# Medicinal Plants in Livestock Ethnoveterinary Medicine: Traditional Knowledge

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**ABSTRACT**

**Objective**. To identify the plant species used in ethnoveterinary medicine and to document their preparation methods, routes of administration, and categories of use in animal health in the municipality of Tlahuiltepa, Hidalgo, Mexico.

**Design/methodology/approach**: A descriptive, cross-sectional study with an ethnobotanical and ethnoveterinary approach was conducted. Seventy-eight livestock producers were interviewed using semi-structured questionnaires, complemented by field visits for the collection and identification of plant species. Common and scientific names, plant parts used, preparation methods, routes of administration, and categories of use were recorded. Data were analyzed using frequencies and percentages to identify patterns of use.

**Results**: Twenty-two species belonging to 16 botanical families were identified, predominantly used in cattle. Leaves were the most frequently utilized plant part, infusion was the most common preparation method, and oral administration was the predominant route. The most representative categories of use were general health and gastrointestinal disorders, whereas other systems, such as the renal, hepatic, and cardiovascular systems, were addressed less frequently.

**Limitations/implications**: The information was based on reports from local producers, which may introduce variability in dosage and observed effects. The pharmacological efficacy of the documented species was not evaluated; therefore, further research is required to validate their therapeutic properties.

**Findings/conclusions**: Medicinal plants constitute a key resource in local ethnoveterinary practices, providing accessible and sustainable alternatives for livestock health management and underscoring the importance of traditional knowledge in animal care.

**Keywords**: medicinal plants, animal health, plants extracts.

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## INTRODUCTION

Ancestral knowledge regarding the use and properties of plants in health care constitutes the foundation of traditional medicine, and it has been transmitted from generation to generation through the use of leaves, stems, bark, roots, and flowers because of their therapeutic properties (Pascual *et al.*, 2014). Plant-based traditional medicine has endured throughout history, particularly in remote rural areas and among ethnic minorities, as an alternative source of health care for low-income families lacking access to governmental or

private health systems (Mostacero *et al.*, 2011; Pérez *et al.*, 2017). The diversity of medicinal plants represents a valuable resource for the global population because their leaves, stems, roots, and fruits contain vitamins, mineral salts, carotenoids, and anthocyanin pigments which, together with substances derived from secondary metabolism, such as alkaloids, polyphenols, and terpenoids, serve as precursors for the chemical-pharmaceutical synthesis of compounds with therapeutic properties capable of preventing or curing disease (Bhat and Paliyath, 2016; Jatinder *et al.*, 2016). In the livestock sector, ethnoveterinary medicine constitutes a repository of knowledge, practices, and beliefs used for the prevention and treatment of diseases in domestic animals (Caseres *et al.*, 2022; Heera *et al.*, 2023). In rural areas of Mexico, the use of medicinal plants remains in force due to their local availability, low cost, and the perception of lower toxic risk compared with synthetic drugs (Hernández *et al.*, 2018). Various studies indicate that many of these species contain secondary metabolites such as alkaloids, terpenoids, and phenolic compounds with antimicrobial, anti-inflammatory, and antiparasitic activity (Heera *et al.*, 2023). The indiscriminate use of antibiotics in animal production represents a public health risk because of the presence of residues in animal-derived products and the development of antimicrobial resistance (Woolhouse *et al.*, 2015; Shao *et al.*, 2021). In this context, documenting ethnoveterinary knowledge becomes particularly relevant as a complementary strategy for sustainable animal health management. Therefore, the aim of this study was to identify the plant species used in ethnoveterinary medicine and to document their preparation methods, routes of administration, and categories of use in animal health in the locality of Tlahuiltepa, Hidalgo, Mexico.

## MATERIALS AND METHODS

The study was conducted in the municipality of Tlahuiltepa, Hidalgo, Mexico (20° 55’ 24” N, 98° 56’ 59” W; altitude 2,000 m). The region is characterized by a temperate subhumid climate and the presence of family-based livestock production units, where traditional animal health management practices predominate. Through a descriptive, cross-sectional study with an ethnoveterinary approach, traditional knowledge associated with the use of medicinal plants in animal health management was documented.

### Selection of informants

The study population consisted of livestock producers older than 18 years of age with experience in the use of medicinal plants for the treatment of domestic animals. Informants were selected through non-probabilistic snowball sampling, beginning with key informants recognized by the community for their ethnoveterinary knowledge (Bailey, 1994). In total, 78 producers from the communities of Santo Domingo, Las Manzanas, and Rancho Nuevo, in the municipality of Tlahuiltepa, were interviewed.

### Data collection

Semi-structured interviews were conducted following Bocanegra *et al.* (2011). The interviews included items such as the informant’s name, occupation as livestock producer, farmer, or other, the common names by which the plant is known, its uses, the quantity of

plant material employed, whether it is used alone or combined with another plant, methods of preparation, route of administration, and any additional information the interviewees wished to provide. This information was collected in order to identify plants with potential use in animals.

### Plant collection and identification

Field visits were carried out in the company of local producers to identify the plants they use, after which the plant material was collected. Specimens were pressed and dried in the phytotherapy laboratory of the Universidad Politécnica de Francisco I. Madero for subsequent taxonomic identification based on information from the National Herbarium of UNAM and the use of taxonomic keys (Rzedowski and Rzedowski, 2001). Information concerning common names and the plant parts used was obtained directly from the interviewees.

### Classification of ethnoveterinary use

The reported animal ailments were grouped into categories of ethnoveterinary use: gastrointestinal, respiratory, dermal, reproductive, and general conditions (Lans *et al.*, 2007). According to González *et al.* (2014), the routes of administration were classified as oral, topical, and combined. Preparation methods were grouped as infusion, decoction, and maceration.

### Data analysis

A descriptive analysis was performed using frequencies and percentages to identify patterns of use.

## RESULTS AND DISCUSSION

### Identification and ethnoveterinary use

A total of 22 medicinal plant species belonging to 16 botanical families were recorded as being used in ethnoveterinary medicine. Cattle were the animals most frequently treated, with species from all recorded families being used for this purpose, followed by goats, horses, sheep, pigs, and poultry, thereby reflecting the economic and cultural relevance of cattle production in the region (Table 1).

The Lamiaceae family was the most representative, with five species used in the treatment of various digestive, respiratory, and antimicrobial conditions across all reported animal species. Other families, such as Asteraceae and Brassicaceae, exhibited a more selective use, being concentrated mainly in cattle and sheep, whereas families such as Moringaceae (Moringa) and Cactaceae (Opuntia) showed a broader range of use, including cattle, goats, and poultry. These results are consistent with those reported by Lara *et al.* (2019), who identified Asteraceae, Rosaceae, and Lamiaceae as the most prominent families, accounting for 20, 10, and 6%, respectively. Likewise, Zambrano *et al.* (2015) argued that the high frequency of use of plants from the Asteraceae and Lamiaceae families is associated with the presence of secondary metabolites, vitamins, mineral salts, and antioxidants.

**Table 1**. Ethnoveterinary plants used in peasant livestock systems in the municipality of Tlahuiltepa, Hidalgo, Mexico.

| Common name | Scientific name | Family | Use | Animal species |
|---|---|---|---|---|
| Horsetail | *Equisetum arvense* | Equisetaceae | Diuretic; urinary disorders | Cattle, goats |
| Rose of Jericho | *Anastatica hierochuntica* | Brassicaceae | Digestive stimulant; dehydration | Cattle |
| Aranto | *Kalanchoe* spp. | Crassulaceae | Wounds; inflammation; dermatitis | Cattle, horses |
| Cuachalalate | *Amphipterygium* spp. | Anacardiaceae | Antiparasitic; digestive disorders | Cattle |
| Horehound | *Marrubium vulgare* | Lamiaceae | Digestive aid; cough; bronchitis | Cattle, sheep |
| Tepozán | *Buddleja cordata* | Scrophulariaceae | Anti-inflammatory; wounds | Cattle, goats |
| Wormwood | *Artemisia absinthium* | Asteraceae | Vermifuge (deworming) | Cattle, sheep |
| Spearmint | *Mentha spicata* | Lamiaceae | Digestive aid; colic; halitosis | Cattle, goats |
| Rosemary | *Salvia rosmarinus* | Lamiaceae | Antiseptic; cough; digestive aid | Cattle, horses |
| Rue | *Ruta graveolens* | Rutaceae | Antispasmodic; colic | Cattle, pigs |
| Damiana | *Turnera diffusa* | Turneraceae | General stimulant; appetite enhancement | Cattle, goats |
| Chamomile | *Chamaemelum nobile* | Asteraceae | Digestive aid; antispasmodic | Cattle, pigs |
| Hierba prieta | *Cordia curassavica* | Boraginaceae | Anti-inflammatory; wounds | Cattle, goats |
| Valerian | *Valeriana officinalis* | Caprifoliaceae | Sedative; stress relief | Horses, cattle |
| Moringa | *Moringa oleifera* | Moringaceae | Strengthening tonic | Cattle, goats, poultry |
| Antijuelilla | *Lepidium virginicum* | Brassicaceae | Digestive aid; respiratory disorders | Cattle, sheep |
| Oregano | *Origanum vulgare* | Lamiaceae | Antimicrobial; digestive aid | Cattle, pigs |
| Goat's foot | *Bauhinia* spp. | Fabaceae | Antidiarrheal; digestive aid | Cattle, sheep |
| Zacasil | *Anredera leptostachys* | Basellaceae | Anthelmintic; digestive aid | Cattle, goats |
| Dragon's blood | *Croton lechleri* | Euphorbiaceae | Healing agent; external wounds | Cattle, horses |
| Nopalillo | *Opuntia megarrhiza* | Cactaceae | Nutritional supplement; digestive aid | Cattle, goats |
| Basil | *Ocimum basilicum* | Lamiaceae | Antimicrobial; digestive aid | Cattle, goats |

**Ethnoveterinary forms of plant use**

In ethnoveterinary practices, the whole plant, roots, leaves, stems, bark, flowers, and fruits are used (Table 2). The preparation of the plant or its parts varies according to the species and includes infusion, decoction, poultice, and maceration.

Leaves were the most frequently used plant part (59%), followed by bark (14%). The whole plant, flower, root, and stem showed a similar frequency of use, each accounting for 9%, whereas fruit was among the least utilized plant parts, representing 5% (Table 3). Lara *et al.* (2019) reported that plant parts are generally used fresh (83%), with leaves being the most frequently employed component (55%).

With respect to the preparation method, infusion was the most frequently employed, accounting for 59%, which reflects its predominance among the recorded practices. This was followed by decoction, used in 27% of the cases. The poultice method (topical application) represented 18%, whereas maceration was the least frequent, accounting for 9% of the total.

Regarding preparation methods, these results are consistent with those reported by De Sol et al. (2018), who indicated that the most commonly used methods were decoction (56.7%), infusion (29.3%), inhalation (5.2%), maceration (3.1%), raw plant material (2.2%),

**Table 2**. Plant parts used, preparation methods, and routes of administration in ethnoveterinary practices in Tlahuiltepa, Hidalgo.

| Common name | Scientific name | Plant part used | Preparation method | Route of administration |
|---|---|---|---|---|
| Horsetail | *Equisetum arvense* | Wp | In | Dr |
| Rose of Jericho | *Anastatica hierochuntica* | L | De | Dr |
| Aranto | *Kalanchoe* spp. | St | De | Dr |
| Cuachalalate | *Amphipterygium* spp. | Bk | In | Dr |
| Horehound | *Marrubium vulgare* | L | De | Fe |
| Tepozán | *Buddleja cordata* | L | In | Dr |
| Wormwood | *Artemisia absinthium* | L | In | Dr |
| Spearmint | *Mentha spicata* | L | In | Dr |
| Rosemary | *Salvia rosmarinus* | L | Po, In | Dr, To |
| Rue | *Ruta graveolens* | L | In | Dr |
| Damiana | *Turnera diffusa* | Fl | De | Dr |
| Chamomile | *Chamaemelum nobile* | L, Fl | In | Dr |
| Hierba prieta | *Cordia curassavica* | L | De | Dr |
| Valerian | *Valeriana officinalis* | Rt | De | Dr |
| Moringa | *Moringa oleifera* | Wp | In, Po, Ma | Ba, Dr, To |
| Antijuelilla | *Lepidium virginicum* | L | In | Dr |
| Oregano | *Origanum vulgare* | L | In | Dr |
| Goat's foot | *Bauhinia* spp. | L, Bk | De, Ma | Dr, To |
| Zacasil | *Anredera leptostachys* | Rt | Po | To |
| Dragon's blood | *Croton lechleri* | Bk | In | Dr |
| Nopalillo | *Opuntia megarrhiza* | Fr | Po | To |
| Basil | *Ocimum basilicum* | L | De | Dr |

Abbreviations: Bk, bark; Fl, flower; Fr, fruit; L, leaf; Wp, whole plant; Rt, root; St, stem. Preparation method: Po, poultice; In, infusion; De, decoction; Ma, maceration. Route of administration: Ba, baths; Dr, drinking; Fe, feed; To, topical application.

fermentation (2.0%), and oils (1.5%). Fernández *et al.* (2019) reported that the most common form of preparing medicinal plants for therapeutic use is infusion (60%). Infusion facilitates a more rapid assimilation of the medicinal properties of the plants used (Angulo *et al.*, 2012). The most frequently employed route of administration was drinking, with 82%, indicating a markedly predominant use. External topical application accounted for 27%, whereas combined administration was recorded in 14% of the cases. Heera *et al.* (2023) noted that the selection of plant parts and preparation methods in ethnoveterinary medicine is influenced both by the ease of collection and preparation and by ancestral knowledge of therapeutic efficacy.

**Categories of ethnoveterinary use**

Regarding the categories of use, the highest frequency corresponded to general use, with 45.5%, followed by the category aimed at treating gastrointestinal disorders, which reached 41%. To a lesser extent, renal disorders accounted for 14%, whereas hepatic

**Table 3**. Frequency of plant parts, preparation methods, and routes of administration in ethnoveterinary practices in Tlahuiltepa, Hidalgo.

| Category | Subcategory | Frequency (species) | Percentage (%) |
|---|---|---|---|
| Plant part | Leaves (L) | 13 | 59 |
| | Stems (St) | 2 | 9 |
| | Bark (Bk) | 3 | 14 |
| | Root (Rt) | 2 | 9 |
| | Flowers (Fl) | 2 | 9 |
| | Whole plant (Wp) | 2 | 9 |
| | Fruits (Fr) | 1 | 5 |
| Preparation method | Infusion (In) | 13 | 59 |
| | Decoction (De) | 6 | 27 |
| | Poultice/Extract (Po) | 4 | 18 |
| | Maceration (Ma) | 2 | 9 |
| | Combinations (In, Po, Ma, etc.) | 3 | 14 |
| Route of administration | Oral (Dr) | 18 | 82 |
| | Topical application (To) | 6 | 27 |
| | Combined (Ba, Dr, To) | 3 | 14 |

diseases, sensory system conditions, and cardiovascular disorders each represented 5%, thus reflecting a substantially lower participation in comparison with the predominant categories (Figure 1).

The general use category, which comprises non-specific treatments or remedies for multiple conditions, also tends to appear with high frequency in ethnoveterinary inventories because many traditional plants are used as tonics, strengthening agents, or preventive remedies without being directed toward a single disease, and are regarded as

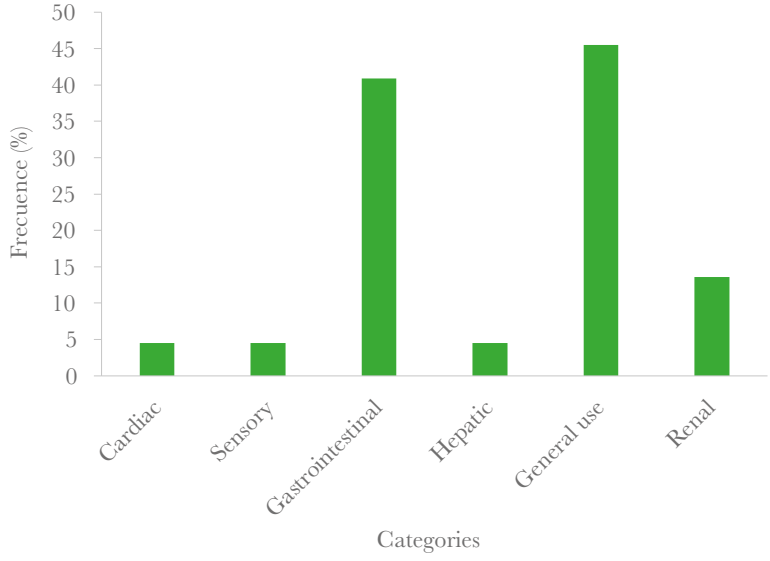


**Figure 1**. Categories of use of medicinal plants recorded in the locality of Tlahuiltepa, Hidalgo.

beneficial for improving the overall health of the animal (Oda *et al.*, 2024). Gastrointestinal disorders have likewise been identified among the most frequently treated conditions with medicinal plants in domestic animals. A meta-analysis reported that more than 95% of the documented uses were associated with gastrointestinal system disorders, including antidiarrheal, digestive, and laxative applications, which constituted the most common subgroups of plant-based indications in traditional livestock production (Cáceres *et al.*, 2022).

## CONCLUSIONS

The study confirms the use of medicinal plants in animal health care as a result of the rich cultural knowledge and accumulated experience of producers from the communities included in the study. These plants represent accessible and sustainable alternatives for livestock health management. The documentation of this traditional knowledge contributes to its preservation, promotes the responsible use of natural resources, and highlights its potential to support animal health in a complementary manner alongside conventional medicine.

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