International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Int. J. of Life Sciences, 2024; 12 (4): 513-520
ISSN:2320-7817(p) | 2320-964X(o)

Review Article Open Access

Ethno-veterinary Medicinal Plants of India: A Review on Traditional Remedies for Anthrax in Livestock

Marathe Vishal R[1] & Deshmukh Muzammil M*

P.G. Dept. of Botany, N.E.S. Science College, Nanded, MS, India
[1]Email: dr.vishalmarathe@gmail.com
*Corresponding author: dr.muzammildeshmukh@gmail.com

Manuscript details:

Received: 03.12.2024
Accepted: 29.12.2024
Published: 31.12.2024

Cite this article as:
Marathe Vishal R & Deshmukh Muzammil M (2024) Ethno-veterinary Medicinal Plants of India: A Review on Traditional Remedies for Anthrax in Livestock, *Int. J. of Life Sciences*, 12 (4): 513-520.

Available online on http://www.ijlsci.in
ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

ABSTRACT

Ethno-veterinary medicinal plants play important role in treatment of livestock. Indian economy mostly depends on these animals as they contribute 4.8 – 6.5 % to the GDP of India every year. Ethno-veterinary medicine refers to people's beliefs, knowledge, skills and practices related with animal care and their treatment. In India, the anthrax is a highly infectious and fatal disease of wild and domestic herbivores such as antelope, cattle, camels, goat, sheep etc. Anthrax is an infective disease caused by spore forming bacterium Bacillus anthracis. In past years, the anthrax cases have been reported from Andhra Pradesh, Tamil Nadu, Telangana State, Karnataka, Maharashtra and Madhya Pradesh. This paper overviews the importance of locally available ethno-veterinary medicinal plants of India against anthrax disease to save the livestock of farmers. Total number of 37 plant species of 34 Genera belonging to 25 Families used for the treatment of anthrax as ethno-veterinary medicine in India have been recorded. The conservation of these plants is important as they are facing threat due to anthropogenic activities.

Keywords: Ethno-veterinary medicine, anthrax, livestock, India

INTRODUCTION

Indian economy mostly depends on these animals as they contribute 4.8 – 6.5 % to the GDP of India every year. As India is agriculture based country, these animals plays an important role in the social upliftment of the peoples of India by various means. They are the most common livestock reared in India. According to 20th livestock census of Department of Animal Husbandry and Dairying, Government of India, there were 192.49 million cattle, 109.85 million buffalo, 74.26 million sheep & 148.88 million goats. Ethno-veterinary knowledge is acquired through practical experience and has traditionally been passed down orally from generation to generation. Documentation and validation of ethno-veterinary medicinal plants arose in early 1980s. The documentation of ethno-veterinary knowledge from

extinction as the farmers or tribal who have this knowledge die and the knowledge also disappear with them. To save such ethnic knowledge by documentation is one of the objectives of conservation of biodiversity.

Anthrax is primarily a disease of herbivores. However, it also occurs in omnivores and rarely in carnivores. Anthrax is an acute infective zoonotic disease caused by spore forming bacterium *Bacillus anthracis* in all warm blooded (poikilothermic) animals like cattle, camels, goats, sheep and other herbivores. It usually occurs after sudden climatic change. The disease is of considerable economic and public health significance due to its rapid spread, high mortality rate.

Bacillus anthracis is a Gram-positive, spore-forming bacterium capable of surviving in harsh environmental conditions for decades due to its highly resistant endospores. These spores are the primary mode of transmission and can infect livestock through ingestion, inhalation, or cuts in the skin. Upon entering the host, the spores germinate, producing toxins that disrupt cellular functions and lead to rapid disease progression (Anonymous, 2008).

Anthrax outbreaks in India are particularly common in regions with poor livestock vaccination coverage and where grazing lands are contaminated with spores. States like Andhra Pradesh, Odisha, and Tamil Nadu have reported frequent outbreaks due to hot and humid climates that favor spore survival.

Study area:

India is a rich repository of traditional healing practices, deeply rooted in its cultural and ecological diversity. The vast knowledge of ethno-veterinary medicine reflects the country's reliance on natural resources for livestock healthcare, especially in rural and tribal areas. This study focuses on highlighting the role of ethno-veterinary medicinal plants in addressing anthrax, a critical zoonotic disease affecting livestock and rural livelihoods in India. While India possesses a wide array of medicinal flora, this review primarily draws references from seven states: Andhra Pradesh, Tamil Nadu, Karnataka, Meghalaya, Madhya Pradesh, Maharashtra, and Telangana (Fig.1).

Enumeration:

The enumeration of ethno-veterinary medicinal plants used against anthrax in India reveals a total of 37 species belonging to 34 genera and 25 families Table 1.

Fig.1 Map showing the seven states in India where the use of ethno-veterinary medicinal plants against anthrax has been recorded.

Table-1: Enumeration of documented ethno-veterinary medicinal plants used against Anthrax in India:

SN	Botanical name	Local name	Family	Part used	Study area	Reference	Name of Journal/ Book
1	*Phyllanthus amarus Schum & Thonn.*	-	Euphorbiaceae	Fruit	Betul Dist. (M.P.)	Deshmukh & Pocchi, 2017	International Journal of Applied Research
2	*Ocimum basillicum*	-	Lamiaceae	Leaves	Betul Dist. (M.P.)	Deshmukh & Pocchi, 2017	International Journal of Applied Research
3	*Aristolochia bracteolata* Lam.	Aaduthinnapalai	Aristolochiaceae	Leaves	Southern districts of T.N.	Ganesan *et al* 2008	Indian Journal of Traditional Knowledge
4	*Nicotiana tabacum* L.	Pugai elai	Solanaceae	Leaves	Southern districts of T.N.	Ganesan *et al* 2008	Indian Journal of Traditional Knowledge
5	*Zingiber officinale* Rose.	Ingi	Zingiberaceae	Leaves	Southern districts of T.N.	Ganesan *et al* 2008	Indian Journal of Traditional Knowledge
6	*Solanum xanthocarpum* Shrader & Wendl.	Kandakathari	Solanaceae	Leaves	Southern districts of T.N.	Ganesan *et al* 2008	Indian Journal of Traditional Knowledge
7	*Capsicum annum* L.	Milagai	Solanaceae	Fruits	Southern districts of T.N.	Ganesan *et al* 2008	Indian Journal of Traditional Knowledge
8	*Piper nigrum* L.	Milagu	Piperaceae	-	Southern districts of T.N.	Ganesan et al 2008	Indian Journal of Traditional Knowledge
9	*Abrus precatorius* L.	Guruvinda	Fabaceae	Stem bark	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
10	*Vitex negundo* L.	-	Verbenaceae	Leaves	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
11	*Curculigo orchioides*	-	Hypoxidaceae	Tubers	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
12	*Piper nigrum* L.	Pepper	Piperaceae	-	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
13	*Allium sativum* L.	Garlic	Alliaceae	-	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
14	*Derris scandens (Roxb.) Benth.*	Nalla teega	Fabaceae	Leaf, rhizome	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
15	*Zingiber officinale* Rose.	Ginger	Zingiberaceae	-	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
16	*Curcuma longa* L.	Turmeric	Zingiberaceae	-	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
17	*Gloriosa superba* L.	-	Amarillidaceae	Tubers	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
18	*Allium cepa* L.	Onion	Alliaceae	-	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
19	*Dillenia pentagyna* Roxb.	Kalinga	Dilleniaceae	Stem bark	Visakhapatnam and Vizianagarm Districts (A.P.)	Lakshmi Narayana *et al*, 2015	Int. J. of Pure & Applied Bioscience
20	*Pergularia daemia* (Forsk.) Chiov.	Guritaku	Asclepiadaceae	Leaf & tuber	Visakhapatnam and Vizianagarm	Lakshmi Narayana *et al*,	Int. J. of Pure & Applied Bioscience

					Districts (A.P.)	2015	
21	*Azima tetracantha* Lam.	Uppina mullu	Salvadoraceae	Leaves	Mallenahalli of Chikmagalur Taluk (K.A.)	Raveesha & Sudhama, 2015	Journal of Medicinal Plant Studies
22	*Albizia lebbeck* (L.) Willd.	East Indian Walnut	Mimosaceae	Bark	Mallenahalli of Chikmagalur Taluk (K.A.)	Raveesha & Sudhama, 2015	Journal of Medicinal Plant Studies
23	*Piper nigrum* L.	Pepper	Piperaceae	Leaves	Mallenahalli of Chikmagalur Taluka (K.A.)	Raveesha & Sudhama, 2015	Journal of Medicinal Plant Studies
24	*Allium sativum L.*	Garlic	Alliaceae	Bulblets	Mallenahalli of Chikmagalur Taluka (K.A.)	Raveesha & Sudhama, 2015	Journal of Medicinal Plant Studies
25	*Ziziphus xylopyrus* (Retz) Wild	-	Rhamnaceae	Root	Mulugu Revenue Div. Dist. Bhupal-pally (T.S.)	Medisetti, 2018	European Journal of Biomedical and Pharmaceutical Sciences
26	*Terminalia chebula* Roxb.	Harra	Combretaceae	Fruit	Chitrakoot Dist. Satna (M.P.)	Gautam and Ricchariya 2015	Int. J. of Pharm. & Life Sciences
27	*Atalantia malabarica* Tanaka	Konda nimma	Rutaceae	Stem bark	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
28	*Piper nigrum* L.	Pepper	Piperaceae	-	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
29	*Allium sativum* L.	Garlic	Alliaceae	-	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
30	*Dillenia pentagyna* Roxb.	Kalinga, Revadi	Dilleniaceae	Stem bark	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
31	*Eulophia epidendraea* Fischer	Segadom ma gaddalu	Orchidaceae	Pseudo-bulbs	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
32	*Lannea coromandelica* (Houtt.) Merr.	Gumpena, Dumpidi	Anacardiaceae	Stem bark	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
33	*Ziziphus xylopyrus* (Retz) Wild	Gotti	Rhamnaceae	Roots	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
34	*Calotropis gigantea* (Linn.) R.Br.	Jillaedu	Asclepiadaceae	Stem bark	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy et al, 2006	Indian Journal of Traditional Knowledge
35	*Erythroxylum monogynum* Roxb.	Devadaari	Erythroxylacea e	-	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
36	*Pterocarpus marsupium* Roxb.	Yegisha	Fabaceae	-	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
37	*Capsicum annum* L.	Chillies	Solanaceae	-	Eastern Ghats of Andhra Pradesh (A.P.)	Reddy *et al*, 2006	Indian Journal of Traditional Knowledge
38	*Abrus precatorius* L.	-	Fabaceae	Stem bark	Perambalur district (T.N.), Rayala Seema Regions (A.P.)	Devendrakuma r & Anbazhagan 2012, Venkata Rami Reddy K *et al*, 2016	Research in Plant Biology, European Journal of Environmental Ecology
39	*Azadirachta indica* A. Juss.	-	Meliaceae	Stem bark	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
40	*Dendrocalamus*	-	Poaceae	Leaves	Rayala Seema	Venkata Rami	European Journal

	strictus Roxb.				Regions (A.P.)	Reddy K *et al*, 2016	of Environmental Ecology
41	*Dillenia pentagyna* Roxb.	-	Dilleniaceae	Leaves	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
42	*Gloriosa superba* L.	-	Amarillidaceae	Tuber	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
43	*Lannea coromandelica* Murr.	-	Anacardiaceae	Stem bark	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
44	*Moringa oleifera* Lam.	-	Moringaceae	Leaves	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
45	*Pergularia daemia* (Forsk.)	-	Asclepiadaceae	Leaves	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
46	*Phyllanthus emblica* L.	-	Euphorbiaceae	Fruits	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
47	*Terminalia bellirica* (Gaertn.)	-	Combretaceae	Stem bark	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
48	*Terminalia chebula* Retz.	-	Combretaceae	Fruits	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
49	*Tylophora indica* (Burm. f.)	-	Asclepiadaceae	Whole plant	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
50	Ziziphus xylopyras L.	-	Rhamnaceae	Root	Rayala Seema Regions (A.P.)	Venkata Rami Reddy K *et al*, 2016	European Journal of Environmental Ecology
51	*Atlantia malabarica* (L.) Correa	Konda nimma	Rutaceae	Stem bark	Tribal regions of A.P.	Pragada & Narsimha rao, 2012	Bangladesh J. Plant Taxon.
52	*Piper nigrum* L.	Pepper	Piperaceae	-	Tribal regions of A.P.	Pragada & Narsimha rao, 2012	Bangladesh J. Plant Taxon.
53	*Allium sativum L.*	Garlic	Alliaceae	-	Tribal regions of A.P.	Pragada & Narsimha rao, 2012	Bangladesh J. Plant Taxon.
54	*Dillenia pentagyna* Roxb.	Kalinga	Dilleniaceae	Stem bark	Tribal regions of A.P.	Pragada & Narsimha rao, 2012	Bangladesh J. Plant Taxon.
55	*Lannea coromandelica* Murr.	Gumpena	Anacardiaceae	Stem bark	Tribal regions of A.P.	Pragada & Narsimha rao, 2012	Bangladesh J. Plant Taxon.
56	*Ziziphus xylopyras* L.	Gotti	Rhamnaceae	Root	Tribal regions of A.P.	Pragada & Narsimha rao, 2012	Bangladesh J. Plant Taxon.
57	*Butea monosperma* (Lamk.)	Palas	Fabaceae	Leaves, flowers	Wardha district (M.H.)	Pranjale & Dube, 2016	Int. J. of Science and Research
58	*Cassia fistula* L.	Sonuru gaach	Fabaceae	Seeds, flowers	East khasi hill of Meghalaya	Bhat et. al. 2023	Heliyon
59	*Phyllanthus emblica* L.	Soh maleng	Euphorbiaceae	Flower, leaf	East khasi hill of Meghalaya	Bhat et. al. 2023	Heliyon
60	*Tinospora cordifolia* (L.) Merr.	Seenthil	Menispermae	Leaves	Perambalur district (T.N.)	Devendrakumar & Anbazhagan 2012	Research in Plant Biology

DISCUSSION

The use of ethno-veterinary medicinal plants in combating anthrax in livestock is a significant aspect of traditional veterinary practices in India. The distribution of these plants across seven states provides valuable insights into regional variations in traditional knowledge and practices.

Taxonomic Contributions

A total of 37 species spanning 34 genera and 25 families were recorded across the surveyed states (Table-2, Fig. 2). Among these, Fabaceae emerges as the most significant family, contributing 29% of the plants used against anthrax. This dominance highlights the potential of Fabaceae species in providing bioactive compounds for disease management. Families like Solanaceae and Asclepiadaceae also contribute substantially (18%), followed by Alliaceae, Combretaceae, and Euphorbiaceae, each contributing 12% (Table-3, Fig. 3). The diversity of plant families reflects the broad spectrum of plants utilized and the adaptability of traditional systems to available flora.

Regional Diversity in Ethno-veterinary Knowledge

The findings reveal that Andhra Pradesh holds the richest repository of ethno-veterinary medicinal plants against anthrax, with 27 species documented. This is significantly higher than Tamil Nadu, which has six species and Karnataka and Meghalaya, where only four species each were recorded. It is followed by the Madhya Pradesh which has record of three species. The states of Maharashtra and Telangana stand out for their minimal contributions, with only one plant species recorded in each state. (Table-4, Fig. 4) This disparity underscores the need for more extensive surveys in regions with fewer documented species to capture potentially untapped traditional knowledge.

Anthrax and the Need for Cost-Effective Solutions

Anthrax, a critical zoonotic disease, possess severe threats to livestock health and, consequently, rural livelihoods. The use of ethno-veterinary medicinal plants offers a cost-effective or no-cost alternative for farmers, especially in resource-limited settings. These plants are often locally available and culturally accepted, making them a practical solution for tribal and rural communities. Moreover, their application reduces dependency on expensive pharmaceutical treatments, aligning with the socio-economic conditions of marginalized populations.

Gaps and Future Prospects

The study highlights significant gaps in the documentation of ethno-veterinary plants in states like Maharashtra and Telangana, where only one plant was recorded against anthrax. This suggests a potential underutilization or lack of documentation of traditional knowledge in these regions. Future field surveys should prioritize these underrepresented states and others to uncover and preserve undocumented plant species and practices. Comprehensive surveys would not only enrich the ethnobotanical database but also provide a robust foundation for pharmacological validation and conservation efforts.

Implications for Policy and Livelihood Development

The findings have critical implications for animal welfare, disease control, and rural livelihood development. Policymakers can leverage this traditional knowledge to promote sustainable livestock healthcare practices. Integrating ethno-veterinary medicine into formal veterinary systems can enhance accessibility and affordability for rural farmers. Additionally, the documentation and conservation of ethno-veterinary plants can contribute to biodiversity preservation and the safeguarding of indigenous knowledge systems.

Table-2: Spectrum of taxa of ethno-veterinary medicinal plants against anthrax

Sr. No.	Category	Numbers
1	Genus	34
2	Species	37
3	Families	25

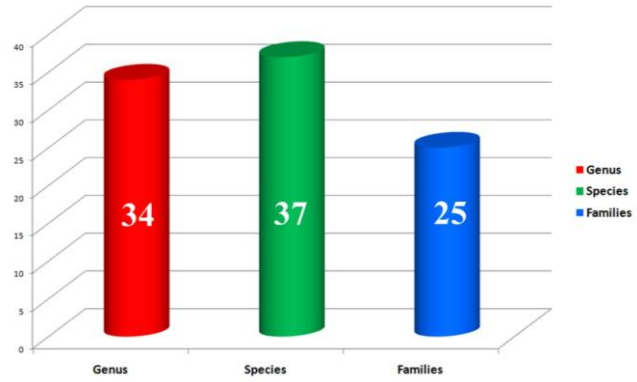

Fig. 2: Spectrum of taxa of ethno-veterinary medicinal plants against anthrax

Table-3: Plant families used in ethno-veterinary medicine for treating anthrax

Sr. No.	Family	Numbers
1	Fabaceae	5
2	Asclepiadaceae	3
3	Solanaceae	3
4	Alliaceae	2
5	Combretaceae	2
6	Euphorbiaceae	2

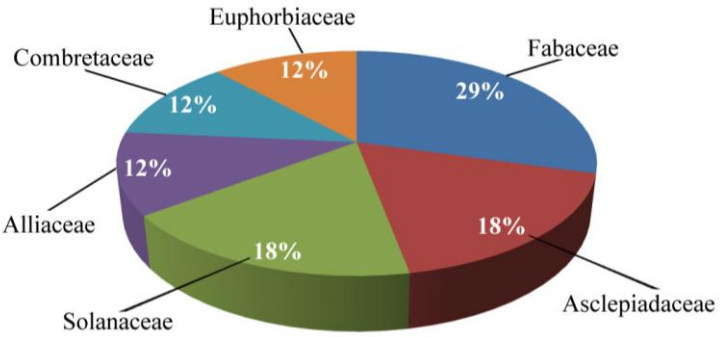

Fig. 3: Plant families used in ethno-veterinary medicine for treating anthrax

Table 4: Geographical distribution of ethno-veterinary medicinal plants used against anthrax across Indian states

States	Number of EVM Plants used against anthrax
Andhra Pradesh	27
Tamil Nadu	6
Karnataka	4
Meghalaya	4
Madhya Pradesh	3
Maharashtra	1
Telangana State	1

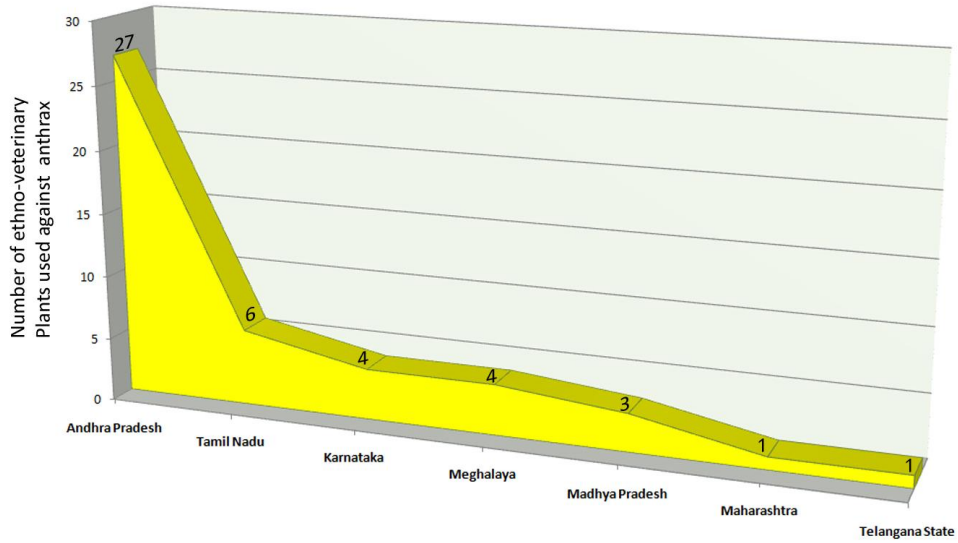

Fig. 4: Geographical distribution of ethno-veterinary medicinal plants used against anthrax across Indian states

CONCLUSION

The documentation of ethno-veterinary medicinal plants against anthrax highlights the rich traditional knowledge present only in seven states of India. This limited geographic representation suggests that significant traditional knowledge remains undocumented or underexplored in many other states of India. States with rich biodiversity and strong traditional knowledge systems, such as Arunachal Pradesh, Kerala, and Rajasthan, are yet to contribute to the documented database for anthrax treatments. The uneven documentation underscores the need for further field surveys and research across the remaining states to capture the full spectrum of India's ethno-veterinary practices. Expanding this knowledge base and integrating it with modern veterinary practices can play a pivotal role in addressing livestock health issues, ensuring rural sustainability, and preserving cultural heritage.

Conflict of Interest: The authors declare no conflict of interest in relation to this research.

Acknowledgement
We express our heartfelt gratitude to the traditional healers, tribal communities, and farmers of India for preserving and practicing their ethno-veterinary knowledge of medicinal plants.

Data Availability Statement: Not applicable.

Correspondence and requests for materials should be addressed to **Deshmukh Muzammil M**

Peer review information
IJLSCI thanks the anonymous reviewers for their contribution to the peer review of this work. A peer review file is available.

REFERENCES

Anonymous (2008) *Anthrax in Humans and Animals* – 4th ed. WHO cataloguing-in-publication data, Press, World Health Organization, Geneva, Switzerland

Bhat NA, Jeri L, Karmakar D, Mipun P, Bharali P, Sheikh N, Nongkynrih CJ, Kumar Y (2023) Ethnoveterinary practices of medicinal plants used for the treatment of different cattle diseases: A case study in East Khasi Hill district of Meghalaya, North East India. *Heliyon*. 9(7): e18214.

Deshmukh OS and VU Pochhi (2017) Plants used in Ethno-veterinary medicines by Tribal Peoples in Betul District, Madhya Pradesh, India. *International Journal of Applied Research*. Vol. 3 (Special issue 3, part B): 34-39.

Devendrakumar & Anbazhagan (2012) Ethnoveterinary medicinal plants used in Perambalur District, Tamil Nadu. *Research in Plant Biology*. Vol. 2 (3): 24-30.

Ganesan S, M Chandhirasekaran and A Selvaraj (2008) Ethnoveterinary healthcare practices in southern districts of Tamil Nadu. *Indian Journal of Traditional Knowledge*. Vol. 7(2): 347-354

Gautam P and Ricchariya GP (2015) Ethnoveterinary medicinal plants used by tribal's and rural communities of Chitrakoot, Distt. Satna (M.P.). *International Journal of Pharmacy & Life Sciences*. 6 (4): 4427-4430.

Lakshmi NV and GM Narasimha Rao (2015) Ethnoveterinary practices and phytochemical analysis of some selected medicinal plants from North Coastal Andhra Pradesh, India. *India Journal of Applied Research*. Vol. 5 (9): 455-457.

Medisetti N (2018) Ethnoveterinary practices in Mulugu revenue division of Jayashankar Bhupalpally District, Telangana. *European Journal of Biomedical and Pharmaceutical Sciences*. Vol. 5 (2): 811-818.

Pragada MR and GM Narsimha Rao (2012) Ethnoveterinary medicinal practices in tribal regions of Andhra Pradesh, India. *Bangladesh Journal of Plant Taxonomy*. 19 (1): 7-16.

Pranjale A and Dube KG (2016) Ethno-veterinary Traditional Knowledege of some plants used in Wardha district (Maharashtra). *International Journal of Science and Research*. Vol. 5 (5): 1279-1283.

Raveesha HR and VN Sudhama (2015) Ethnoveterinary practices in Mallenahalli of Chikmagalur Taluka, Karnataka. *Journal of Medicinal Plants Studies*. 3 (1): 37-41.

Reddy KN, GV Subbarajau, CS Reddy and VS Raju (2006) Ethnoveterinary medicine for treating livestock in eastern ghats of Andhra Pradesh. *Indian Journal of Traditional Knowledge*. Vol. 5(3): 368-372.

Sikarwar, RLS (1996) Ethno-veterinary herbal medicines in Morena district of Madhya Pradesh, India. Pp. 194-196 in *Ethnobiology in Human Welfare*. Edited by S.K. Jain. Deep Publications, New Delhi.

Venkata Rami Reddy K, M Nagalakshmi Devamma and P Prayaga Murty (2016) Ethnoveterinary Medicinal Practices in Rayala Seema Regions of Andhra Pradesh, India. *European Journal of Environmental Ecology*. 3 (1): 7-20.