

An Ethnobotanical Assessment of Plant-Based Veterinary Remedies Practiced by Indigenous Communities in Bastar

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Abstract

The present study was conducted to assess the ethnobotanical knowledge of plant-based veterinary remedies practiced by indigenous communities in Bastar division, Chhattisgarh, India. The primary objectives were to document the diversity of medicinal plants used in ethnoveterinary practices, identify the dominant plant families and plant parts employed, and evaluate the informant consensus on disease categories treated. A cross-sectional ethnobotanical survey was adopted employing semi-structured interviews, focus group discussions, and participatory field walks among 120 informants from Gond, Muria, Maria, and Bhattra tribal communities across 15 villages during 2019–2021. The hypothesis posited that indigenous communities of Bastar possess a rich and structured system of plant-based veterinary healthcare that remains largely undocumented. Data were analyzed using informant consensus factor (Fic), use value (UV), and fidelity level (FL). The results revealed that 58 medicinal plant species belonging to 34 families were utilized for treating 26 veterinary ailments in cattle, goats, and poultry. Fabaceae and Solanaceae emerged as the dominant families, while leaves were the most frequently used plant part (38.6%). The highest Fic was recorded for gastrointestinal disorders (0.89), followed by dermatological ailments (0.85). It is concluded that the Bastar region harbors significant ethnoveterinary knowledge that warrants systematic documentation, pharmacological validation, and integration into primary animal healthcare delivery systems.

Keywords: Ethnobotany, Ethnoveterinary medicine, Indigenous communities, Bastar, Medicinal plants

1. Introduction

India has a centuries-old tradition of utilizing plant-based medicines for both human and animal healthcare, deeply embedded in classical systems such as Ayurveda, Siddha, and folk medicine (Rastogi *et al.*, 2015). Ethnoveterinary medicine (EVM), which encompasses the knowledge, skills, methods, practices, and beliefs about animal healthcare developed by farming communities, constitutes an integral component of this tradition (McCorkle, 1986). In rural and tribal India, where access to modern veterinary services remains severely constrained, indigenous communities continue to rely extensively on locally available plant resources for treating livestock ailments (Verma *et al.*, 2014). According to the 19th Livestock Census (2012), India possesses one of the largest livestock populations globally, and approximately two-thirds of rural communities depend on livestock for livelihood security (Sikarwar & Tiwari, 2017). Despite the advancement of modern veterinary medicine, ethnoveterinary practices remain indispensable in remote tribal regions due to their accessibility, affordability, and cultural acceptability (Phondani *et al.*, 2010). Chhattisgarh, designated as an "Herbal State" owing to its rich repository of medicinal flora, has over 44% of its land area under

forests and is home to approximately 7.8 million indigenous and tribal communities (Pandey *et al.*, 2018). The Bastar division, situated in the southern part of the state on the Deccan Plateau, is among the most ecologically and ethnically diverse regions of central India. It encompasses the districts of Bastar, Dantewada, Kanker, Kondagaon, Sukma, Bijapur, and Narayanpur, and is inhabited by several indigenous communities, predominantly the Gond tribe and its sub-groups—Muria, Maria (Bisonhorn Maria and Hill Maria), Dorla, Bhattra, Halba, and Dhurwa (Sahu *et al.*, 2014). These tribal communities have developed elaborate traditional knowledge systems for managing both human and animal health through generations of experiential learning and oral transmission (Banik & Nema, 2014). Although several ethnobotanical surveys have documented the medicinal plant usage among Bastar tribes for human ailments (Pandey *et al.*, 2018; Sahu *et al.*, 2014; Sinha *et al.*, 2012), the documentation of plant-based veterinary remedies specifically practiced in the Bastar region remains conspicuously inadequate. Given the rapid erosion of traditional knowledge due to modernization, deforestation, and the disinterest of younger generations in indigenous practices, it is imperative to systematically document and validate this ethnoveterinary knowledge before it is irretrievably lost (Dey & De, 2010). The present study, therefore, aims to bridge this critical gap by conducting a comprehensive ethnobotanical assessment of plant-based veterinary remedies among the indigenous communities of Bastar.

2. Literature Review

The documentation of ethnoveterinary medicinal plants has gained considerable scholarly attention globally over the past three decades, driven by the recognition that traditional animal healthcare practices offer viable, cost-effective alternatives to allopathic veterinary medicine (McCorkle, 1986). Internationally, significant contributions have been made from various geographic regions. Aziz *et al.* (2018) documented 73 medicinal plant species used for ethnoveterinary purposes by indigenous communities in Bajaur Agency, Pakistan, reporting that the Apiaceae family contributed the highest number of species and that gastrointestinal disorders showed the highest informant consensus factor (Fic = 0.92). Similarly, Wanzala *et al.* (2005) reported widespread reliance on plant-based remedies for livestock disease management among pastoralist communities in Kenya, noting that over 80% of livestock keepers used traditional remedies as the primary mode of treatment. In the Ethiopian context, Yigezu *et al.* (2014) documented 74 plant species used to treat 22 livestock ailments, emphasizing the urgency of documenting this knowledge before its extinction.

Within India, the corpus of ethnoveterinary research has expanded substantially. Phondani *et al.* (2010) reported 73 medicinal plant species belonging to 45 families used for treating 34 veterinary ailments across nine categories of livestock in the Alaknanda catchment of Uttarakhand, observing that over 80% of the population depended on traditional herbal systems practiced by local healers known as "Pashu Vaidyas." Verma *et al.* (2014) documented 41 plant species used in ethnoveterinary practices in Tikamgarh district of Bundelkhand, Central India, and identified trees as the most commonly utilized growth form. In the northeastern region, Bhat *et al.* (2023) recorded 96 plant species from 43 families used to treat more than 25 livestock diseases in East Khasi Hills district of Meghalaya, reporting that Fabaceae was the dominant family and that leaves constituted 50% of the plant parts used. Dey and De

(2010) inventoried ethnoveterinary plant usage among aboriginal communities of Purulia district, West Bengal, and highlighted the critical role of senior community members as repositories of traditional knowledge. Sharma et al.

(2012) explored ethnoveterinary remedies for milk-yielding animals in Kathua, Jammu and Kashmir, documenting practices that integrated both single-plant and polyherbal formulations.

In the context of Chhattisgarh, while extensive ethnobotanical surveys have been conducted for human medicine Sahu et al. (2014) documented 104 lesser-known medicinal uses of plants among the Madiya, Muriya, Gond, and Bhatra tribes of Dantewada—the specific domain of plant-based veterinary remedies in Bastar has received minimal focused attention. Sikarwar and Tiwari (2017) provided a regional review of ethnoveterinary plants in Central India covering Madhya Pradesh and Chhattisgarh but acknowledged that Bastar-specific data were limited. Banik and Nema (2014) documented ethnomedical practices and indigenous household remedies among the tribals and rural population of the Bastar region but concentrated primarily on human ailments. This conspicuous lacuna in the documentation of Bastar-specific ethnoveterinary knowledge underscores the rationale and significance of the present investigation.

3. Objectives

1. To document and categorize the medicinal plant species used in plant-based veterinary remedies by the Gond, Muria, Maria, and Bhatra tribal communities of Bastar division, Chhattisgarh, including their taxonomic identity, plant parts utilized, methods of preparation, and livestock ailments treated.
2. To evaluate the informant consensus, use value, and fidelity level of the documented ethnoveterinary medicinal plants in order to identify the most culturally significant species and prioritize candidates for pharmacological validation.

4. Methodology

The present study employed a cross-sectional descriptive research design rooted in ethnobotanical survey methodology as outlined by Martin (1995) and Alexiades (1996). The study was conducted across 15 purposively selected villages in the Bastar division of Chhattisgarh, encompassing Bastar, Kondagaon, Dantewada, and Narayanpur districts. Villages were selected based on the predominance of tribal population, accessibility, and the presence of recognized traditional healers ("Vaidyas" or "Gunias"). The sample comprised 120 informants, including 30 traditional healers, 45 elderly community members (aged 50 years and above), 25 livestock keepers, and 20 herbal practitioners, selected through a combination of purposive and snowball sampling techniques. Data were collected through semi-structured interviews using a pre-tested questionnaire adapted from standard ethnobotanical protocols (Jain & Goel, 1995), supplemented by focus group discussions (8 sessions) and guided field walks with key informants for plant identification and habitat documentation. Plant specimens were collected, identified using regional flora references including the Flora of Chhattisgarh (Verma et al., 2007) and authenticated at the Department of Botany, Shaheed Mahendra Karma Vishwavidyalaya, Bastar. Data were analyzed using quantitative ethnobotanical indices: informant consensus factor (Fic) to evaluate agreement among informants on plant usage for specific ailment categories, use value (UV) to determine relative importance of each species, and fidelity level (FL) to identify the

most preferred species for a given ailment. Ethical clearance was obtained from the institutional ethics committee, and prior informed consent was secured from all participants.

5. Results

The ethnobotanical survey documented 58 medicinal plant species belonging to 34 families and 52 genera utilized by the indigenous communities of Bastar for treating 26 veterinary ailments across cattle, goats, buffaloes, and poultry. The findings are presented through the following tables with statistical explanations.

Table 1: Distribution of Ethnoveterinary Medicinal Plants by Family (Top 10 Families)

S.No.	Plant Family	No. of Species	Percentage (%)
1	Fabaceae	8	13.79
2	Solanaceae	6	10.34
3	Euphorbiaceae	5	8.62
4	Lamiaceae	4	6.90
5	Asteraceae	4	6.90
6	Zingiberaceae	3	5.17
7	Combretaceae	3	5.17
8	Moraceae	3	5.17
9	Meliaceae	2	3.45
10	Apocynaceae	2	3.45

(Source: Primary field survey data, Bastar division, 2019–2021)

As presented in Table 1, Fabaceae emerged as the most dominant family contributing 8 species (13.79%), followed by Solanaceae with 6 species (10.34%) and Euphorbiaceae with 5 species (8.62%). The prominence of Fabaceae is consistent with findings reported by Bhat *et al.* (2023) from Meghalaya and Saha *et al.* (2014) from West Bengal. The dominance of these families can be attributed to their widespread distribution in the tropical deciduous forests of Bastar and the rich phytochemical diversity, including alkaloids, flavonoids, and tannins, that confer therapeutic efficacy against veterinary ailments (Pandey *et al.*, 2018).

Table 2: Plant Parts Used in Ethnoveterinary Preparations

S.No.	Plant Part Used	No. of Use Reports	Percentage (%)
1	Leaves	47	38.52
2	Roots	22	18.03
3	Bark	18	14.75
4	Whole plant	12	9.84
5	Seeds	10	8.20
6	Fruits	8	6.56
7	Rhizome	5	4.10

(Source: Primary field survey data, Bastar division, 2019–2021)

Table 2 reveals that leaves were the most frequently utilized plant part, accounting for 38.52% of all use reports, followed by roots (18.03%) and bark (14.75%). The preferential use of leaves aligns with the findings of Bhat *et al.* (2023), who reported 50% leaf usage in ethnoveterinary practices in Meghalaya. The preponderance of leaf usage may be explained by the ease of collection, year-round availability, and higher concentration of bioactive secondary metabolites in foliar tissues (Dey & De, 2010). The use of roots and bark, while less frequent, was particularly associated with chronic and deep-seated conditions such as fractures and reproductive disorders.

Table 3: Informant Consensus Factor (Fic) for Different Veterinary Disease Categories

S.No.	Disease Category	No. of Use Reports (Nur)	No. of Taxa (Nt)	Fic Value
1	Gastrointestinal disorders	142	16	0.89
2	Dermatological ailments	98	15	0.85
3	Reproductive disorders	64	12	0.83
4	Respiratory infections	56	11	0.82
5	Musculoskeletal problems	38	9	0.78
6	Ectoparasitic infestations	32	8	0.77

(Source: Primary field survey data analyzed using Fic formula: $Fic = (Nur - Nt) / (Nur - 1)$, Bastar division, 2019–2021)

The Fic analysis presented in Table 3 indicates that gastrointestinal disorders recorded the highest consensus (Fic = 0.89) with 142 use reports across 16 taxa, suggesting well-established and widely shared knowledge for treating digestive ailments in livestock. Dermatological ailments followed with Fic = 0.85 across 98 use reports. These values are comparable to those reported by Aziz *et al.* (2018) for gastrointestinal disorders (Fic = 0.92) in Pakistan and Sikarwar and Tiwari (2017) for skin diseases in Central India. The relatively high Fic values across categories indicate strong cultural consensus and suggest that these remedies have been empirically validated over generations of use within the community (Phondani *et al.*, 2010).

Table 4: Top 10 Ethnoveterinary Plant Species by Use Value (UV)

S.No.	Botanical Name	Local Name (Gondi)	UV	Primary Ailment Treated
1	<i>Azadirachta indica</i> A. Juss.	Neem	0.78	Ectoparasites, skin diseases
2	<i>Curcuma longa</i> L.	Haldi	0.72	Wounds, inflammation
3	<i>Butea monosperma</i> (Lam.) Taub.	Palas	0.65	Intestinal worms
4	<i>Aegle marmelos</i> (L.) Corrêa	Bel	0.61	Diarrhoea, dysentery
5	<i>Calotropis procera</i> (Aiton) Dryand.	Akwani	0.57	Bloating, tympany
6	<i>Vitex negundo</i> L.	Nirgundi	0.54	Joint pain, swelling
7	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Arjun	0.51	Fractures, weakness
8	<i>Withania somnifera</i> (L.) Dunal	Ashwagandha	0.48	Reproductive disorders
9	<i>Tinospora cordifolia</i> (Willd.) Miers	Giloy	0.45	Fever, immunity
10	<i>Pongamia pinnata</i> (L.) Pierre	Karanj	0.42	Skin infections

(Source: Primary field survey data; $UV = \sum U_i/n$, where U_i = number of uses reported by informant i and n = total number of informants, Bastar division, 2019–2021)

Table 4 presents the top 10 ethnoveterinary plant species ranked by use value. *Azadirachta indica* recorded the highest use value ($UV = 0.78$), reflecting its widespread application in treating ectoparasitic infestations and dermatological conditions. *Curcuma longa* ($UV = 0.72$) ranked second, primarily used for wound healing and anti-inflammatory purposes. These results corroborate the findings of Verma *et al.* (2014), who identified *Azadirachta indica* as the most popular ethnoveterinary plant across Central India, and Sharma *et al.* (2012), who reported its extensive use in Jammu and Kashmir. The high use values of these species underscore their pharmacological relevance; *Azadirachta indica* is well-documented for its azadirachtin-based insecticidal and antimicrobial properties (Rastogi *et al.*, 2015).

Table 5: Fidelity Level (FL) of Most Preferred Species for Specific Ailments

S.No.	Plant Species	Ailment	Ip	Iu	FL (%)
1	<i>Azadirachta indica</i>	Ectoparasites	72	78	92.31
2	<i>Aegle marmelos</i>	Diarrhoea	58	65	89.23
3	<i>Curcuma longa</i>	Wounds	62	72	86.11
4	<i>Butea monosperma</i>	Intestinal worms	48	58	82.76
5	<i>Calotropis procera</i>	Tympany/bloating	42	54	77.78
6	<i>Vitex negundo</i>	Joint pain	36	48	75.00

(Source: Primary field survey data; $FL = (Ip/Iu) \times 100$, where Ip = informants citing species for a specific ailment and Iu = total informants citing the species, Bastar division, 2019–2021)

As depicted in Table 5, the fidelity level analysis revealed that *Azadirachta indica* exhibited the highest FL (92.31%) for ectoparasitic treatment, indicating that the overwhelming majority of informants who reported using this species employed it specifically for ectoparasite management. *Aegle marmelos* demonstrated an FL of 89.23% for diarrhoea treatment, followed by *Curcuma longa* at 86.11% for wound management. These high fidelity values parallel the findings of Bhat *et al.* (2023), who reported *Aegle marmelos* with 100% FL for indigestion in cattle in Meghalaya. Species with FL values exceeding 80% are considered strong candidates for pharmacological validation (Dey & De, 2010), suggesting that *Azadirachta indica*, *Aegle marmelos*, and *Curcuma longa* merit priority investigation for their veterinary therapeutic potential.

Table 6: Mode of Preparation and Administration of Ethnoveterinary Remedies

S.No.	Mode of Preparation	No. of Remedies	Percentage (%)
1	Paste	28	30.11
2	Decoction	24	25.81
3	Juice/extract	18	19.35
4	Powder	12	12.90

5	Poultice	7	7.53
6	Fumigation	4	4.30

(Source: Primary field survey data, Bastar division, 2019–2021)

Table 6 indicates that paste preparation was the most prevalent mode of remedy preparation, accounting for 30.11% of all documented remedies, followed by decoctions (25.81%) and juice/extracts (19.35%). The dominance of paste-based preparations is consistent with the observations of Bhat *et al.* (2023) and reflects the practical simplicity of grinding fresh plant material for topical and oral application. Oral drenching was the principal route of administration for gastrointestinal disorders, while topical application was preferred for dermatological and musculoskeletal conditions. Fumigation, though least common (4.30%), was specifically used for respiratory ailments and ectoparasitic infestations, a practice also noted by Phondani *et al.* (2010) in the Himalayan region.

6. Discussion

The present study provides a comprehensive ethnobotanical assessment of plant-based veterinary remedies among indigenous communities in Bastar, documenting 58 medicinal plant species used for treating 26 veterinary ailments. The findings confirm the initial hypothesis that indigenous communities of Bastar possess a rich, structured, and functionally sophisticated system of plant-based veterinary healthcare. The dominance of Fabaceae (13.79%) as the most species-rich family aligns with multiple ethnoveterinary studies across India and globally, including those by Bhat *et al.* (2023) in Meghalaya, Aziz *et al.* (2018) in Pakistan, and Saha *et al.* (2014) in West Bengal. The prevalence of Fabaceae can be attributed to its cosmopolitan distribution in tropical forest ecosystems and the presence of diverse bioactive compounds including flavonoids, isoflavones, and alkaloids that confer antimicrobial and anti-inflammatory properties (Rastogi *et al.*, 2015). In alignment with the first objective, the study documented that the Gond, Muria, Maria, and Bhattra tribal communities employ a diverse pharmacopoeia drawn predominantly from the surrounding tropical deciduous forests of Bastar. The identification of leaves as the most commonly used plant part (38.52%) corroborates the broader pattern observed in ethnoveterinary studies across India (Phondani *et al.*, 2010; Verma *et al.*, 2014) and can be attributed to their non-destructive harvesting, perennial availability, and the concentration of photosynthetically active secondary metabolites in leaf tissues. The predominance of paste-based preparations (30.11%) reflects the resource-constrained conditions of tribal villages where access to sophisticated processing equipment is limited, necessitating reliance on simple, replicable preparation methods (Dey & De, 2010).

With reference to the second objective, the quantitative ethnobotanical analysis yielded critical insights into the cultural significance and therapeutic reliability of the documented remedies. The high Fic value for gastrointestinal disorders (0.89) indicates substantial consensus among informants regarding the treatment of digestive ailments a finding that reflects the epidemiological prevalence of gastrointestinal conditions in Bastar's livestock, attributable to poor sanitation, contaminated water sources, and parasitic loads in forested environments (Sikarwar & Tiwari, 2017). The identification of *Azadirachta indica* (UV = 0.78, FL = 92.31%) as the most culturally important ethnoveterinary species is a particularly noteworthy finding, consistent with the pan-Indian recognition of neem as a versatile

therapeutic agent. Its well-characterized bioactive constituents, including azadirachtin, nimbin, and gedunin, have demonstrated scientifically validated insecticidal, antifungal, and antibacterial activities (Rastogi *et al.*, 2015). Similarly, the high fidelity levels recorded for *Aegle marmelos* (89.23% for diarrhoea) and *Curcuma longa* (86.11% for wounds) reflect the empirical efficacy that tribal communities have observed and preserved over centuries of practical application. The study also revealed important socio-demographic patterns in knowledge distribution. Consistent with the observations of Banik and Nema (2014) and Sahu *et al.* (2014), ethnoveterinary knowledge was disproportionately concentrated among elderly informants (aged 60 years and above) and specialized traditional healers, while younger community members exhibited limited awareness. This intergenerational knowledge erosion, driven by modernization, migration to urban centres, and the penetration of allopathic veterinary services, poses a significant threat to the continuity of ethnoveterinary traditions in Bastar (Sharma *et al.*, 2012). Furthermore, deforestation and habitat degradation in the Bastar forests are diminishing the availability of several medicinally important species, including *Tinospora cordifolia*, *Terminalia arjuna*, and *Withania somnifera*, which were reported by informants as increasingly scarce. These converging threats underscore the urgency of systematic documentation coupled with in-situ and ex-situ conservation strategies for ethnoveterinary medicinal plant resources in the region.

7. Conclusion

The present study concludes that the indigenous communities of Bastar division Gond, Muria, Maria, and Bhattra possess a rich and functionally coherent system of plant-based veterinary medicine encompassing 58 medicinal plant species from 34 families for treating 26 livestock ailments. Fabaceae emerged as the dominant plant family, leaves were the most utilized plant part, and paste was the principal mode of preparation. *Azadirachta indica*, *Curcuma longa*, and *Aegle marmelos* were identified as the most culturally significant and therapeutically reliable species with the highest use values and fidelity levels. Gastrointestinal disorders constituted the most prevalent ailment category with the highest informant consensus. The study highlights the critical need for pharmacological validation of the identified high-fidelity species, integration of validated ethnoveterinary practices into primary animal healthcare delivery in tribal regions, and implementation of conservation measures to protect both the traditional knowledge base and the medicinal plant resources of Bastar from the twin threats of cultural erosion and ecological degradation.

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