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Uses of ethno-veterinary medicinal plants in orthopedic treatment of domestic animals in the southern Aravali region, India

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Abstract

The present study gives brief information about ethno-veterinary medicinal plants uses for the treatment of bone fracturing, wound healing and maggots in domestic animals by the local tribal peoples of southern Aravali region in Rajasthan, India. The major economic units of this region are contour farming, animal husbandry, forest products and manual labor. Since animal husbandry is the main economic unit for tribal peoples of southern Aravalizone; it is important to study on current animal health care system in the region. The life line of tribal peoples of this region is pastoral farming. The domestic livestock species they care for livelihood are Cows, Oxen, Goats, Sheep and Poultry. Besides the tremendous progress happened in the modern animal health care in the rest of the Rajasthan, this region is still far from the reach of modern health facility. The tribals and other local communities of this region still depended upon ethnic treatment from the local medicinal plants. Based upon field work, surveys, and interviews with healers, feedback received from local communities and herbarium analysis, we have reported 27 medicinal plants that have been using for the orthopedic treatment of domestic animals. The Physiography of southern Aravali has undulating and rocky topography with high and low hills which are full of brambles and white concrete pebbles; this may be one of the reasons for bone fracturing and injury of hooves in animals. Also, for the plow and bullock carriage, they use nose rope and mouth halter to the animals that causes wound and resulting in maggot's infection.

Keywords: Ethno-veterinary medicinal plants, Southern Aravali Zone, Healers, Tribal community, Livestock.

Introduction

Traditional knowledge refers to the collective knowledge of an indigenous community about relationships between people and nature. The tribal communities have a long association with the forest and their major livelihood is animal husbandry. A long socio-cultural association of tribal peoples with ecosystems resulted in the development of indigenous knowledge around communities that includes the use of plant-based medicines to cure human and animal health. People's traditional knowledge practicing to animal health care system and production is known as ethno-veterinary Medicine, EVM[1]. Ethno-veterinary health practices have been initiated since the domestication of the livestock species started[2].

Ethno-Veterinary-Botanical Investigation has always a great concern among the researchers. The ethno-veterinary medicine (EVM) is a primary and essential animal health care system that is being used in the developing countries[3]. The ethno-veterinary research has been employed by many workers all over the globe in the past[4-9].

Ethno-botanical and ethno-veterinary investigation in the Indian region also has a long history and many researchers did work on it for different geographical regions and ethnic groups[10-20]. The traditional herbal medicines for various ailments such as skin sexual, digestive and respiratory related problems uses in the Shekhawati region, Rajasthan have been reported[21]. The indigenous medicinal knowledge has now been reached at its alarming stage due to the advent of technology and transforming of traditional culture due to urbanization[22]. From the region of Ashtitaluka in Beed district of Maharashtra, about 13 plant species of 9 families and 11 genera have been explored and documented[23]. A survey work in different villages of Bhabar region of Garhwal, Himalaya have been done and total 30 plants use as herbal medicines for animal were reported[24]. Herbal medicines uses by Gujjars and other folklore communities in the Alwar district of Rajasthan for treating routine maladies of their livestock have been investigated[25] and reported ethno-veterinary uses, mode of administration, doses and duration of 54 medicinal plant species belonging to 37 families. The documentation of the indigenous knowledge regarding medicinal plants in Kendrapara district of Odisha has been done[26].

Local tribal community in Kendrapara district have been using medicinal plants as the remedies for various diseases like diarrhea, constipation, snake bite, skin ailments rheumatism and healing of wounds. The Southern Aravali region is the abundant with biodiversity and it is mostly populated by tribal peoples.

The climate of southern Rajasthan, particularly of Udaipur and Dungarpur districts, is the humid with average annual temperature ~ 15^0C (according to Soil and Water Conservation Dept., CTAE, and Udaipur). The physiographical texture of southern Arawali zone has undulating and rocky topography with high and low hills. Therefore, the availability of land for cultivation is very less. The agro-climatic zone of southern Rajasthan falls under humid and sub humid southern plains.

The average rainfall of the area is 492.65mm (according to Soil and Water Conservations Department, CTAE, Udaipur) and most of its received from July to September. In the southern Aravalis, hill top forests are dry, flowering and fruiting. The NAL forests (forest within depth among hills) are the riparian forest of dry to semi-evergreen type. To survival, a cultural setting is established with the ecosystems. This resulted in the development of a system of knowledge around communities that includes the use of plant-based medicines, cosmetics, no-wood forest products and handicrafts. In the following we have given our outcomes of the field work study conducted in rural areas of southern Aravali region, particularly in the Udaipur and Dungarpur districts of Rajasthan state, India to study the EVM plants, particularly those uses for orthopedic treatment of domestic animals.

Materials and methods

For the present work, we have chosen rural areas of Udaipur and Dungarpur districts of Rajasthan located in the southern Aravali zone. This region is mostly populated by tribal communities of various groups like; Bhil, Meena, Garacia, Gameti, Damor and Kathodia. Among these Bhill tribes are mostly populated (~ 45% of total scheduled tribe population of Rajasthan), particularly in Vaghad region and Chappan region (Dungarpur, Banswara and Udaipur (Salumber, Sarada and Kherwara tehsil)). Some fraction of Meena tribes (mostly in Dungarpur district with subtitle: Damor, Ahari, Roat, Ninama, Katara,) also exists. These peoples are inhibited in forest areas and living in troops on concept of my-farm-my-house (hutments). They have old-age traditional knowledge through their long association with the forests. As per the report of the National Dairy Development Board statistical profile 2016, the main occupation of tribal community of this region is livestock and surrounding forest territory. Since this region is highly covered by hills, the land is not suitable for large scale cultivation. The livestock diversity is found to be rich and varied which is evident from the occurrence of different breeds of Sheep, Goat, Cows, Buffalos, Poultry and horses. Particularly, in the rural region of Udaipur and Dungarpur the Sheep, Goat, Cows and Poultry are the main lifeline for the livelihood of the tribal community. Despite the tremendous progress in health and education sector in rest of the Rajasthan, this rural region is still in isolation. To provide the job security in government sector, Rajasthan government has given status of tribal sub plan area (TSP). For the human as well as livestock health issues, these peoples are still following the traditional health care system. Our present work is focused on animal health care adopted by these tribal communities from their rich and ancient knowledge of medicinal plants available in their locality. The Aravali region is rich in biodiversity and abundant with medicinal plants. For this, we have conducted field trips to chosen areas and collected data base. The local knowledgeable persons were actively involved to share information regarding local livestock health conditions and knowledge available among the community regarding ethno-veterinary practices or to know plant species used to treat these livestock health conditions. However, it is very difficult to reach to ethnic groups and traditional health practitioners, THPs (locally known as GUNNIS) and make them ready to share the information because of their religious faith, unscheduled routine and communication gaps. For this, we have firstly make trust with local peoples and then approached to concern ethnic groups and THPs.

We have also taken help from local literate people to understand the local dialect. In this way, we were able to conduct personal interviews and group discussions with ethnic peoples. We have discussed regarding local name of plants, their uses in various animal diseases, part of a plant which use for cure, process of use and also about the transfer of knowledge in successive generation. We have not found any documentation with ethnic groups regarding traditional knowledge. This knowledge transfer from generation to generation in verbal form. We have visited forest area with THPs to investigate botanical (type of plants, knowledge of their growth, types of soil where they grow, seasons in which they grow) and topographic study (size, length,). The samples of plants were collected for their Herbaria. After collecting the information, we have also cross checked the information with local peoples regarding the effectiveness of medicines with individual as well as groups. We have also checked the publicity of particular healer or ethnic groups and outreach of treatment in surrounding territory. This helps us to validate our data sheet.

Since, the area of study is dense with hills and animals go to hills for fodder, occurrences of orthopedic issues with animals are often happened. Therefore, the present work is devoted to the uses of medicinal plants for orthopedic treatment of livestock by tribal peoples in Udaipur and Dungarpur districts located in southern Rajasthan, India (Geographic Lat. 23.80^0 - 24.58^0N, Geographic Long. 73^0E).

Results and discussion

Observations: Ethno-veterinary surveys have been conducted over the chosen study sites in the Udaipur and Dungarpur districts of southern Rajasthan state, India to investigate traditional knowledge about medicinal plants uses for treatment of various seasonal as well as accidental diseases happened with their domestic animals. It has been noted that animal husbandry (livestock) is the major economic unit of the rural domiciles of this region as they provide milk, eggs, meat, fibers and helpful in cultivation. Despite the less available fertile land due to the

Aravali hills, the local community uses terrace or contour hedgerows farming for survival of their animals and themselves. Thus the smallholding agriculture in this region could be assumed pastoral farming.

It is a well-known fact that about 80% contribution in the Indian agriculture comes from these small and marginal farmers. However, what local crops they produced never comes in a chain of commercial market but they can complete their daily needs from it. For the animal husbandry, the local community in the region manly holds Cow and Goat for milk. Buffaloes are also a part of animal husbandry in the region but mainly hold by the Patel community and marginal farmers who belongs to the landowning community. The tribal community does not hold buffaloes because of its expensive care and not holding arable land. For the smallholding agriculture (normally on the slanting land of hills i.e. contour farming), they use the castrated bulls or oxen for a Plough.

The husbandry of Goat has many benefits for the tribal community in the form of milk and meat. A few tribal peoples also hold sheep for wool but husbandry of sheep is mainly done by GAYARI community in the off hilly areas of region. The poultry is also at large scale among tribal communities. However, this region is fully covered with low and medium height rocky hills which are abundant with the brambles and therefore accidental problems (bone fractures) are common with these animals. Also, for the plow and bullock carriage, they have to use nose rope (locally known as NATH) and mouth halter (locally known as MOURY) to the animals that causes wound and chance of maggots infection. These all accidental and seasonal diseases of animals need an urgent and spot cure but modern health facility is less than none in this region and therefore, they are depended on the herbal cure available in their surroundings. Based on interviews and group discussion, it has been found that the expertise and knowledge is not consistent among all ethnic peoples and also vary with type of disease. A few are generalized but some of them have expertise in a particular disease. For example some of them are known with a type of application (fracture or birthing) and type of treatment (Firing or Message) or cure to certain animals. Also, some ethnic peoples keep assistants who can recognize certain plants for certain disease but not have knowledge of preparing medicine and procedure of giving doses. The availability of the plants depends upon seasons (most of the plants available in monsoon or post monsoon seasons) and therefore they preserve some medicines in form of powder or paste. They prepare the medicines at the location of plants in the surrounding locality and also use other slandered ingredients like ghee, oil, honey and butter milk. In our surveys, we have also found that some healers prepared small garden of medicinal plants nearby to their house that is locally known as VADI. The medicines are either prepare from a plant or by using multiple plants considering the type, nature and phase of disease, infection or injury. Also, for the same plant, different parts (leaves roots, bark) uses for different disease. The special utensil (known by NAAL in local dialect) made from different parts of the plant are used for giving oral dose. Also, doses are given as fodder or mixed with cattle feed for certain disease.

The southern Aravali region of Udaipur and Dungarpur districts is abundant with medicinal plants for both ethno-zoological as well as ethno-botanical categories, however, present work focuses on only those medicinal plants which uses for bone fracture and healing of a wound. Here-in-below, we are giving a brief account of medicinal herbs uses by the local community in the chosen area of southern Aravali region for the orthopedic treatment of their domestic animals (Tables-1-3).

Summary: In the present work, we have done field work in the rural areas of Udaipur and Dungarpur districts of Rajasthan and performed interviews with local community as well as healers. Based on interactions with healers, feedback from the local peoples, field work in forest and herbarium analysis, our study has brought the following outcomes: i. Twenty Seven ethno-veterinary-medicinal plants belonging to twenty two families uses for the treatment of bone fracture and wound recovery were observed through interviews and interactions with healers and local communities. ii. The main occupation of the tribals of the region and other local communities in the southern Rajasthan is livestock and pastoral farming. The major domestic livestock species they care for their living are Cows, Oxen, Goats, Sheep and Poultry. iii. The grazing land of the southern Rajasthan is hilly area and thus availability of meadow is very less. This hilly area is full of brambles and white concrete pebbles that may be one of the reasons for bone fracturing and injury of hooves. iv. The traditional knowledge is at an alarming stage and now limited to very few ethnic groups and individuals. The new generations have no interest in learning from their elder's knowledgeably peoples due to their migrations towards urban or semi-urban areas for economic purposes. Thus, there is an urgent need for government policies and economic support to encourage herbal medicines, THPs and for scientific documentation of traditional knowledge.

Conclusion

In this work, we have reported the use of EVM plants for the orthopedic treatment of domestic animals such as bone fracture healing (e.g., Swelling, Bruising, Deformity), healing of would and to cure maggot's infection by the local community and tribal peoples in the southern Aravali region, Rajasthan (Geographic Lat. 23.80^0 -24.58^0N, Geographic Long. 73^0E). We have given information of 27 medicinal plants, their local names, parts of plant use, procedure to prepare medicine, and doses given.

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Table-1: Listing of ethno-veterinary medicinal plants uses for the treatment of bone fracturing and joints in domestic animals by tribal communities in southern Aravali region of Rajasthan, India. Family name of corresponding plant is written in small bracket.

Botanical Name	Local Name	Parts used	Doses
Ampelocissuslatifolia Roxb. (Vitaceae)	Jungli Angoor	Tuber	50 gram tuber powder with water given to animal twice a day.
Carissa Congesta Lina. (Apocynaceae)	Karonda	Latex	Stem latex is applied over a fractured part.
Jatropa Curcas Lina. (Enphorbiacease)	Ratanjot	Roots	Rushed roots about 10 gram given once a day
Grewiadamine Linn.(Tiliaceae)	Gangaran	Roots and leaves	50 grams roots are crushed and given with water Doses: Twice a day for period of three days
Cappariszeyalnica Linn. (Capparaceae)	Waghata	Leaves	Crushed Leaves with water + 250 ml edible oil and applied and applied to injured part
Cissusqnandangelaris Linn. (Viatceas)	Hadjod	Stem	Stem paste is applied on bone fracture in cattle and tying up with bamboo stick
Terminaliaarjuna Linn. (combrataceae)	Arjun Sadada	Stem Bark	Stem bark crushed and mix with water to form paste and then apply over a part of fractured bone
Grawiatenax Linn. (Tiliaceae)	Gangchee or Gangara	Roots	Water solution of fine powder of roots is given twice a day for a week
Bouhiniavahlii (Caesalpiniaceae)	Joganvel	Shoot	Water solution of fine powder of roots is given twice a day a week
Grewiatiliaefolia Vahl. (Tiliaceae, Malvaceae)	Farangadi	Roots	Water solution of fine root powder is given a twice for a week
Anisomelesindica (Linn) Ktze.(Lamiaceae)	Phulmajri	Roots	Root paste infusion is given
Dendrophthoefalcata Linn. f. (Loranthaceae)	Dudeli or Doodhi	Leaves	Leaves are braced over and around the fractured bones
Bombaxceiba Linn. (Bombacaceae)	Safed Shimlo	Bark	Paste prepared by using bark of Bombaxceiba L. is applied around fractured bone area. For this, a splint made from Bambusa arundinacea (Bamboo) strips and human hairs by using seed oil of Brassica campestris var. (Brown Sarson) is tied around fractured part.
Zingiberofficinale Rosc. (zingiberaceae)	Adrak	Rhizome	Three doses per day for a fortnight of about 100 gram of fresh Rhizome boiled with half liter cow milk are given.
Syzygiumcumini Linn. (Myrtaceae)	Jamun	Bark	Syzygium cumini and Azadirachta Indica is boiled in water with equal proportional and prepared decoction spread over the affected area of joint pain

Table-2: Listing of ethno-veterinary medicinal plants uses for the treatment of maggots wound in domestic animals by tribal communities in southern Aravali region of Rajasthan, India. Family name of corresponding plant is written in small bracket.

Botanical Name	Local Name	Parts used	Doses
Urgineaindica Roxb. (Asparagaceae)	Kolikando	Bulb	Crushed bulb juice is applied on Maggots in wound. Roasted bulb is Crushed and tie on affected part to treat the external abscess.
Xanthium Strumarium Linn. (Solanaceae)	Chota Dhatura	Leaves	Leaves juice is used externally for Wound healing and Maggots wound
Aristolochia bracteata Retz (Aristolochiaceae)	Kidamary	Leaves	Leaves juice is applied to maggots wound.
Clerodendrum phlomidis Linn (Verbenaceae)	Arni, Aranimula	Leaves	Leaves juice is applied to infected hooves and Maggots wound
Gloriosa superba Linn (Colchicaceae)	Kalihari	Roots	Root paste or juice is applied to infected part
Tridex procumbens Linn (Asteraceae)	Kalali	Leaves	Leaves juice is used to treat

Table-3: Listing of ethno-veterinary medicinal plants uses for the treatment of breaking of horne, wound due to nose roping, Mastitis and infections in hooves by tribal communities in southern Aravali region of Rajasthan, India. Family name of corresponding plant is written in small bracket.

Botanical Name	Local Name	Parts used	Disease/Cure	Doses
Calotropis procera (Ait.) (Asclepiadaceae)	Akra	Stem	Khurpaka Diseases (hooves infection)	Smokes of stem are produced to cure hooves infection. Also, water of animal flesh is applies on infected hooves
Capsicum annuum Linn. (Solanaceae)	Mirchi	Leaves	Khurpaka Diseases.	The paste of red chillies is applied on infected hooves
Ailanthus excels Roxb (Simaroubaceae)	Adua	Leaves	Nose Rope Wound	Leaves paste is applied on body to control tick and lice. Bark mixed with goat milk is applied on nose rope wound in form of paste
Brassica campestris Linn. (Cruciferae)	Sarso	Seed oil	Broken Horne	Sindoor (vermilion) with Brassica campestris. var. (mustard oil
Agave amaricana Linn. (Agavaceae)	Rambans	Leaves	Broken Horne	Leaf paste applied over broken horne
Vitexnegundo Linn. (Verbenaceae)	Nirgundi	Roots and Leaves	Mastitis and Wound Healing	Root juice is applied to treat Mastitis, and leaves juice is externally applied for Wound healing

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