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Ethnoveterinary medicines used by tribals of Tadgarh-Raoli wildlife sanctuary, Rajasthan, India

Praveen Galav, Anita Jain* & S S Katewa

Laboratory of Ethnobotany & Agrostology, Department of Botany, College of Science, Mohanlal Sukhadia University, Udaipur, Rajasthan, India

E-mail: anitajain_02@rediffmail.com

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Extensive ethnoveterinary survey was carried out during the 2006–2009 to document the precious indigenous healthcare practices prevalent among the different ethnic groups (*Bhil, Meena, Garasia*, etc.) of Tadgarh–Raoli wildlife sanctuary. Ethnoveterinary surveys of the study area revealed veterinary uses of 54 plants belonging to 34 families of Angiosperms. Euphorbiaceae is the dominant family with a number of 6 species used in veterinary medicines. The identified taxa are described by mentioning their families, vernacular names, ethnoveterinary medicinal uses along with mode of administration.

Keywords: Ethnoveterinary, tribals *Bhil, Meena, Garasia*, Tadgarh–Raoli wildlife sanctuary Rajasthan

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The Tadgarh–Raoli wildlife sanctuary which lies in the civil districts of Rajsamand, Pali, and Ajmer districts is located in South–east region of Rajasthan, India. Geographically the area of sanctuary is a land of contrast, with rivers, valleys, dense forests and sandy plains overlooked by the ancient hills of Aravallis. Spreading over an area of 497 sq km, the sanctuary represents the 'Northern Tropical Dry Deciduous Forest" type. Difference in altitude offers a great variety of flora and fauna, which can be seen here due to diverse ecosystem, namely lakes, forests and grasslands. In its eastern part are found mountain ranges reaching to an altitude of more than 1066.8 m, while the western part of this sanctuary is adjoining to *Marwar* plains. The main floral diversity of this region is *Acacia catechu* (L.f.) Willd. (*Khair*), *Ziziphus mauritiana* Lamk. (*Ber*), *Butea monosperma* (Lam.)Taub.(*Dhok*), *Anogeissus latifolia* Wall.ex Guill & Perr. (*Dhawda*), *Acacia senagal* (L.) Willd. (*Kumtha*), *Boswellia serrata* Roxb. ex Cocls. (*Salar*) and *Capparis decidua* (Forsk.) Edgew. (*Kair*) and the faunal diversity is *Gazella bennettii* (*Chinkara*), *Boselaphus tragocamelus* (*Nilgai*), *Lepus nigricollis* (Indian Hare), *Felis chaus* (Jungle cat), *Sus scrofa* (Indian wild bear). Besides these mammals several water and terrestrial birds, and reptiles are also found[2].

The major tribes inhabiting in or around the sanctuary are *Bhil, Meena, Garasiya,* etc. *Bhil* are the aboriginal inhabitant of Rajasthan residing on the Aravalli. Originally *Bhils* are hunters. The main occupation of these tribes is agriculture but at present tribal people earn their livelihood by serving as labours in road, mines and forest operation. The surrounding plants and animals form an integral part of culture of these people and information about indigenous healthcare practices is passed on from generation to generation orally through oral folklore, although it is often kept secret. Tribals of this region have a predominantly livestock based economy. Some of the best breeds of cattle, goat, sheep, camel, wild ass and even wild ungulates are found here. Though there is no authentic evidence of when and how plants came into usage for curing the domestic animals, the tribals seem to be aware of it through generations. Access to and within the rural areas is extremely difficult during certain periods of the year making evacuation for medicinal treatment an unrealistic alternative. Therefore, rural people almost solely depend on traditional medicine; this knowledge of rural people with the traditional healing practices using wild plants is now fast disappearing due to modernization and the tendency of younger generation to discard their traditional lifestyle and gradual migration to the mainstream. Therefore, an urgent need was felt to

*Corresponding author

study and document this precious knowledge for posterity[2].

Efforts are on to document all the ethnomedicinal knowledge, but there are very few reports on plants used in veterinary medicine[3-14]. So far, no systematic investigation was ever done on the indigenous healthcare practices used by the tribal people of Tadgarh–Raoli wildlife sanctuary of Rajasthan. In the present paper, an attempt has been made to document the veterinary herbal medicines.

Methodology

Rapport was made with one or two persons preferably the chief, guidance sought and contact with other tribals. Local informants were medicine-men, workers in the field, village headman, priests (*Bhopa*) and other community leaders. Prior informed consent has been taken from each informant before taking the interview. Study sites were visited with the local informant/medicine-men (Table 1). The persons above the age of 50 yrs have accurate information regarding their old traditions. Generally two types of interviews were taken, firstly of individuals and secondly of groups. Of individuals, persons were selected at random on the way or entering a hut. The information was cross-checked with different informants. The plants were identified at the Herbarium of Forest Research Institute, Dehradun. Specimens are deposited in the Herbarium of Laboratory of Ethnobotany and Agrostology, Department of Botany, College of Science, M L Sukhadia University, Udaipur (Rajasthan).

Result and discussion

Tribals residing in the remote forest areas of Tadgarh-Raoli wildlife sanctuary, Rajasthan have an amazingly good understanding of the uses of medicinal plant parts and quantities needed, and the methods used in harvesting, processing, storing, preserving and utilizing medicinal plants to ensure good drug efficacy and to enhance the survival of plant germplasm. If the above procedures are poorly executed, plant resources may be over- exploited, which can lead to extinction of certain species. This means that the best results from medicinal plant preparations can only be obtained when the tribals and rural people are taught to judiciously harvest, process, store, preserve and utilize the preparations. An extensive ethnoveterinary survey of tribal area of Tadgarh-Raoli wildlife sanctuary Rajasthan yielded veterinary uses of 54 plant species belonging to 34 families of Angiosperms are reported (Table 2). The ethnoveterinary medicinal plants listed here are locally available and easily accessible and thus provide a cheaper treatment as compared to modern drugs. The only limitation is the seasonal availability of certain plants, for which tribals have acquired different ways to preserve them for off-season uses. Most common way of preserving is sun-drying.

Tribals use these medicines against various ailments to treat their suffering animals. There is no specific treatment for a particular type of animal, e.g. cattle, goats, sheep, camels or horses. Same treatment is applied to different animals but the dose depends on body weight of the animal. Wherever there is a medicine specific to a particular animal, it has been specially mentioned. For example, in case of goats, leaves of *Ceropegia bulbosa* are given as fodder as a prophylactic measure against tumour formation.

Generally, it was observed that there is a certain overlap between plants used for human and animal medicine. Certain plants like *Albizia lebbeck* (conjunctivitis), *Helicterus isora* (diarrhoea), *Anethum graveolens* (as galactogogue), *Euphorbia triculii* (skin disorders), *Ricinus communis* (constipation), are used as medicine for same diseases in humans as well as animals although the dose in such cases varies greatly. This may be possible as aresult of tribal's tendency to try human medicines on animals. Such medicines are found to be equally useful in veterinary diseases14.

Table 1—Detailed information about the informants of the study area

S. No.	Name	Tribe	Sex	Age	Locality	Occupation
1	Naruji	Meena	Male	58	Sila ka Guda, Rajsamand	Medicine-man
2	Ganesh singh	Meena	Male	60	Jamguda, Pali	Farmer
3	Ramaroa	Meena	Male	75	Dudlashwar, Rajsamand	Pujari
4	Kaser Singh	Bhil	Male	57	Kamlighat, Rajsamand	Farmer
5	Sohanlalji	Bhil	Male	67	Tadgarh, Ajmer	Pujari
6	Radhabai	Bhil	Female	45	Tadgarh, Rajsamand	Medicine-woman
7	Pramaram	Bhil	Male	52	Tadgarh, Ajmer	Forester
8	Ganesh	Garasia	Male	55	Ranawas, Pali	Medicine-man
9	Radhabai	Garasia	Female	54	Bhim, Rajsamand	Medicine-women

Table 2—List of Ethnoveterinary plants used in various ailments of animals

Name of the plant species	Local name	Plant part/parts used	Clinical uses
Abrus precatorius Linn. (Fabaceae)	*Chirmi*	Seed	Paste of one or two seeds is given to the animal once in a day for relief in constipation and easy expulsion of placenta after delivery.
Justicia adhatoda Linn. (Acanthaceae)	*Adusa*	Leaves	Paste prepared from boiled leaves of *Justicia adhatoda*, jaggery and powder of *Curcuma longa* is given orally twice a day for three day in case of abscess or septicemia for early healing.
Agave americana Linn. (Agavaceae)	*Jungli gwar-patha*	Leaves	Paste prepared from leaves is applied over broken horns for early healing.
Albizia lebbeck (Linn.) Benth. (Mimosaceae)	*Siras*	Latex	Milk of sheep mixed with latex of *Albizia lebbeck,* is used as eye drops to cure conjunctivitis.
Allium cepa Linn. (Liliaceae)	*Kanda*	Bulbs	To overcome the calcium deficiency and overall weakness after delivery, 300 gm bulbs of onion are given orally to cattle once in a day for 7-10 days.
Allium sativum Linn. (Liliaceae)	*Lahsan*	Segments	Segments charred in mustard oil is given orally to the animal to cure weakness, foot and mouth disease and impaction with fever.
Ampelocissus latifolia (Roxb.) Planch. (Vitaceae)	*Jungli-Angoor*	Tuber	About 50 gm tuber powder is given to the animal with water, twice a day for three days for early healing of fractured bone.
Anethum graveolens Linn. (Apiaceae)	*Suwa*	Seeds	Milch-cattle are fed with porridge prepared from seeds of *Trigonella foenum-graceum, Anethum graveolens* and *Triticum aestivum* as a galactogogue.
Annona squamosa Linn. (Annonaceae)	*Sitaphal*	Le/ aves	Paste of 100 gm leaves is given once with fodder to the animal to cure constipation.
			For removal of internal parasite, 5-7 leaves of *Annona squamosa* are ground with a pinch of Sodium carbonate and *Ferula asafoetida* each and mixed with 200-400gm of seed oil of either *Sesamum indicum* or *Arachis hypogaea* or *Ricinus communis* or *Linum usitatissimum,* is given to the animal with the help of drenching tube or bottle once in a day for three days. Dosage of this preparation depends on body weight of the animal.
			Leaf paste is applied over the infected area to remove external parasites.
Asparagus racemosus Willd. (Asparagaceae)	*Satavar*	Whole plant	Milch–animal is fed with whole plant early in the morning as a galactogogue.
Bacopa monnieri (Linn.) Pannell. (Scrophulariaceae)	*Brahmi*	Whole plant	Paste of whole plant (250 gm) is given to the animal once in day for 5-7 days to treat paralytic attack. A single dose is found to be effective.
Bombax ceiba Linn. Bombacaceae)	*Semal*	Bark and Flowers	The paste prepared from the 100 gm bark is applied as a poultice around fractured bone and then plastered with *Bambusa arundinacea* strips and tied with the help of fallen human hairs dipped in mustard (*Brassica* campestris) oil.
			200 gm flowers mixed with fodder are fed to the animal once in a day for 1-2 days for easy removal of placenta after delivery.
Butea monosperma (Lam.) Taub. (Fabaceae)	*Khakhara*	Gum and Flowers	Fresh gum is very effective if applied over the animal skin for removal of external parasites.
			500 gm flowers mixed with fodder are given to the animal once or twice for easy removal of placenta after delivery.
Capparis sepiaria Linn. (Capparaceae)	*Ker*	Stem	Oil of *Ricinus communis,* crushed rhizomes of *Curcuma longa* and jaggery mixed in equal ratio, *i.e.* 2 kg each; 250 gm of this mixture mixed with 250 gm coal prepared from wood of *Capparis sepiaria* is given to the animal with 1 kg of milk. This heals up the fractured bone fast if given daily for 8-10 days.
Carica papaya Linn. (Caricaceae)	*Hajar kakdi*	Latex	Leaf/stem latex is applied over the skin to cure eczema.
Carissa congesta Wt. (Apocynaceae)	*Karonda*	Latex	Stem latex is applied over the fractured bone or dislocated joint for early healing.

(*Contd.*)

Table 2—List of Ethnoveterinary plants used in various ailments of animals—(*Contd*.)

Name of the plant species	Local name	Plant part/parts used	Clinical uses
Cassia fistula Linn. (Caesalpiniaceae)	*Karmalo, Amaltas*	Stem bark/ Pods	Decoction of either 100 gm of pods or stem bark (if pods are not available) is given to the animal as a purgative**.**
Ceropegia bulbosa Roxb. (Asclepiadaceae)	*Khadula*	Leaves	Leaves are given as fodder as a prophylactic measure against tumour formation to cattle especially goats.
Chlorophytum tuberosum (Roxb.) Baker. (Liliaceae)	*Dholi musli*	Tubers	Three to four tubers mixed with fodder are given to the animal twice in a day for 3 days in diarrhoea.
Cissus quadrangularis Linn. (Vitaceae)	*Jungli Angoor*	Whole plant	Whole plant (200 gm) is ground with 50 gm bark of *Wrightia tinctoria*, 50 gm leaves of *Vitex negundo,* 50 gm seed powdered of *Piper nigrum* and 50 gm bulbs of *Allium sativum.* This mixture is given to the animals orally to treat foot and mouth disease. Paste of about three nodes is given to the animal with water through drenching tube once in a day for 8- 10 days for early healing of fractured bones.
Clitoria ternatea Linn. (Fabaceae)	*Gokarni*	Seeds	Seeds (5-10) are given with jaggery or *chapatti* as per requirement for relief in constipation. Dose depends on body weight of the animal.
Cocculus hirsutus (Linn.) Diels (Menispermaceae)	*Baar*	Leaves	Leaves (100 gm) are given orally once in a day for three days as an antidote in dog-bite.
Cordia dichotoma Forst. f. (Ehretiaceae)	*Gunda*	Leaves	Paste of leaves (100 gm) is given to the animal with water twice a day for three days to cure diarrhoea. Leaves and fruits are given as a fodder to the animal suffering from leucorrhoea.
Crinum asiaticum *Linn. (Amaryllidaceae)*	*Jahari kanda*	Tuber	Tuber paste is applied over the skin to treat carbuncles.
Curculigo orchioides Gaertn. (Hypoxidaceae)	*Kaali Musli*	Tubers	Paste of 10 gm tuberous roots is given orally thrice in a day for 2-3 days along with water as an antidote to poisonous bite. It is believed to be effective against all types of poison (snake bite, scorpion bite, etc.). *Dried tubers ground with stem of* Cissus quadrangularis *are given orally to cure impaction.*
Curcuma longa Linn. (Zingiberaceae)	*Halad*	Rhizome	A mixture of mustard oil*,* 5 gm rhizome of *Curcuma longa* and 2 gm potash alum is given to the animal orally through a drenching tube twice in a day for three days, to cure internal wounds.
Dalbergia sisso Roxb. (Fabaceae)	*Shisham*	Leaves and Bark	Paste of about 250 gm leaves is given to the animals through drenching tube twice in a day for three days, to cure diarrhea. Oil is extracted through traditional method by heating bark of *Dalbergia sisso* and hard coconut shell is applied over eczema, abscess or septic in a very small quantity for quick relief. Excess amount causes burning sensation.
Dioscorea alata Linn. (Dioscoreaceae)	*Kada – kanda*	Tubers	For treating all kind of abscesses in the animals, tubers (250 gm) are fed to the animal orally.
Euphorbia neriifolia Linn. (Euphorbiaceae)	*'Thor*	Stem latex	Small amount (4-5 drops) of latex is used as purgative to treat constipation.
Euphorbia triculii Linn. (Euphorbiaceae)	*Angli thor*	Stem latex	Latex is applied over the skin to cure eczema.
Ferula asafoetida Linn. (Apiaceae)	*Hing*	Resin	A pinch of resin mixed with 500 ml of *Brassica campestris* seed oil is given to buffalo for instant relief from flatulence.
Ficus carrica Linn. (Moraceae)	*Anjeer*	Leaf/stem latex	Latex is applied over the skin to treat eczema and carbuncles.
Ficus racemosa Linn. (Moraceae)	*Gular*	Latex and Bark	Latex is applied over skin to suppress all kinds of pimples and carbuncles. Paste of bark is applied locally to treat the injury caused by snake-bite.
Grewia damine Gaertn. (Tiliaceae)	*Gangaran*	Roots and Leaves	About 50 gm roots are crushed and given to the animal with water, twice a day for three days for early healing of fractured bone. The paste of *Grewia damine* leaves, 4-5 eggs of hen and milk of cow is mixed and poured into the mouth of suffering animal daily with the help of a tumbler or drenching tube for 10 days for early healing of fractured bone. (*Contd*.)

Table 2—List of Ethnoveterinary plants used in various ailments of animals—(*Contd*.)

Name of the plant species	Local name	Plant part/parts used	Clinical uses
Grewia orientalis Linn. (Tiliaceae)	*Gengchi*	Leaves	About 50 gm leaves are given orally as fodder to treat impaction.
Helicterus isora Linn. (Scrophulariaceae)	*Marodphali*	Bark / Fruits	About 100 gm paste of either bark or dried fruit is given thrice a day for 3-5 days for relief in bloody dysentery and diarrhoea.
Hibiscus rosa- sinensis Linn. (Malvaceae)	*Gurhal*	Leaves	About 500 gm leaves are fed to the animal once in a day for 5-7 days with fodder to control haematuria and leucorrhoea.
Jatropha curcas Linn.(Euphorbiaceae)	*Ratanjot*	Roots	Roots (10 gm) are crushed and given to the animal once for early healing of broken joints/ bones.
Jatropha gossypifolia Linn. (Euphorbiaceae)	*Jamalghota*	Seeds	Seeds are given in limited quantity (30-40gm) for relief in constipation.
Lawsonia inermis Linn. (Lythraceae)	*Mehndi*	Leaves	Paste of leaves is applied over skin to cure burns.
Lindernia crustacea (Linn.) F. Muell. (Scrophulariaceae)	*Chotibui*	Leaves	Paste of leaves (5-10 gm) is applied over eczema, twice in a day.
Mangifera indica *Linn. (Anacardiaceae)*	*Aam*	Bark	*Decoction of 50 gm stem bark is given to the animal through drenching tube twice in a day for three days to cure diarrhoea.*
Mucuna pruriens (Linn.) DC. (Fabaceae)	*Kenvach*	Pods	One or two pods are mixed with jaggery (*Saccharum officinarum*) or wheat bread and fed to the female animal twice a day for five days for ouster induction.
Phaseolus mungo Linn. (Fabaceae)	*Urad*	Seeds	The cattle are fed with *chapattis* made up of *Phaseolus mungo* with seed oil of *Sesamum indicum* for early recovery from foot and mouth disease.
Phyllanthus virgatus Forst.f. (Euphorbiaceae)	*Dudhi*	Leaves	About 10 gm leaves are given along with fodder once in a day for 2-3 days to treat fever.
Piper nigrum Linn. (Piperaceae)	*Kali Mirch*	Seeds	About 150 gm seeds are mixed with 280 gm *ghee* (milk fat) and given once in a day for 3 days for early recovery from mastitis. Oily and acidic foodstuffs are not given to the cattle during this treatment.
Ricinus communis Linn. (Euphorbiaceae)	*Arand*	Seed oil	Seed-oil (100 ml) is given orally once or twice a day for relief in constipation. About 250 ml seed oil is given to the animal for instant relief in flatulence.
Sesamum indicum Linn. (Pedaliaceae)	*Til*	Seeds	Animal is given massage of *Sesamum indicum* seed oil with a spoonful of sodium chloride added to it to cure eczema.
Tectona grandis L.f. (Verbenaceae)	*Sagwan*	Leaves	Paste of leaves is applied twice a day over the skin to cure eczema and other skin problems.
Tinospora cordifolia (Willd.) Miers. (Menispermaceae)	*Adharvela*	Whole plant	Decoction of whole plant (50 gm) mixed with spoonful of '*Haldi'* (rhizome powder of *Curcuma longa*) is given orally twice a day for three days to treat tonsillitis as well as foot and mouth disease.
Triticum aestivum Linn. (Poaceae)	*Gehu*	Seeds	About 500 gm of sprouted seeds are mixed with jaggery (*Saccharum officinarum*) and seed oil of *Brassica campestris* are given to the animal for 5-10 days for ouster induction.
Vitex negundo Linn. (Verbenaceae)	*Negad*	Leaves	Paste of 50 gm tender leaves, with 5 gm seed powder of *Piper nigrum* and 4-5 bulbs of *Allium sativum* is given once in a day for three days to treat ephemeral fever and impaction.
Withania somnifera (L.) Dunal. (Solanaceae)	*Asgandh*	Roots/Stem	Paste of root or stem is applied over the skin as it has antibiotic and antibacterial action.
Ziziphus nummularia (Burm.f.) Wight & Arn. (Rhamnaceae)	*Bor*	Spines	Decoction of 2 - 3 yrs old thorns is given to the animal once or twice for easy removal of placenta after delivery.

It is interesting to note that certain plants/ plant parts in small quantities are useful as ethnoveterinary medicines whereas in large quantities they are poisonous and are fatal e.g., *Abrus precatorius, Jatropa gossypifolia, Butea monosperma,* etc. correct understanding of dosage of such plants may be useful in identifying their utility in ethnoveterinary medicine.

From the present study it was concluded that for acute, life threatening infections and epidemics, modern medicine such as antibiotics will remain the first choice. But for common and chronic conditions

like skin diseases, worms, wounds, diarrhea, etc. ethnoveterinary medicines can be an alternative or complement to modern treatments especially because some antibiotics and other drugs have been overused, stimulating resistance among micro-organisms and leaving dangerous residues in meat, milk and groundwater. A combination of modern and local remedies and management practices might be the best for problems like ticks and trypanosomiasis where neither modern nor ethnoveterinary medicine alone provides a satisfactory solution.

Conclusion

Present study reports 62 ethnoveterinary medicinal remedies based on more than 51 plant species from the tribal area of Tadgarh-Raoli wildlife sanctuary, Rajasthan. These miraculous remedies are helpful to cure several chronic diseases. The list of folk veterinary medicinal plants from the tribal area of Rajasthan and their utilization for the welfare of livestock's will provide basic data for further studies aimed at conservation, cultivation, traditional medicine and economic welfare of rural and tribal population of the region.

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