# Indigenous Knowledge, Attitude and Practices on Plant Use for Animal Disease Management: Ethnobotanical Survey in Kongwa District

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## SUMMARY

To complement modern veterinary drugs in addressing the growing burden of livestock diseases, exploring alternative treatments such as medicinal plants is increasingly important. This study, conducted in Kongwa District, examined farmers' knowledge, attitudes, and practices regarding the use of medicinal plants to treat the infectious parasites of animals, with more emphasis on pigs. Randomly selected wards, villages, and streets were included, and face-to-face interviews were carried out with livestock owners using structured questionnaires. Plant identification was done with PlantNet software and verified by a botanist from the Department of Botany at Sokoine University of Agriculture. Findings showed that most respondents were aware of medicinal plant use for livestock treatment, receiving information mainly from family members, neighbors, and online sources. Many participants rated the effectiveness of medicinal plants as moderate to highly effective, though a few viewed them as less effective or ineffective. Several plants were documented for anthelmintic purposes, notably *Azadirachta indica* (roots and leaves), *Cassia abbreviata* (roots and stem bark), and *Albizia anthelmintica* (roots and stem bark). Plants used for managing ectoparasites includes *Ocimum americanum*, scattered or burned to repel pests; *Capsicum annuum* fruits burned to produce flea-repelling smoke; and *Albizia lebbeck*, whose root or stem bark was crushed in water to control ticks. Thus, it was observed that Kongwa District in Tanzania retains rich indigenous knowledge of medicinal plants' use for managing animal diseases. Many farmers demonstrated awareness, positive attitudes, and continued practical use of these plant-based treatments.

Key Words: *Medicinal plants, Antihelmintic, Pigs, Kongwa, Ectoparasites*

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## INTRODUCTION

The use of medicinal plants to treat diseases dates back to ancient times when medicinal plants played a crucial role in addressing a range of animal and human diseases, from infectious to non-infectious (Petrovska, 2012). They were the primary treatment option before conventional medicine became

available (Gabalebatse *et al*., 2013). However, as civilization advanced, the use of modern medicines increased, leading to a decline in the use of plant-based medicines (Ndou *et al*., 2023), especially in urban areas. Nonetheless, the increasing burden of animal diseases and the treatment failures of conventional drugs increase the need for alternative treatment methods. Natural products, including medicinal plants, are highly considered as a potential option. In Tanzania, the use of medicinal plants for disease management is more reported from the human side, with little or no information on livestock diseases. For instance, control of ectoparasites and helminths infestation, has been more dependent on industrial drugs. However, modern drugs are not so reliable because of limited affordability and accessibility for many farmers, especially in rural areas. That increases the need for exploration of the alternative or supplementary treatment methods.

Several plant species have been reported in documented studies to offer useful medicinal effects against the human diseases (Umba *et al*., 2023; Rakotoarivelo *et al*., 2015) and animal diseases (Ndou *et al*., 2023; Luseba and Tshisikhawe, 2020; Wendimu *et al*., 2024). Nevertheless, there is a paucity of information on the traditional use of Medicinal plants for livestock disease treatment including the management of ectoparasites and endoparasites in Tanzania, with therapies depending more on modern drugs. Such information is highly crucial for the identification, documentation, improvement, and upscaling of effective local medical knowledge for efficient animal disease management. Therefore, the current study was conducted to investigate farmers' knowledge, attitudes, and practices regarding the use of medicinal plants in animal disease treatment, with a particular focus on ectoparasites and endoparasites.

## Methodology

### Study Area

Field surveys for ethnobotanical studies were undertaken in Kongwa District. The district is found in the Dodoma Region, Tanzania, and it lies between latitudes 5° 30' to 6° 00' South and longitudes 36°15' to 36°00' East of Greenwich Meridian. The district possesses a 4,041 km² administrative area (Figure 1). It is bordered by Manyara Region to the north, Morogoro Region to the east, Mpwapwa District to the south, and Chamwino District to the west. Kongwa's economy depends more on subsistence agriculture and livestock production. The dominant livestock and their population in the area include cattle (117,599), goats (73196), sheep (33896), and donkeys (2680). Other animals, including dogs (3,744), cats (866), chickens (376,877), and ducks (5627) (KDC, 2012). The district experiences a semi-arid climate influenced by the Great Rift Valley. It receives an average annual rainfall of approximately 700 mm and maintains a mean temperature of 26.5°C. Kongwa District is situated on an extensive plateau, characterized by grasslands and smallholder mixed crop–livestock systems, including a growing pig-keeping sector managed under extensive and semi-intensive conditions (URT, 2016).

### Ethical Review and Research Clearance

Ethical review for this research was granted by the ethical review board of the Sokoine University of Agriculture offering research clearance (SUA/DRPTC/R/126/VET/3/2023/7 before research commencement. Informed consent was presented and signed by all participants before their involvement in the research.

### Research Design, Duration, and Sampling

The research was conducted from March to April 2025, which normally marks the end of the rainy season, and most plant species are in the flowering stage, making it easy for identification. The Dodoma Region, particularly Kongwa District, was purposely selected as the study area because of its large livestock population, including subsistence piggery farming. From the district, four study wards, including Chiwe, Kibaigwa, Lenjulu, and Iduo, were randomly selected using simple random sampling. Each selected ward was a frame for the random selection of five villages. Within the villages, any participant owning at least a pig with or without other livestock in the household was eligible for the study. Each ward contributed 40

participants, making a total of 160 interviewed participants. However, due to dropouts or incomplete information, data from 120 participants qualified for analysis.

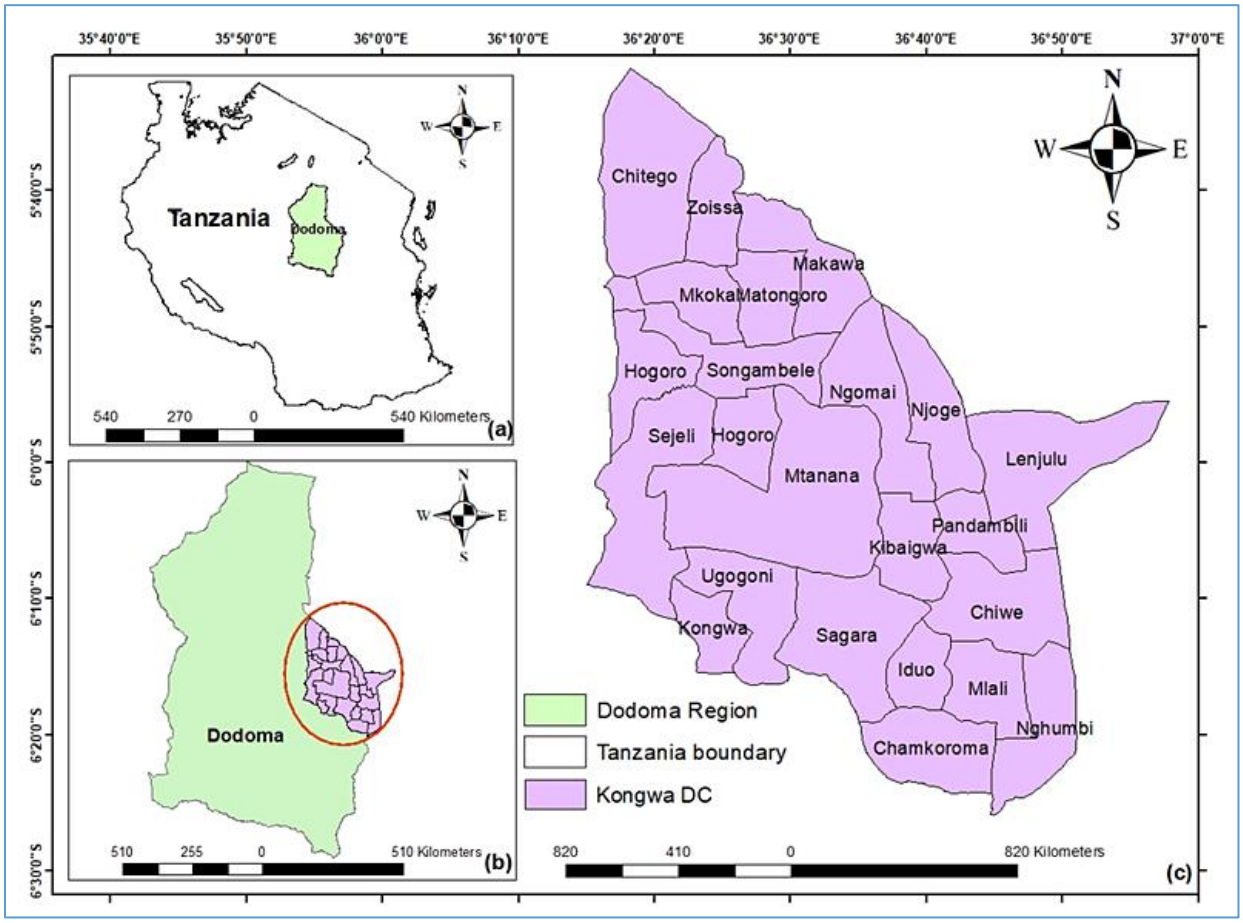


Figure 1. A map of Tanzania (a) displaying Dodoma Region, (b) the Dodoma Region displaying Kongwa District (c) the Kongwa District indicating different wards. Sourced from Kayanda et al. (2025).

**Data Collection Tool**

The tool used to assess participants' Knowledge, Attitudes, and Practices (KAP) was a simple, structured questionnaire, with English and Kiswahili translations. The questionnaire had four sections. The first section had 8 questions gathering information on social demographic data. The second section contained 10 questions to assess participants' knowledge. The third section for attitude assessments contained 8 questions and the fourth section for practices on medicinal plant uses contained 20 questions. Pretesting questionnaires were administered to twelve individuals at the Karume Magharibi village in the Kibaigwa ward for piloting.

**Data Collection**

Face-to-face interviews were conducted to collect data on participants' social demographics, knowledge, attitudes, and practices regarding medicinal plants. The plants mentioned by study participants were identified for confirmation using a software called PlantNet and a University-employed Botanist from the Department of Botany at Sokoine University of Agriculture. The score classification for the KAP responses from the interviewees used specific codes elaborated in

numbers. The numbers were scored against each corresponding response item to be used in the data analysis. The medicinal plant was considered to be used in its natural form when the whole plant or its root, leaves, flowers, fruits, bark were used in their intact form without any processing (grinding, boiling, macerations, etc.).

**Data Analysis**

Data entry, handling, and clearing were done in Microsoft Excel 2016. IBM SPSS Statistics 25 was employed for data analysis. The descriptive analysis was used to compute frequencies on social demographic features, knowledge, attitude, and practices of participants.

## RESULTS

**Participant Social Demographic Characteristics**

The majority of participants were farmers of the prime working age group of 24-54 years old (78.8%), and males were dominant (69.2%). Also, while 24% had no formal education, 13% attended secondary school, 0.8% college, and 64.2% had a primary school education. Some participants kept a mixture of livestock: Pigs and Poultry (15.8%), Cattle and Small ruminants (6.7%), Cattle, Small ruminants, Pigs and Poultry, or Cattle and Pigs (10.8%). Cattle/Small ruminants/Pigs/ Poultry (15%), Cattle and Poultry (2%), Cattle and Small ruminants (1.7%), Small ruminants/ Poultry (1.7%). Others kept a single animal species: 18.3% Pigs, 11.7% Cattle, and 5% Poultry. Participants with ≥ 11 years' experience in livestock keeping were 51.7%. The remaining had ≤ 5 years (27.5%) or 6 to 10 years (20.8%) of livestock-keeping experience.

**Common Livestock Diseases in the Study Areas**

The majority of Kongwa's residents were aware that animals do get sick, similar to humans. The leading animal diseases reported from Kongwa District include Mange, worms, and African Swine fever in pigs; tick-borne diseases, trypanosomiasis, respiratory diseases, skin conditions, and worms in cattle. Respiratory and nervous diseases, as well as worms, were commonly reported in small ruminants, while Newcastle Disease (NCD) and infectious coryza were the frequent diseases of poultry (Table 1).

**Knowledge of Participants on Medicinal Plants' Use**

The majority of respondents were aware of plant use as medicine in animal disease treatment, and the common sources of the information were from other family members, neighbours, and online sources. About 55.8% of participants had information on the plants used for animal disease management in their areas. Participants reported that herbal medicine was mostly used during the unavailability or high cost of conventional drugs, ineffectiveness of conventional drugs, and in a few cases, as first aid. The majority of participants rated the effectiveness of medicinal plants in treating animal diseases as moderate, effective, or highly effective, while a minority rated them as less effective or ineffective (Table 2).

Table 1. Participants' Responses on the Livestock Disease Situation in the Kongwa District, Dodoma, Tanzania

| Questions on the livestock disease situation | **Frequency** | **Percentage (%)** |
|---|---|---|
| Are you aware that animals can also get sick like humans? | | |
| Yes | 112 | 93.3 |
| No | 2 | 1.7 |
| I don't know | 6 | 5 |
| **List of diseases/ conditions in pigs** | | |
| ASF | 8 | 6.7 |
| Mange and worms | 38 | 31.7 |
| ASF, mange, and worms | 23 | 19.2 |
| No disease/ condition reported | 51 | 42.4 |
| **List of diseases/ conditions in cattle** | | |
| Respiratory diseases | 13 | 10.8 |
| Worms and flukes | 3 | 2.5 |
| Tick diseases | 4 | 3.3 |
| Mixed of either 1, 2, 3, 4 and 5 | 24 | 20 |
| FMD | 4 | 3.3 |
| IBK | 4 | 3.3 |
| RP | 1 | 0.8 |
| No disease/ condition reported | 67 | 55.8 |
| **List of diseases/ conditions in small ruminants** | | |
| Respiratory diseases | 8 | 6.7 |
| Worms | 3 | 2.5 |
| Nervous diseases | 5 | 4.2 |
| Mixed of either 1,2 and 3 | 1 | 0.8 |
| No disease/ condition reported | 103 | 85.8 |
| **List of diseases in poultry** | | |
| Newcastle disease | 8 | 6.7 |
| Infectious coryza | 3 | 2.5 |
| Mixed of 1 and 2 | 4 | 3.3 |
| worms | 2 | 1.7 |
| Mites | 1 | 0.8 |
| No disease reported | 102 | 85 |

Table 2. Table 2. Respondents' Knowledge of Herbal Medicine Use in the Kongwa District, Dodoma, Tanzania

| Questions on Herbal Medicine | Frequency | Percentages (%) |
|---|---|---|
| **Are you aware of the use of plants as medicines in the treatment of animal diseases?** | | |
| Yes | 74 | 61.7 |
| No | 7 | 5.8 |
| No response | 39 | 32.5 |
| **Source of knowledge on herbal medicine** | | |
| Family | 51 | 42.5 |
| Neighbour | 19 | 15.8 |
| Herbal practitioners | 4 | 3.3 |
| Livestock officers | 1 | 0.8 |
| Online sources | 10 | 8.3 |
| No response | **35** | 29.3 |
| **Are there any medicinal plants used to treat animal diseases in your area?** | | |
| Yes | 67 | 55.8 |
| No | 12 | 10 |
| I don't know | 36 | 30 |
| No response | **5** | 4.2 |
| **In what situations are medicinal plants used as medicine in animals?** | | |
| Unavailability of conventional drugs | 24 | 20 |
| High cost of conventional drugs | 33 | 27.5 |
| Ineffectiveness of conventional drugs | 13 | 10.8 |
| I don't know | 37 | 30.8 |
| First aid | 4 | 3.3 |
| No response | 9 | 7.6 |
| **How do you score the "effectiveness" of herbal products** | | |
| Not effective | 1 | 0.8 |
| Less effective | 12 | 10 |
| Moderately effective | 41 | 34.2 |
| Effective | 17 | 14.2 |
| Highly effective | 47 | 39.2 |
| I don't know | 2 | 1.6 |

**Respondents' Attitudes on Medicinal Plants Use in Animals**

A high percentage of studied participants agreed that interest in herbal medicine use in animals is growing, and that herbal medicine use in animals can be equally effective as conventional medicine. Moreover, a high percentage of participants agreed that if herbal and conventional drugs are equally effective, they will choose herbal medicine because of fewer side effects, lower costs, and availability.

Moreover, the paucity of evidence on the efficacy of medicinal plants was the commonly reported reason for the low interest in medicinal plants' use in animal disease treatment (Table 3).

Table 3. Respondents' Attitudes on Medicinal Plant Use in Animal Disease Management in Kongwa District, Dodoma, Tanzania

| Questions on attitudes toward using medicinal plants in animals | frequency | Percentages (%) |
|---|---|---|
| **Is the interest in herbal medicine in animals growing?** | | |
| Yes | 61 | 50.8 |
| No | 14 | 11.7 |
| I don't know | 45 | 37.5 |
| **Herbal medicine use can be effective in animals** | | |
| Yes | 68 | 56.7 |
| No | 7 | 5.8 |
| I don't know | 45 | 37.5 |
| **Herbal medicine can be equally effective as conventional medicine** | | |
| Yes | 81 | 67.5 |
| No | 2 | 1.7 |
| I don't know | 37 | 30.8 |
| **If herbal and conventional drugs are equally effective, I would choose herbal medicine** | | |
| Yes | 61 | 50.8 |
| No | 30 | 25 |
| I don't know | 29 | 24.2 |
| **The choice to use herbal medicine is due to fewer side effects** | | |
| Yes | 57 | 47.5 |
| No | 11 | 9.2 |
| I don't know | 52 | 43.3 |
| **Choice to use herbal medicine is because of less costs** | | |
| Yes | 66 | 55 |
| No | 14 | 11.7 |
| I don't know | 40 | 33.3 |
| **Choice to use herbal medicine is because they are readily available** | | |
| Yes | 73 | 60.8 |
| No | 10 | 8.3 |
| I don't know | 37 | 30.8 |
| **What could be the reasons for the low use of medicinal plants In animals?** | | |
| Non-efficacy, | 1 | 0.8 |
| Not evidence-based, | 21 | 17.5 |
| Their adverse effects | 2 | 1.7 |
| I don't know | 96 | 80 |

**Plant Species Mentioned Against Ecto and Endoparasites of Livestock Diseases in Kongwa District**

With regards to endoparasites, frequently mentioned plant species for helminth treatment in livestock included *Azadirachta indica* (roots and leaves), *Cassia abbreviate* (roots and stem bark), and *Albizia anthelmintica* (roots and stem bark). Other plants, probably equally important were also mentioned but less frequently (Table 4). The reported preparation methods to obtain treatment products from most anthelminthic plants in this study show to involve crushing the targeted plant part in a mortar and pestle, mixing with water, and then filtering to obtain a crude extract. The prepared crude extracts are normally administered orally by drenching the animals using a bottle. Common livestock treated with anthelminthic plants in the area include pigs, cattle, and small ruminants.

There were a few plants mentioned to be used for the management of ectoparasites in the Kongwa District. The plants include *Ocimum americanum* (whole plant) against fleas and mites, *Capsicum annuum* (fruits) against fleas, and *Albizia lebbeck* (root, stem bark) against flea, mites and ticks. *Ocimum americanum* is used by scattering the whole plant in the animal house, taking advantage of its pungent smell or burning to produce repellent smoke against fleas and mites. *Albizia lebbeck* was reported to be prepared by grinding roots or stem bark using mortar and pestle, mixing in water, then filtered to get the extract for ointment. Details on the plant parts used, preparation methods, route of administration, and livestock of targets are displayed in Table 5.

| Common name | Botanical name | Frequency (n) | Percent | Part used | Drug form | Route | Animals |
|---|---|---|---|---|---|---|---|
| Mwarobaini | *Azadirachta indica* | 16 | 32 | Roots, leaves | Crude, aqueous extract | Oral | Cattle, small ruminants, pigs and poultry |
| Mkakatika | *Cassia abbreviata* | 8 | 16 | Root, bark | Crude, aqueous extract (boiling) | Oral | Cattle, small ruminants and pigs |
| Mkutani | *Albizia antihelmintica* | 5 | 10 | Root, bark | Aqueous extract | Oral | Cattle, small ruminants, pigs and poultry |
| Mlonge | *Molinga oleifera* | 3 | 6 | Leaves | Crude, aqueous extract | Oral | Cattle, small ruminants, pigs, Poultry |
| Mzimwe | *Cleome gynandra L* | 3 | 6 | Leaves | Aqueous extract | Oral | Cattle and pigs |
| Ilenge | *Cucurbita maxima* | 2 | 4 | Fruit | Crude | Oral | Cattle, small ruminants and pigs |
| Lusina | *Leucaena leucocephala* | 2 | 4 | Pods, leaves | Crude, aqueous extract | Oral | Pigs, Poultry |
| Mchalala | *Albizia lebbeck* | 2 | 4 | Root, bark | Aqueous extract | Oral | Small ruminants and pigs |
| Mchunga (sunga) | *Launaea cornuta* | 3 | 4 | Whole plant | Whole plant | Oral | Cattle, small ruminants, pigs, rabbits and poultry |
| Mnyaa | *Euphorbia tirucalli* | 2 | 4 | Leaves | Aqueous extract | Oral | Small ruminants and pigs |
| Mteratera | *Opuntia ficus- indica (cactus)* | 2 | 4 | Leaves | Aqueous extract | Oral | Pigs |
| Mbono kaburi | *Jatropha curcas L* | 1 | 2 | Roots | Aqueous extract | Oral | Cattle, small ruminants |
| Mdalalangwe | *Coptosperma graveolens* | 1 | 2 | Roots, barks | Aqueous extract | Oral | Cattle, small ruminants |

**Table 5. Plants that were Mentioned for the Management of Ectoparasites (fleas, mites, ticks) in Livestock in Kongwa District, Dodoma, Tanzania**

| Common name | Botanical name | Frequency (n) | Percent (%) N= 7 | Part used | Drug form | Route of Administration | Animals |
|---|---|---|---|---|---|---|---|
| Lwanye (sweet basil) | *Ocinum americanum* | 4 | 57.1 | Crude, (whole plant) | Crude form | Topical (sweep, litter, hang in animal house) | Against fleas and mites in poultry house |
| Pilipili kichaa | *Capsicum annuum* | 2 | 28.6 | Fruits | Repellant smoke | Topical (smoking) | against fleas and mites in Poultry |
| Mchalala | *Albizia lebbeck* | 1 | 14.3 | Roots, stem bark | Aqueous extract | Topical (ointment, rubbing) | against ticks in Cattle, Small ruminants and pigs |

## DISCUSSION

The study documented indigenous knowledge, attitudes, and practices of small livestock holders regarding medicinal plants for treating animal diseases. This information is vital for future reference, verification, improvement, and upscaling. The study revealed that several smallholder livestock keepers in Kongwa District possess undocumented traditional knowledge of medicinal plants' use for animal diseases treatments. Most participants had a low level of formal education, indicating that knowledge of medicinal plant use has been informally passed down through generations. The majority appeared to have learned about herbal medicine use from neighbors and family members. Several diseases that were shown to affect their livestock were among the targets when using medicinal plants. This study also revealed that the drivers for turning to herbal medicine in disease treatment were the unavailability, high cost, or ineffectiveness of conventional drugs.

Kongwa District is one of the areas in Tanzania with a high burden of worm infestation in pigs. In addition to conventional drugs, several plant species were mentioned for helminth management in livestock in that area. The most frequently cited plants include *Azadirachta indica* (Neem), *Cassia abbreviata* (Mkakatika), and *Albizia antihelmintica* (Mkutan). Other, less frequently mentioned but probably equally important, included *Moringa oleifera*, *Cleome gynandra* L, *Cucurbita maxima*, *Leucaena leucocephala*, *Albizia lebbeck*, *Launaea cornuta*, *Euphorbia tirucalli*, *Opuntia ficus-indica*, *Jatropha curcas*, and *Coptosperma graveolens*.

The plants for traditional worm control mentioned in the Kongwa District study have also been reported in other documented reports. For instance, the anthelmintic effects of *Azaradicta indica* in India (Jamra *et al*., 2015), *Cassia abbreviate* in South Africa (Molgaard *et al*., 2001), and *Albizia antihelmintica* in Uganda (Grade 2008). Others include: *Molinga oleifera* in Brazil (Cabardo and Portugaliza, 2017), *Cleome gynandra L* in South Africa (Fouche *et al*., 2016), *Cucurbita maxima* in Poland (Grzybek *et al*., 2016), *Albizia lebbeck* in India (Manigandan *et al*., 2017), and *Euphorbia tirucalli* in India (Asha *et al*., 2009). Also, other plants shown experimentally by other studies to be effective against worms includes *Opuntia ficus-indica* (Féboli *et al*., 2016) and *Jatropha curcas* L (Monteiro et al., 2011). Therefore, the traditional knowledge on medicinal plants used for animal disease management is widespread between different societies, countries, and continents.

Most of the plants that were mentioned for use in worm treatment in Kongwa were prepared by crushing the targeted plant part in a mortar and pestle, then dissolving it in water and filtering to produce a crude extract. Some plants, such as *Launaea cornuta* and *Cucurbita maxima*, were reported to be fed in their natural form. Others, including *Opuntia ficus-indica* (cactus), *Leucaena leucocephala*, *Moringa oleifera*, *Albizia antihelmintica*, *Cassia abbreviata*, and *Azadirachta indica*, were mixed into concentrate feed given to the animals after grinding in a mortar and pestle.

Also, a few plants were mentioned for ectoparasite management in pigs, cattle, small ruminants, and poultry from Kongwa District. *Ocimum americanum*, a weed with a pungent smell, was said to be used as a flea and mite repellent in poultry houses by scattering the whole plant or burning it to produce repellent smoke. The insecticidal potential of Ocimum spp has been reported in other studies, with *Ocimum basilicum* and *Ocimum suave* mentioned (Alimi *et al*., 2022). *Capsicum annuum* was another plant reported to repel fleas from poultry houses by burning the fruits to produce repellent smoke. However, available literature indicates the effects of *Capsicum annuum* against mosquitoes and plant pests, with no information against fleas, mites, and ticks. *Albizia lebbeck,* a known toxic plant, was also mentioned as being used against ticks, fleas, and mites in cattle, small ruminants, and pigs by rubbing the plant extracts on the animals' skin. However, such effects have not been reported elsewhere, whereas most available

studies report *A. lebbeck* extracts as effective against mosquitoes and beetles (Govindarajan *et al*., 2015). Several other plants mentioned in other studies have been traditionally used for ectoparasite control, mostly against ticks, fleas, mites, and lice. *Tephrosia vogelii* (leaves) and *Tagetes minuta* (leaves) were said to be effective against fleas, while leaf extracts of *Aloe secundiflora*, *Ajuga remota*, and *Nicotiana tabacum* were reported to be active against ticks (Jeyathilakan *et al*., 2019, and Phaahla *et al*., 2017).

## CONCLUSION

In Kongwa, a district of the Dodoma region, Tanzania, there still exists indigenous knowledge on medicinal plants' use for animal disease management. The study revealed a substantial number of farmers who had knowledge and positive attitudes toward medical plants, and several of them reported using the plants to treat animal diseases.


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## CONFLICT OF INTEREST

There is no conflict of interest associated with this research work.

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