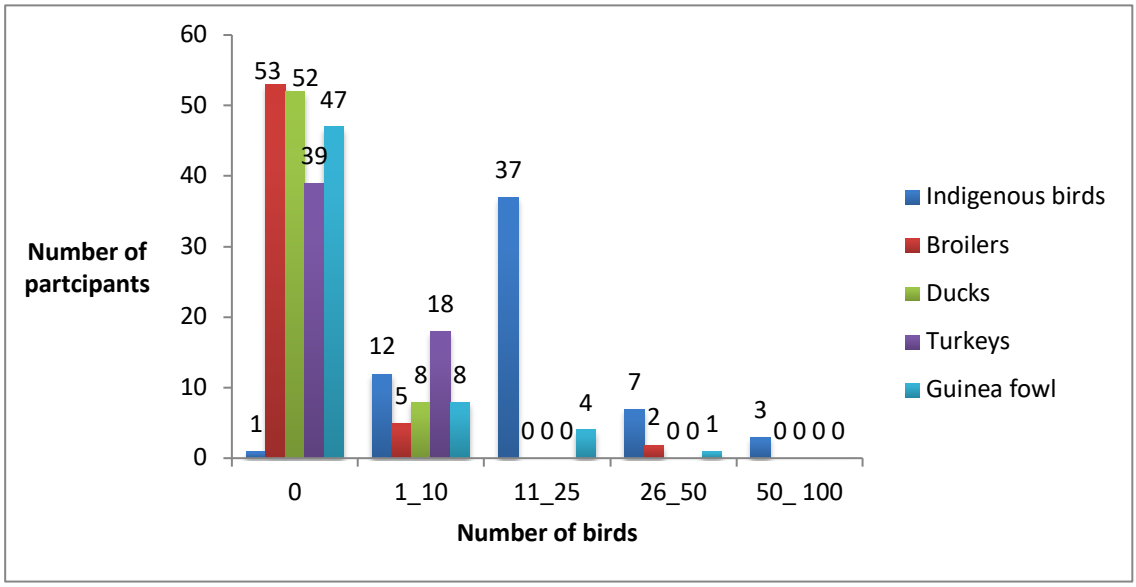

Figure 3. Poultry species kept by the participants

Use of medicinal plants and conventional drugs

Fifty per cent of the study population used a combination of medicinal plants and conventional drugs whilst 33.33% used medicinal plants only. A small percent of the study population (16.67%) used conventional drugs only (Fig. 4).

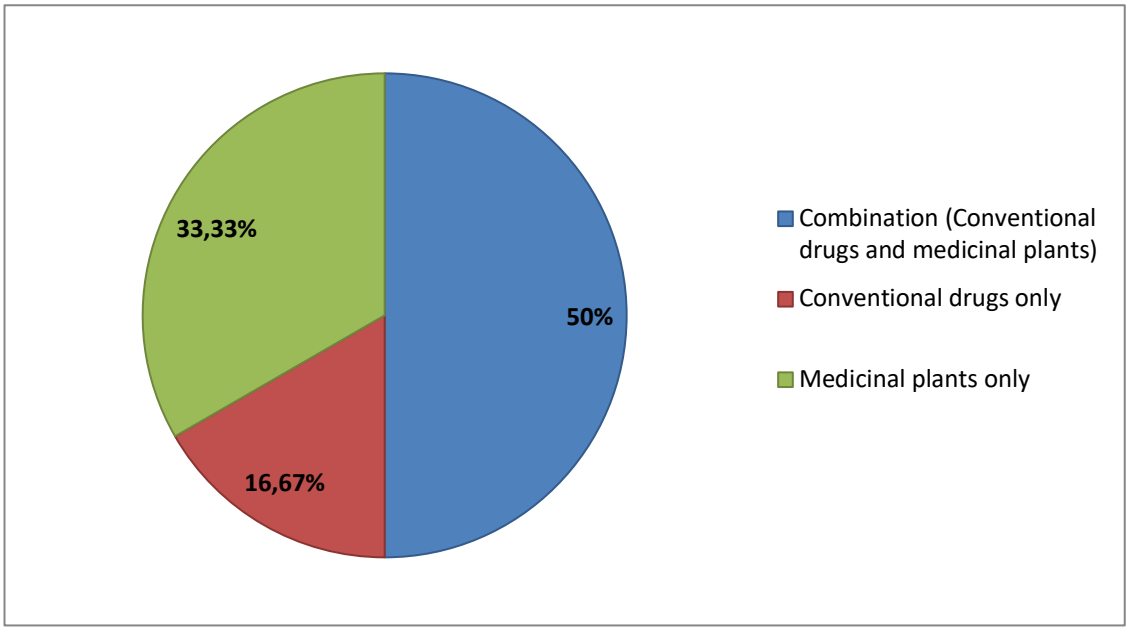

Figure 4. Treatment modalities used by the respondents in terms of percentages.

Veterinarian/Para-veterinarian consultation

Forty-five per cent of the respondents said they consulted an animal health professional (veterinarian or para-veterinarian) for assistance with regards to livestock health problems whilst 55% of the population said they did not consult any animal health professional whenever their animals fall ill, they just treated symptomatically.

Livestock health constraints

The gastrointestinal class had the highest number of health conditions that were recorded (Table 2). Helminthic infections were the most frequently cited health problem with a citation percentage of 15.6 followed by bloat and coccidiosis with 13.4% and 13.2% respectively. Dermatology was the second most cited class from the survey, with wounds being the most common health problem in this class with a citation percentage of 13.9. Lethargy and general weakness were ranked third with a citation percentage of 10.7. Reproductive problems, tick-borne diseases and lactation problems were the least cited livestock health problem with citation percentages of 2, 2 and 1.6 respectively. Ectoparasites control was only done in poultry.

Health constraints and plant species used as remedies

The highest number of plant species were used for the treatment of wounds. All the livestock health problems recorded in this study had an informant consensus factor of greater than 0.9 which is close to 1 except snakebites which had a very low consensus factor of 0 (Table 2).

Table 2. Classification of the animal health problems, their frequency of citation, and number of plant species used

Classification of the health problems	Animal health problem/ symptom	Frequency of citation	Relative frequency of citation	Number of plant species used	Informant consensus factor (F_{ic})
Dermatology	Wounds	157	13.9	6	0.968
	Snake bites	2	0.2	2	0
Ectoparasites	Fleas	55	4.9	2	0.981
Eye problems	Eye- problem	41	3.6	2	0.975
Gastrointestinal problems	Bloating	152	13.4	4	0.980
	Coccidiosis	149	13.2	4	0.980
	Diarrhoea	96	8.5	4	0.968
	Helminthic infections	176	15.6	3	0.989
General Health	Lethargy/ general weakness	121	10.7	4	0.975
Lactation problems	Mastitis	18	1.6	2	0.941
Reproductive problems	Retained placenta	23	2.0	1	1
Respiratory problems	Respiratory distress	72	6.4	2	0.986
Tick-borne	January disease	23	2.0	1	1

Plants species used in Livestock ethnomedicine in the study areas

Twenty-six (26) plant species were identified as being useful for the control of livestock health problems in Mutanda and Domborembizi villages (Table 3). These medicinal plants belonged to 20 different families. The most cited plant species belonged to the families: Fabaceae (6), Euphorbiaceae (2), Asphodelaceae and Anacardiaceae (2). Other families were represented by one species, as indicated in Table 3. *Aloe vera* was the most frequently cited plant species with a citation percentage of 15.3. It was used to treat a broad range of livestock diseases across different animal species. *Erythrina abyssinica* and *Melia azedarach* were also among the plant species with high relative frequencies of citation. They had 9.8% and 7.1% respectively. *Strelitzia nicolai* and *Securidaca longipendiculata* were the least cited plant species with a citation percentage of 0.3 and 0.7 respectively (Table 3). *Lippia javanica* and *Nicotiana rustica* leaves were also some of the plant species that were cited, and they were used for ectoparasite control in chickens. Salt and other non-plant elements like soot were also used to prepare ethnoveterinary remedies

Table 3. Plant species used in ethnoveterinary medicine by farmers in the study areas

Family	Plant species	Vernacular name	Voucher number	Frequency of citation	Relative Frequency of citation	Parts used and traditional method of preparation	Ethnomedicinal use: diseases/ symptoms
Amaryllidaceae	*Crinum macowanii* Baker	**Dururu**	TK001	32	2.8	**Leaves:** crushed and added to drinking water	Reduced milk yield
Anacardiaceae	*Lannea schweinfurthii* **(**Engl.) Engl. var. *stuhlmannii* (Engl.) Kokwaro	**Musototo**	TK002	24	2.1	**Bark:** dried crushed into powder and mixed with water	Used mostly in cases of diarrhoea and gastrointestinal problems
	Sclerocarya birrea (A.Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro	**Mupfura**	TK003	53	4.7	**Bark:** dried crushed into powder and mixed with water	Used as a de-wormer and other colic-related problems
Asphodelaceae	*Aloe vera* (L.) Burm.f.	**Gavakava**	TK004	173	15.3	**Leaves:** fresh leaves crushed and added to drinking water	Coccidiosis, Respiratory distress, bloating, lethargy/ general weakness, wounds diarrhoea
Astereceae	*Tagetes minuta* L.	**Chimbanjesango**	TK005	35	3.1	**Whole plant:** the plant is placed on poultry pans	Mites and tick repellent in poultry houses
Cactaceae	*Opuntia monacantha* Salm Dyck	**Dhorofiya**	TK006	42	3.7	**Whole plant:** crushed and added to drinking water	Lethargy/ general weakness
Celastrceae	*Gymnosporia senegalensis* (Lam.) Loes	**Musosavafa**	TK007	19	1.7	**Leaves:** dried then crushed and mixed with water to form a suspension.	Colic and gastrointestinal problems like straining to defecate
Euphorbiaceae	*Euphorbia tirucalli* L.	**Rusungwa**	TK008	24	2.1	**Whole plant:** crush fresh plant and dissolve in water Extract plant sap and apply to wound	Lethargy/ general weakness Wounds
	Ricinus communis L. var. *communis*	**Pfuta**	TK009	36	3.2	**Leaves:** fresh leaves crushed and added to drinking water	Bloat, diarrhoea

Fabaceae-Caesalpinioideae	*Piliostigma thoningii* (Schumach.) Milne-Redh.	**Musekesa**	TK010	21	1.9	**Leaves:** fresh leaves crushed and added to drinking water	Swollen joints
	Afzelia quanzensis Welw.	**Mukamba**	TK011	25	2.2	**Bark:** dry and crush bark into powder and dissolve into drinking water	January disease and snake bites
	Burkea africana Hook.	**Mukarati**	TK012	12	1.1	**Leaves:** fresh leaves crushed and added to drinking water	Diarrhoea and other gastrointestinal problems
Fabaceae-Papilionoidede	*Erythrina abyssinica* Lam. ex DC.	**Mutiti**	TK013	111	9.8	**Bark:** crush bark into powder and dissolve it into drinking water	Respiratory distress, coccidiosis
	Bobgunnia madagascariensis (Desv.) J.H. Kirkbr. & Wiersama	**Mucherekecha**	TK014	22	1.9	**Pods:** crush dried pods into powder and dissolve them in drinking water	Coccidiosis, respiratory distress
	Dalbergiella nyassae Baker f.	**Muswati**	TK015	17	1.1	**Bark:** dry and crush bark into powder and apply topically on wounds	Wounds
Loganiaceae	*Strychnos spinosa* Lam.	**Mutamba**	TK016	40	3.5	**Fruit:** dried fruit crushed and added to water and applied to eyes	Eye problems
Meliaceae	*Melia azedarach* L.	**Mukina**	TK017	80	7.1	**Leaves:** fresh leaves crushed and added to drinking water	Helminthic infections
Myrothamnaceae	*Myrothamnus flabellifolius* Welw.	**Mufandichimuka**	TK018	36	3.2	**Whole plant:** cut into small parts and boiled in water	Mastitis
Passifloraceae	*Adenia cissampeloides* (Planch. ex Hook.) Harms	**Muhore**	TK019	29	2.6	**Whole plant:** crush fresh plants and dissolve them in drinking water	Coccidiosis, bloat, lethargy/ general weakness
Pedaliaceae	*Dicerocaryum senecioides* (Klotzsch) Abels	**Mufeso**	TK020	18	1.6	**Whole plant:** crush the whole plant and add it to drinking water.	Coccidiosis
Polygalaceae	*Securidaca longipendiculata* Fresen.	**Mufufu**	TK021	8	0.7	**Leaves:** crush fresh leaves and mixed with water	Constipation and snake bites
Rubiaceae	*Psydrax livida* (Hiern) Bridson	**Muvengahonye**	TK022	44	3.7	**Fresh leaves:** crushed and applied to the wound	Septic wounds

Solanaceae	*Solanum incanum* sensu auct. pro parte	**Ndundurwa**	TK023	32	2.8	**Fruit:** crushed and the fluid is applied to the eye or wound	Eye problems, wounds
Strelitziaceae	*Strelitzia nicolai* Regel & Koern.	**Mubhanana**	TK024	3	0.3	**Fruit peels:** dried peels crushed into powder and applied to the wound	Wounds
Urticaceae	*Pouzolzia mixta* Solms	**Nhanzva**	TK025	67	5.9	**Leaves:** crushed and added to water; the mixture is administered orally. **Fresh leaves:** crushed and the slippery paste inserted into the vagina	Bloat Retained placenta
Vitaceae	*Cissus quadrangularis* L.	**Chirunjurunju**	TK026	40	3.5	**Whole plant:** crushed and added to drinking water Stem: crushed and paste applied to wounds	Helminthic infections, wounds

Association between demographic characteristics and the number of plant species cited

There was an association between the age bracket and the number of plant species cited by the respondents ($p<0.05$) with the respondents in the older age brackets citing more plants compared to those in the younger age brackets (Table 4). However, there was no association between religion and the number of plant species cited ($p>0.05$) There was also no association between the place of residence (village) and the number of plant species cited.

Table 4. Results of Chi-Square Test - Association between demographic characteristics and the number of plant species cited

Parameter	Value	Df	Asymp. Sig. (2-sided)
Age	229.991[a]	120	0.000
Religion	22.895[a]	30	0.820
Residence	74.267[a]	90	0.885

Plant part used

Different plant parts were used in the preparation of medicines. Leaves had the highest citation percentage of 37.5, whilst roots and tubers had no citation at all (Table 5). The other plant parts were in the following descending order in terms of citation, whole plant, bark, fruit, pods and seeds

Table 5. Frequency of citation for plant parts utilised in the preparation of medicines.

Plant parts used for the preparation of medicines	Frequency of citation (Fc)	Citation Percentage %
Leaves	421	37.56
Pods	24	2.14
Whole plant	357	31.85
Bark	229	20.43
Seeds	1	0.09
Fruits	89	7.93
Total	1121	100

Methods for preparation of herbal remedies

Four methods of preparation were cited by the respondents with crushing fresh plant material and dissolving in water having the highest citation percentage (Fig. 5). Extraction of sap from plant material had the second highest percentage of citation, followed by grinding of dried plant material and crushing of dried plant material and dissolving in water.

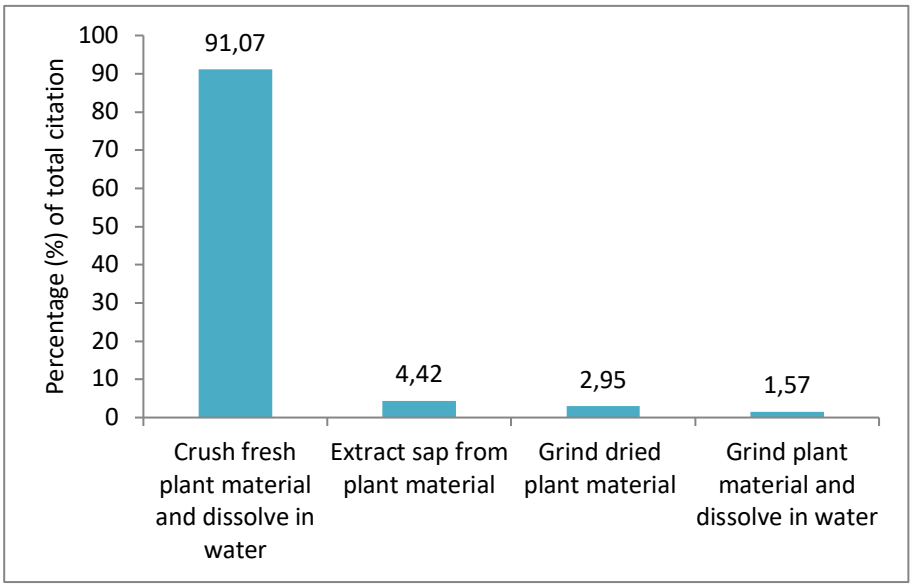

Figure 5. Percentage frequency of total citation for the methods of preparations of the medicines

Mode of Administration

Only three methods of administration were cited namely oral, topical and applying the medicine to the floor of poultry houses. The methods were ranked in descending order, with oral having the highest citation followed by topical and applying to the floor of poultry houses (Fig. 6).

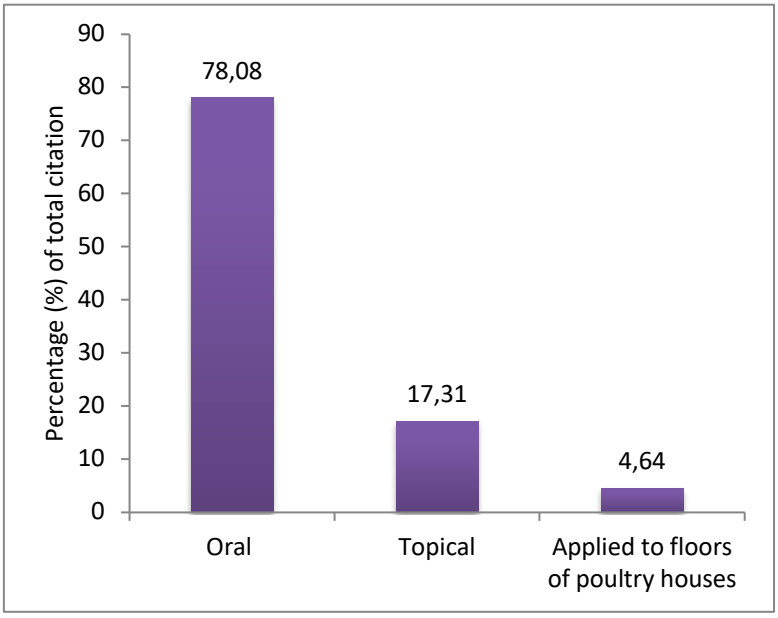

Figure 6. Method of administration of ethnomedicines

Discussion

They were more male respondents compared to females in the current survey. The high number of male respondents in comparison with females has also been recorded in previous ethnoveterinary surveys in Zimbabwe (Maroyi 2012, Gumbochuma *et al*. 2013). This can be explained by the fact that males are the head of most African families. The low percentage (23.4%) of participants in the age bracket of 1- 40 years can be attributed to the mass migration of people in this age group to towns and across national boundaries in search of better livelihoods and employment opportunities. Similar findings have also been recorded by other researchers in Zimbabwe (Nyahangare *et al*. 2015, Jambwa *et al*. 2022). The number of Christians was high compared to ATR practising practitioners. A similar finding has also been recorded from previous research in Zimbabwe (Jambwa *et al*. 2022). This can be attributed to the longstanding imposition of Western beliefs on indigenous people during the colonial era.

The village which had the highest population of cattle had a mean of 11.5 per household. Cattle were the most reared ruminant species followed by goats. Cattle play a very important socio-economic role in African cultures, as they can be used for draught power, provision of milk, meat and manure and are also used in traditional rituals (Mapiye *et al*. 2020). The most commonly reared avian species were indigenous birds, with most of the respondents rearing birds in the range of 11-25. Chickens are essential to the participants' livelihoods because they give the household easily available, inexpensive protein and may be utilized to generate revenue quickly (Nyahangare *et al*. 2015). Turkeys were the second most reared avian species. The least-reared avian species were broilers. Similar findings were recorded by Jambwa et al. (2022), where the majority of the population reared indigenous birds. This finding can be attributed to the fact that indigenous birds are easy to rear and are resistant to most diseases. In a study done by Maroyi (2012) in the Midlands province, he noted that there was an association between gender and livestock ownership where women owned more goats, sheep, rabbits, guinea fowls, chickens, pigeons and turkeys than men. However, this was not the case in the current survey as there was no association between gender and animal species kept by different participants. This outcome reflects that animal species are given the same value by both genders in study area.Participants from Mutanda and Domborembizi villages practised small-scale mixed farming. This finding can be explained by the fact that most farmers in the villages have limited access to funding hence they spread out the risk of losing everything by practicing mixed farming (Maroyi 2012).

Other surveys done in Zimbabwe showed that a greater percentage of the population used veterinary plants either as a sole treatment modality or in combination with conventional drugs (Gumbochuma *et al*. 2013, Nyahangare *et al*. 2015). Similar

results were obtained from this survey, where 50% of the population used a combination of medicinal plants and conventional drugs and 33.33% relied solely on medicinal plants as a treatment modality. Less than a quarter (16.67%) relied on conventional drugs only for the management of livestock health problems. The increased usage of medicinal plants is a reflection that the participants believe that these plants have some pharmacological activity that can be useful in the alleviation of illnesses. It can also be explained in terms of reduction in the cost of production, as the use of conventional drugs to treat recurring or endemic diseases is expensive. The population that solely relied on conventional drugs showed some negative attitudes towards the usefulness of medicinal plants. The negative attitude can be due to a lack of information passage from one generation to another.

The common health problems in poultry from the study were diarrhoea, coccidiosis, wounds and respiratory problems, whilst diarrhoea, wounds, bloat and worm burden were the common health problems in ruminants. The study done in Takavarasha village by Gumbochuma et al (2013) agrees with findings from the current study as they reported similar health problems in poultry. Gastrointestinal conditions had the highest frequency. This can be attributed to the fact that most gastrointestinal conditions are a direct reflection of the level of hygiene in the environment. In a free-range set-up, it is very difficult to implement good hygienic practices such as frequent removal of poultry droppings to prevent the accumulation of parasites in the environment. The high prevalence of wounds in in cattle can be attributed to different factors. In cases where there is frequent dipping of cattle and damp areas in the kraals, the skin of the animals will be soft and can easily get abraded resulting in wound formation. In a survey done by Maroyi (2012), the increased occurrence of wounds was attributed to the increase in the number of tick bites especially during the rainy season as the dipping services in the study area were erratic.

There was an association between the numbers of plant species cited by different age groups. This result is contrary to another study done by Jambwa et al (2022) where there was no significant difference between the plant species cited by different age groups. However, the study by Jambwa et al (2022) focused on plants used in poultry ethnomedicine only. The results from the current survey show that there was no significant flow of information from one generation to another in both Mutanda and Domborembizi villages as there was an association between the age bracket and the number of plant species cited by the respondents with the older generation citing more plant species compared to the younger generation ($p<0.05$). The lack of passage of information can be due to the death of the elderly people who are custodians of the information because they are the ones pass down information on ethnomedicine to the next generations or the unwillingness of the younger generations to learn from the elderly people. The results from the current survey should be a workup call to members of the community and the government to come up with programs that will help in the preservation of this heritage before it becomes extinct.

There was no association between the number of plant species cited and religion. This implies that Christians in the study area still embrace the use of traditional plants despite the shift from their historical African traditional religion to Christianity. There was no significant difference in the number of plant species cited by participants from different villages. The fact that there was no association between residence and plants used is an indication that there is a flow of information between villages.

Leaves had the highest frequency of citation followed by whole plant, bark, fruits, pods and seeds respectively. Most of the leaves were obtained in the wild and used as fresh leaves most likely because most farmers would only look for ethnoveterinary plants when they need to treat ongoing diseases, avoiding the need to store them in dried form (Luseba *et al*. 2013). The use of the whole plant and roots may have destructive effects on the conservation of these medicinal plants. Plants like *Tagetes minuta* (chimbanjesango) used by Mutanda and Domborembizi farmers involve uprooting the whole plant and placing it in poultry houses. This may be detrimental since a large population owns poultry. The bark had the third highest frequency of citation which is also destructive if the villagers keep collecting from the same trees without allowing them to heal. Pods, seeds and fruits had the lowest frequency of citation largely because there are seasonal parts of the plants and villagers might have largely adopted the use of parts available throughout the year.

Crushing fresh plant material and dissolving in water was the most common method of preparation followed by extraction of sap from plant material. These two methods of preparation involve the use of fresh plants which is highly suggestive that the majority of the villagers were using ethnoveterinary plants on a need basis rather than other factors like toxicity which might have affected the choice of preparation (Luseba *et al*. 2013). *Ricinus communis* is one of the plants species cited by the farmers for the treatment of bloat and diarrhoea despite the fact that some parts of the plant are toxic. The villagers only use crushed fresh leaves of *Ricinus communis* mixed with water. The seeds of *Ricinus communis* are used by pharmaceutical companies to make castor oil which has very potent medicinal effects. However, the hull of *Ricinus communis*

seeds contains a deadly poison called ricin so great care must be taken in preparation so the leaves tend to be less toxic to livestock (Rana *et al*. 2012). Application of dried plant material and preparing aqueous remedies using dried ground powder had the lowest frequency of citations respectively. The act of drying plants and storing them for future use was not popularly practised among these four villages.

Three methods of administration were reported with the oral route having the highest frequency of citation followed by topical application and lastly environmental application. The oral application provides the best possible bioavailability of EVMs since the preparations leave them with a lot of impurities. The impurities can cause various adverse effects if administered intravenously, intramuscularly or subcutaneously. The oral, topical and placing of plants on the floor of poultry houses are quite easy methods of administration and can be performed by almost anyone in the communities.

The high informant consensus factors of greater than 0.9 for most of the conditions shows that most of the respondents agreed on medicinal plants used in the management of these conditions. Therefore, there is sharing of information among people from different villages. Only snake bites had a very low informant consensus factor, and this shows that farmers had little knowledge about medicinal plants which can be useful for the treatment of snake bites with only two plant species being cited. *Aloe vera*, *Erythrina abyssinica, Melia azedarach* and *Pouzolzia mixta* were the most cited plant species from this study. It is important to note that a high frequency of citation does not necessarily translate to high efficacy as efficacy is only determined through efficacy experiments (Nyahangare *et al*., 2015). Aloe species have also been cited in other surveys done in Zimbabwe as one of the frequently used plant species in the management of livestock health problems (Maroyi 2012, Mwale *et al*. 2005, Nyahangare *et al*. 2015). *Aloe vera* has also been one of the frequently cited herbs in the surveys. It was reported to be used for the treatment of coccidiosis and diarrhoea in poultry in a survey done in Takaravasha village (Gumbochuma *et al*. 2013). It is also used as an acaricide (Nyahangare *et al.* 2015). *Aloe vera* species are known to possess the following biological properties: laxative, wound healing, antioxidative, antimicrobial, antitumor, anti-inflammatory (Sharma *et al*. 2014). In a study done by Saddiq & Al-Ghamadi (2018), *Aloe vera* extracts reduced growth and biofilm formation against methicillin-resistant *Staphylococcus aureus.*

Erythrina abyssinica is a small to medium-sized deciduous leguminous tree which is originally from east Africa but has spread throughout Africa and other continents (Obakiro *et al*. 2021)**.** The villagers in Mutanda and Domborembizi villages reported that they use the bark extracts of *Erythrina abyssinica* for the treatment of respiratory problems and coccidiosis. Phytochemical analysis of the bark belonging to *Erythrina abyssinica* revealed the presence of saponins, tannins, alkaloids, and flavonoids. The roots had alkaloids, cardiac glycosides, saponins, coumarins, and anthraquinone derivatives (Obakiro *et al*. 2021)**.** Studies have shown that extracts of *Erythrina abyssinica* have significant antibacterial, strong antioxidant and anti-inflammatory activities (Marume *et al*. 2018, Jambwa *et al*. 2023). The phytochemicals isolated from this tree have antifungal, antiviral, anticancer, anthelminthic and antibacterial properties (Obakiro *et al*. 2021)**.** These findings support the use *Erythrina abyssinica* in livestock ethnomedicine in the communities under study**.**

Melia azedarach is a medium-sized deciduous tree that may grow up to 45 meters tall, with a spreading crown and moderately branching limbs (Kolkar *et al*. 2024). The villagers reported that they use fresh leaves of *Melia azedarach* for the treatment of helminthic infections. The phytochemical analysis of *Melia azedarach* revealed that it contains flavonoids, steroids, terpenoids, acids, alkaloids, saponins and anthraquinones (Ramya *et al*. 2022). The juice of *Melia azedarach* leaves acts as an anthelminthic, emmenagogue, diuretic, expectorant and vermifuge (Sharma *et al*. 2014). Lee *et al* (2007) concluded that extracts of *Melia azedarach* are potent against *Trichomonas vaginalis*. This result was attributed to the ability of the extracts to prevent cell division and interfering with protein synthesis. Szewezuk et al (2006), demonstrated that ethanol extracts of *Melia azedarach* had superior anthelminthic activity against a tapeworm *(Taunea solium)* compared to piperazine. This reported biological activity of *Melia azedarach* validates the use of this plant species in livestock medicine for the treatment of helminthic infections by the respondents in the current study. Studies have revealed the presence of phytochemicals such as, steroids, alkaloids, phenols, flavonoids, saponins, tannins, anthraquinone and phytosterols in *Melia azedarach* extracts (Malar *et al*. 2020, Shrestha *et al*. 2021). These are some of the compounds which may be responsible for its biological activity.

Pouzolzia mixta is a small plant and its multi-stemmed growing up to four meters high. It is used to correct retained placenta in livestock that would have usually suffered difficulties during parturition and can also be used to treat animals that have diarrhoea (Moreki *et al*. 2012). The antibacterial, antifungal, antiviral, anti-diabetic, anti-fertility and antioxidant activities of *Pouzolzia mixta* have been documented (Maroyi 2023). The presence of the following phytochemicals: alkaloids, glycosides,

flavonoids, phenolics and tannins in *Pouzolzia mixta* has been reported (Maroyi 2023). The use of *Pouzolzia mixta* in veterinary ethnomedicine by the informants may be linked to the presence of these phytochemicals.

Psydrax livida, locally known as Muvengahonye has been cited in several studies done in Zimbabwe as the plant of choice in the treatment of septic wounds (Gumbochuma *et al*. 2013, Maroyi 2012, Nyahangare *et al*. 2015). A study on the antibacterial activity of *Psydrax livida* extracts showed that it has antibacterial activity against *Esicherichia coli, Enterococcus faecalis, Pseudomonas aeruginosa, Staphylococcus aureus* (Mukandiwa *et al.* 2012). The dichloromethane extract had significant activity against *Staphylococcus aureus* with an MIC of 0.078 mg/ml. This validates the use of *Psydrax livida* for the treatment of septic wounds by the respondents as *Staphylococcus aureus* is a common pathogen of these wounds.

Conclusion

The most commonly cited health problems in poultry were diarrhoea, coccidiosis, wounds and respiratory problems, whilst the common health problems in ruminants that emerged from the study were wounds, bloat and helminth burden. This survey revealed that a higher percentage of smallholder farmers (83%) still used ethnoveterinary plants to treat livestock health problems. However, of the population that used plants, most of them preferred to utilize a combination of natural botanicals and allopathic drugs. Twenty-six plant species belonging to twenty families were employed to manage or control thirteen disease/health constraint categories which were identified. Most of the conditions had a high F_{ic} showing that the respondents agreed on plants used in the management of specific conditions. Leaves were the most commonly used plant part in the preparations of medicines. Oral administration was the most common method of administration of EVMs. There was no significant flow of information from the older to the younger generation. This finding calls for prompt action to document these plants and indigenous knowledge before it becomes extinct.

Declarations

List of abbreviations: EVM – Ethnoveterinay medicine, F_{ic} – Informant consensus factor, RF – Relative frequency of citation, DF – degrees of freedom

Ethics approval and consent to participate: According to Zimbabwean guidelines, ethical approval was unnecessary for this study. Permission was sought from the District Administrators (DA) councillors and village heads to enter the communities and collect data. Participants were able to ask questions about the survey before agreeing to participate and the nature and goals of the survey were made apparent. Each participant signed a consent form, to agree that the information they are providing will be used for research purposes only and they had the right to decline or leave the interview at any moment, without having to give a reason.

Consent for publication: Not applicable

Availability of data and materials: Data will be made available on request.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: PJ, NHS, TK, TNM - conceptualisation of the study, NHS, TK, VD – conducting the survey, PJ, NHS, TK, TNM – writing the original draft of the manuscript, VD, AM, CG –data analysis, reviewing and editing. All authors have read and agreed to the final version of the manuscript.

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Literature Cited

Batool Z, Singh K, Gairola S. 2022. Documenting potential ethnoveterinary knowledge from the indigenous communities of Cold Desert of Ladakh: a trans-Himalayan region of India. Ethnobotany Research and Applications 24:1-20.

Bekele A, Musa A. 2009. Ethnoveterinary practice in Chiro District, western Hararge, Ethiopia. Pharmacology online 1:128-39.

Gumbochuma G, Hamandishe VR, Nyahangare ET, Imbayarwo-Chikosi VE, Ncube S. 2013. Ethnoveterinary practices for poultry and cattle in Zimbabwe: a case study of Takavarasha village. Scientific Journal of Animal Science 12:355-9.

Heinrich M, Edwards S, Moerman DE, Leonti M. 2009. Ethnopharmacological field studies: a critical assessment of their conceptual basis and methods. Journal of ethnopharmacology 1:1-17.

Jambwa P, Katsande S, Matope G, McGaw, LJ. 2022. Ethnoveterinary remedies used in avian complementary medicine in selected communal areas in Zimbabwe. Planta Medica 88:313-323.

Jambwa P, Nkadimeng SM, Mudimba TN, Matope G, McGaw LJ. 2023. Antibacterial and anti-inflammatory activity of plant species used in traditional poultry ethnomedicine in Zimbabwe: A first step to developing alternatives to antibiotic poultry feed additives. Journal of Ethnopharmacology 300: p.115687.

Kolkar KP, Malabadi RB, Sadiya MR, Chalannavar RK. 2024. Updates on some medicinal and ornamental plants-Ayurvedic medicines. World Journal of Advanced Research and Reviews 3(1):111-47.

Lee YS, Chung IB, Choi WH, Cho YJ, Chu JP, Min BI, Shin EH. 2007. Inhibitory effects of Melia azedarach L. extracts on the growth of Trichomonas vaginalis-Ultrastructural changes of Trichomonas vaginalis treated by Melia azedarach L.-. The Journal of Protozoology Research 1:16-24.

Luseba D, Tshisikhawe MP. 2013. Medicinal plants used in the treatment of livestock diseases in Vhembe region, Limpopo province, South Africa. Journal of Medicinal Plants Research 7(10):593-601.

Makoni District Food and Nutrition Security Profile. World Food Programme. 2022. https://fnc.org.zw/wp-content/uploads/2023/04/Makoni-District-Profile. Accessed (09/04/2025).

Makoni District, Manicaland, Zimbabwe. The MIndat Manual. https://www.mindat.org/loc-247530.html. Accessed (09/04/2025).

Malar TJ, Antonyswamy J, Vijayaraghavan P, Kim YO, Al-Ghamdi AA, Elshikh MS, Hatamleh AA, Al-Dosary MA, Na SW, Kim HJ. 2020. In-vitro phytochemical and pharmacological bio-efficacy studies on Azadirachta indica A. Juss and Melia azedarach Linn for anticancer activity. Saudi Journal of Biological Sciences 27(2): 682-8.

Manyenyeka M, Tagwireyi WM, Marufu MC, Spargo RM, Etter E. 2022. Spatio-temporal clustering and risk factor analysis of bovine theileriosis (Theileria parva) in Zimbabwe from 1995 to 2018. Transboundary and emerging diseases 69(3):1186-1196.

Mapiye O, Chikwanha OC, Makombe G, Dzama K, Mapiye C. 2020. Livelihood, food and nutrition security in Southern Africa: what role do indigenous cattle genetic resources play? Diversity 12(2): p.74.

Marandure T. 2016. Concepts and key issues of EVM in Africa: A review of its application in Zimbabwe. African Journal of Agricultural Research 11(20):1836-1841.

Maroyi A. 2011. An ethnobotanical survey of medicinal plants used by the people in Nhema communal area, Zimbabwe. Journal of Ethnopharmacology 136(2):347-354.

Maroyi A. 2012. Use of traditional veterinary medicine in Nhema communal area of the Midlands province, Zimbabwe. African Journal of Traditional, Complementary and Alternative Medicines *9*(3):315-322.

Maroyi A. 2023. Biological and medicinal properties of Pouzolzia mixta Solms (Urticaceae): A narrative review. African Journal of Food, Agriculture, Nutrition and Development 23(10): 24825-43.

Marume A, Matope G, Khoza S, Mutingwende I, Mduluza T, Mawoza T, Chawana TD, Taderera T, Ndhlala AR, 2018. Antimicrobial and in vitro enzyme inhibitory activities of selected Zimbabwean ethno-veterinary medicinal plants used in folklore animal wound management. International Journal of Herbal Medicine 6:97-103.

Masimba ES, Mbiriri DT, Kashangura MT, Mutibvu T. 2011. Indigenous practices for the control and treatment of ailments in Zimbabwe's village poultry. Livestock Research for Rural Development 23(12), pp.2-9.

Moreki J. 2012. Documentation of ethnoveterinary practices used in family poultry in Botswana. Veterinary World 6(1):18-21.

Mukandiwa L, Naidoo V, Eloff JN. 2012. In vitro antibacterial activity of seven plants used traditionally to treat wound myiasis in animals in Southern Africa. Journal of Medicinal Plants Research Vol, 6(27), pp. 4379-4388.

Mwale M, Bhebhe E, Chimonyo M, Halimani TE, 2005. Use of herbal plants in poultry health management in the Mushagashe small-scale commercial farming area in Zimbabwe. International Journal of Applied Research in Veterinary Medicine 3(2):163-170.

Nyahangare ET, Mvumi BM, Mutibvu T. 2015. Ethnoveterinary plants and practices used for ectoparasite control in semi-arid smallholder farming areas of Zimbabwe. Journal of Ethnobiology and Ethnomedicine 11:1-16.

Ndhlovu DN, Masika PJ. 2013. Ethno-veterinary control of bovine dermatophilosis and ticks in Zhombe, Njelele and Shamrock resettlement in Zimbabwe. Tropical animal health and production 45:525-532.

Obakiro SB, Kiprop A, Kigondu E, K'Owino I, Odero MP, Manyim S, Omara T, Namukobe J, Owor RO, Gavamukulya Y, Bunalema L. 2021. Traditional medicinal Uses, phytoconstituents, bioactivities, and toxicities of Erythrina abyssinica Lam. ex DC. (Fabaceae): a systematic review. Evidence-Based Complementary and Alternative Medicine 2021:1-43.

Parasuraman S, Thing GS, Dhanaraj SA. 2014. Polyherbal formulation: Concept of ayurveda. Pharmacognosy reviews 8(16):73.

Ramya S, Loganathan T, Chandran M, Priyanka R, Kavipriya K, Pushpalatha GGL, Aruna D, Ramanathan L, Jayakumararaj R, Saluja V. 2022. Phytochemical Screening, GCMS, FTIR profile of Bioactive Natural Products in the methanolic extracts of Cuminum cyminum seeds and oil. Journal of Drug Delivery and Therapeutics 12(2-S):110-118.

Rana M, Dhamija H, Prashar B, Sharma S. 2012. Ricinus communis L.—a review. International Journal of PharmTech Research 4(4):1706-1711.

Rashid S, Majeed LR, Nisar B, Nisar H, Bhat AA, Ganai BA. 2021. Phytomedicines: Diversity, extraction, and conservation strategies. In Phytomedicine 1-33.

Ritter RA, Monteiro MVB, Monteiro FOB, Rodrigues ST, Soares ML, Silva JCR, Palha MDDC, Biondi GF, Rahal SC, Tourinho MM. 2012. Ethnoveterinary knowledge and practices at Colares island, Pará state, eastern Amazon, Brazil. Journal of Ethnopharmacology 144(2):346-352.

Saddiq AA, Al-Ghamdi H. 2018. Aloe vera extract: A novel antimicrobial and antibiofilm against methicillin-resistant Staphylococcus aureus strains. Pakistan journal of pharmaceutical sciences. Pakistan Journal of Pharmaceutical Sciences 2018: p.2123.

Sharma P, Kharkwal AC, Kharkwal H, Abdin MZ, Varma A. 2014. A review on pharmacological properties of Aloe vera. International Journal of Pharmaceutical Sciences Review and Research 29(2):31-37.

Shrestha SS, Ferrarese I, Sut S, Zengin G, Grana S, Ak G, Pant DR, Dall'Acqua S, Rajbhandary S. 2021. Phytochemical investigations and in vitro bioactivity screening on Melia azedarach L. leaves extract from Nepal. Chemistry & Biodiversity 18(5): e2001070.

Szewczuk VD, Mongelli ER, Pomilio AB. 2006. In vitro anthelmintic activity of Melia azedarach naturalized in Argentina. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives 20(11):993-996.

Velavan S. 2015. Phytochemical techniques-a review. World Journal of Science and Research 1(2):80-91.

Wanzala W, Zessin KH, Kyule NM, Baumann MPO, Mathia E, Hassanali A. 2005. EVM: a critical review of its evolution, perception, understanding and the way forward. Livestock Research for Rural Development 7(11)