A Report on Medicinal Plants Used in Ethnoveterinary Practices of Toda Tribe in the Nilgiri Hills

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Abstract

This study reports the surveyed list of medicinal plants used by Toda tribes of Nilgiri hills in ethnoveterinary practices. During the study, information about ethnoveterinary plants was obtained from Toda tribes by questionnaire method. The ethnoveterinary plants traditionally used by Toda tribes were collected and preserved as herbarium specimens by following the standard methods. The identification of plants was further authenticated with Botanical survey of India, Coimbatore, Tamil Nadu, India. During the survey, it was noted that ten plants were traditionally used by Toda tribes to treat various human and veterinary diseases such as basic first aid for food poison, snake bite, indigestion, physio-therapeutic treatment for bone fracture, antibacterial, antifungal activity over cuts and wounds, insect repellent, deworming in cattle, diarrhea, and increases cattle lactation. The information provided in this study would bring new insights on the development of environmental friendly, effective medicines and vaccines to control veterinary diseases in the future. In addition, this study may be highly useful to protect and conserve the endemic flora species of Nilgiri hills of Tamil Nadu.

Keywords: Ethnoveterinary; Medicinal plants; Conservation; Toda tribe; Nilgiri hills

Introduction

Nature is provided with a lot of herbal medicinal plants which play a major part in the treatment of diseases. Plants are considered as the significant and elemental sources of medicinal traits. Medicinal plants form the richest entity in medicines, food supplements, nutraceutical, pharmaceutical and chemical industries for manufacturing drugs [1]. Application of these medicinal plants as a source of drugs in treating human and animal diseases has been a traditional practice.

Many studies have been carried out on treating specific ailments in livestock with the help of herbal medicines and its derivatives. The traditional use of medicinal plants in treating veterinary diseases is of paramount significance in developing countries; where in, typical therapies for animal health care becomes financially difficult for resource poor farmers [2]. United Nations Food and Agricultural Organization (FAO) stated that the loss in the breeding sector of many developing countries was due to insufficient drugs to treat diseases and infections, which hindered the increased production [3]. Ethnoveterinary medicine has become well known worldwide as an elemental factor of primary health care, as it has been the blessing for marginalized and poor communities. The best reasons for using traditional methods of treating veterinary diseases are (a) cost effectiveness of the developed technology (b) no side effects noted (c) lack of accessibility to modern veterinary facilities and treatments [4]. These reasons offer an inclined response over the field of ethnoveterinary research and development [5]. So far, the information available on ethnoveterinary medicine is not only scanty but failed to reach to rural farmers in India [6] and Tamil Nadu in particular [7].

An extensive understanding of this concept involves an indirect interaction between plants and people. This course is known as Ethnobotany which deals with complete health care and diagnosing diseases of animals. Many studies concerning the ethnoveterinary medicinal plants of the Toda tribe in the Nilgiri hills have been attempted in the past [8] but still the detailed information remains deficient. Hence, the current study forms the first report to elucidate the ethnoveterinary medicinal plants used by Toda tribes to treat and control veterinary diseases in the Nilgiri hills of Tamil Nadu.

Material and Methods

Study area profile

The Nilgiri Biosphere Reserve (NBR) was the first Biosphere Reserve in India and is under consideration by the UNESCO for selection as a World Heritage Site. It is located in the Western Ghats between the co-ordinates of 11°15’ to 12°15’N and 76°0’ to 77°15’E lying at the trijunction to the three States of Kerala (1455.4Km²), Karnataka (1527.4 Km²) and Tamil Nadu (2537.6 Km²) covering an area about 5520 Km². The Nilgiris is situated at an elevation of 900 to 2636 meters above MSL. The NBR is known for its rich biodiversity [9], and is recognized as one of the 14 hotspots of the world because of its unique bio-diversity [10]. About 3300 species of flowering plants can be seen here. Of the 3300 species, 132 are endemic to the Nilgiri Biosphere Reserve [11]. During summer, the climate remains in the maximum of 21°C to 25°C and the minimum of 10°C to 12°C. During winter, the temperature remains a maximum of 16°C to 21°C and minimum of 2°C. Its latitudinal and longitudinal dimensions being 130 KM (Latitude: 10-38 WP 11-49N) by 185 KM (Longitude: 76.0 E to 77.15 E). The Nilgiris is bounded on North, south, east and west of Karnataka State, Coimbatore District, Kerala state and Erode District respectively (Figure 1).
Ethnic communities in Nilgiri Biosphere Reserve

The Government of India has recognized 75 primitive tribal groups covered over 15 States and Union Territories at the pre-requisite margin of ‘a pre-agriculture level of technology, a stagnant or declining population, extremely low literacy and a subsistence level of the economy. Among these tribal communities, six tribal communities live in the Nilgiri District. These six primitive tribes are Todas, Kotas, Irulas, Kattunayakas, Paniyas and Kurumbas.

Toda

The pastoral Todas immigrated into the Nilgiris during the 2nd century Before Christ [12]. They were the first to introduce their native domestic cattle and buffaloes. It is also believed that some of the free ranging feral buffaloes in the upper Nilgiris are left by the Todas. Todas tend to be the most unique tribes for not only existing with their traditional occupation, but also for being very privileged (Figure 2A).

The total tribal population of the district was 25,048 [13] of which Toda population will constitute 1600 individuals. Their houses are built in a special and peculiar way and are called as “Munds” (Figure 2B). Approximately, 72 munds are located in the Nilgiri District and the details are provided in the supplementary Table 1. Todas have the peculiar appearance with curly hair, and they strictly follow vegetarian diet. Todas are well blessed with the indepth knowledge of medicinal herbs and flowers [14] that can be used for various purposes.

| Botanical name                  | Toda name | Local name | Family          | Habit          | Parts used | Name of the diseases             | Mode of uses and route of administration |
|--------------------------------|-----------|------------|-----------------|----------------|------------|---------------------------------|-----------------------------------------|
| Acorus calamus Linn.           | Poli      | Sweet flag/Vasambu | Acoraceae  | Herb         | Rhizome   | Food poison and snake bite       | Grind rhizome is given to the cattle internally |
| Berberis tinctoria Lesch.      | thokk     | Oosikala   | Berberidaceae   | Shrub         | Leaf bunch | Snake bite & indigestion         | Bunch of leaves rubbed the cattle from neck to tail |
| Dodonaea viscosa (L.) Jacq.    | Parshoor  | Velari     | Sapindaceae     | Shrub         | Shrub      | Bone fracture                    | Leaf is exposed to heat directly and mixed with red soil then tied along the fracture area |
| Eupatorium adenophorum Spreng. | Sarman    | Crofton weed/Peenar | Asteraceae | leaf         | Cuts and wounds | Herabaceou s shrub              | Crushed leaf is tied along the wounded area |
| Euphorbia rothiana spren       | kabodi    | Common hill | euphorbiaceaeae | Herb         | leaf       | Insect repellant                 | Leaf mixed with salt water then sprayed on the skin of cattle |
| Lobelia leschenaultiana (C. Presl) Skottsb | Thullksh | Wild tobacco | Campanulaceae | Herb         | leaf       | Insects presence on the wounded area (Maggot wound) | Leaf paste is applied on insects presence on the wounded area |

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Veterinary practices were further authenticated with other members of the Toda community during the survey. The collection of plant materials and preparation of herbarium specimens was carried out by following standard methods [15]. The taxonomic identification of plants was authenticated by the Botanical Survey of India, Coimbatore one lichen species (10%) and one pteridophyte (10%) plants were reported to have medicinal uses (Table 2, Figures 4 and 5). The study of ethnoveterinary medicinal plants of Toda tribes was conducted during the year 2013-2014. A field survey was conducted among the Toda tribes at Pudu mund, Thalappatheri mund, Pagalkodu mund, Artholl mund, Kopumin mund, Thuvalkodu Mund, Taranad mund, Pillkodu mund, Garden mund, Tamilaga mund, Kunthithol mund of Nilgiri hills. During the study period, information about the traditional ethnoveterinary medicinal plants used by Toda tribes was obtained through questionnaire survey method (Supplementary Data 1). The common names and the medicinal values of the flora that were used by the Toda tribes in ethno veterinary practices were further authenticated with other members of the Toda community during the survey. The collection of plant materials and preparation of herbarium specimens was carried out by following standard methods [15]. The taxonomic identification of plants was authenticated by the Botanical Survey of India, Coimbatore and also with standard books that are predominantly referred [16-19].

Results and Discussion

The Nilgiri Biosphere Reserve is an international biosphere reserve in the Western Ghats and it is very rich in floral and faunal diversity. Many ethnobotany studies have been carried out in the Nilgiri hills, but the outcomes of the study have not reached the local and scientific communities to explore further. The results of the present study revealed that the different types of plants like lichen (10%), shrubs (50%), and herbs (40%) (Figure 3) named as Acorus calamus Linn., Berberis tinctora Lesch., Dodonaea viscosa (L.) Jacq., Ageratina adenophora (Spreng.) King & Rob., Euphorbia rothiana Spreng., Lobelia leschenaullitiana (C. Presl) Skotts., Parmelia sp., Pteridium aquilinum L. Kuhn., Solanum sisymbrifolium Lam., Strobilanthes foliosus (wight.) Anders., which belongs to nine orders (Acorales, Ranunculales, Sapindales, Asterales, Malpighiales, Lecanorales, Dennstaedtiaceae, Solanaceae, Lamiaceae) and ten families (Acoraceae, Berberidaceae, Sapindaceae, Asteraeae, Euphorbiaceae, Campanulaceae, Parmeliaceae, Dennstaedtiaceae Solanaceae, Acanthaceae) were surveyed and reported to be traditionally used by Toda tribe for treatment of veterinary diseases.

Table 1: Ethnoveterinary advantages of plants used by Toda tribe in the Nilgiri district.

| Parmelia sp. (Lichen) | The only and primary source of occupation of Toda tribe is cattle-herding and dairy-work. They mainly depend upon their buffaloes. Toda breed of buffaloes was named after an ancient tribe (Toda) of southern India. The toda buffaloes are quite categorical from other breeds and are primitive to Nilgiri hills of Western Ghats. They are distinguished with pale brown color, long body, deep and broad chest, and short & strong legs. The head is heavy with horns set wide apart and curving inwards (Figure 2C). The body is insulated with a layer of thick coat of fur. The animals are affable or sociable in nature. Toda buffaloes are good milk makers, yielding about 4.4 to 8.8 litres of rich milk per day. Buffaloes are good milk makers, yielding about 4.4 to 8.8 litres of rich milk per day. Buffaloes are good milk makers, yielding about 4.4 to 8.8 litres of rich milk per day. | Kalpodhi | Shield lichen/ Kalpaasi | Parmeliaceae | Lichenous | Whole plant | Blood clotting | Leaf paste is applied on the area of blood clotting |
| Thaff | Bracken fern/ Perani | Dennstaedtiaceae | Herb | Leaf | Bed for cattle | Leaf is directly used for making bed for the cattle |
| Pothan | Wild tomato/ Sticky/ Nightshade | Solanaceae | Shrub | Leaf | Deworming & diarrhea | Leaf paste, garlic & salt mixed then given to the cattle internally (Calf) |
| cutt | kurinji | Acanthaceae | Shrub | Leaf | Increase lactation | cattle |
| Leaf paste is applied on the area of blood clotting |

Figure 3: Habit wise percentage of ethnoveterinary plants used by Toda tribe in Nilgiri hills

Of these plants, one monocot plant (10%), seven dicot plants (70%), one lichen species (10%) and one pteridophyte (10%) plants were reported to have medicinal uses (Table 2, Figures 4 and 5). Eupatorium adenophorum Spreng. and Lobelia leschenaullitiana (C. Presl) Skotts. belong to same order Asterales. Rajan et al. [14] reported that the ethnobotany plants such as Berberis tinctora Lesch. and Euphorbia rothiana Spreng. were traditionally used by Toda tribes to treat various diseases in human beings. Kumaravelu [20] reported that the flora Lobelia spp. was used by Toda tribes for treating cattle ailment. Sathyavathy and Janardhanan [21] documented the folklore medicinal practices of badaga community in the Nilgiri Biosphere Reserve. They reported that the flora Acorus calamus Linn., Berberis tinctoria Lesch., Dodonaea viscosa (L.) Jacq., Solanum sisymbrifolium Lam., and Lobelia excelsa Lesch. were used by badaga community to
treat various diseases in human beings. They further stated that *Dodonaea viscosa* (L.) Jacq. and *Strobilanthes kunthianam* was traditionally used by badaga community to treat veterinary diseases. Manikandan [22] reported that the ethnobotany plants, Berberis tinctoria Lesch. and *Dodonaea viscosa* (L.) Jacq. was used by badaga community to cure various diseases in human beings. The leaf paste of *Solanium sisymbriifolium* Lam. was used by badaga community in the Nilgiris to repel insect's ticks infecting cattle [22]. Rajan and Sethuraman [23] studied the plants used in the folk medicine by the Kotas of Nilgiri district, Tamil Nadu. They documented that the fruit of *Berberis tinctoria* Lesch is edible and the leaf of *Dodonaea viscosa* (L.) Jacq, is very effective against bone fracture. They further reported that the leaf of Euphorbia rothiana Spreng. was used as veterinary medicine to treat cattle disease and they also believed that the plant could separate the new born calves from the mother when it get mixed. Recently, medicinal plants used as an immunostimulants were reviewed for the alternative of chemotherapeutics and antibiotics in aquaculture practices [24]. The genus *Parmelia* is a large genus of lichenized fungus. Many studies reported the ethnomedicinal value of *Parmelia* Spp. Sharma et al. [25] reported that the lichens were used in folk medicines by Rai and Limbu communities of east Nepal. Rajan et al. [14] reported that the toda tribes in Nilgiri hills used a type of moss paste from *Parmelia caperata* to heal wounds caused by animal bites. They highlighted that the plant, *Dodonaea viscosa* (L.) Jacq. was used to treat bone fractures. Similarly, the leaf paste of *Dodonaea viscosa* (L.) Jacq. was used traditionally by tribes of Nilgiri hills to cure bone fracture when applied over the fractured area [7,26]. The monocot aromatic plant, *Acorus calamus* Linn. was used to treat food poison and snake bite. It was reported that 50 ml of *Acorus calamus* Linn. extract was able to cure enteritis, when administered orally [7]. They also reported that the infusion of *Acalypha indica* L. and *Solanium surattense* Burm. leaves, *Acorus calamus* Linn. rhizome and *Allium cepa* L. bulb is given orally to cattle once a day to cure tympany.

| S.No | Name of Toda Village | Location | S. No | Name of Toda Village | Location | S. No | Name of Toda Village | Location |
|------|----------------------|----------|------|----------------------|----------|------|----------------------|----------|
| 1    | Garden Mund          | Ooty     | 25   | ChinnaKadi Mund      | Sandynallah | 49   | Koppumin Mund         | Glenmargan |
| 2    | Tamilaga Mund        | Ooty     | 26   | Neerkasi Mund        | Sandynallah | 50   | Pikkapathi Mund       | Ebbanadu |
| 3    | Kandal Mund          | Ooty     | 27   | Malavithi Mund       | Near Governer Solai | 51   | Inkalithi Mund        | Near Kattabettu |
| 4    | Manjakkal Mund       | Ooty     | 28   | Attkor Mund          | Near Governer Solai | 52   | Onnaya Mund           | Kundha |
| 5    | Minik Mund           | Ooty     | 29   | Melkavakkadu Mund    | Near Governer Solai | 53   | Theppakodu Mund       | Kundha |
| 6    | Kuthinthol Mund      | Lovedale | 30   | Kelkavakkadu Mund    | Near Governer Solai | 54   | Onnakudi Mund         | Avalanchi |
| 7    | Kannaya Mund         | Ithalar  | 31   | Kallilal Mund        | Near Governer Solai | 55   | Karikadu Mund         | Ithalar |
| 8    | Pagala Mund          | Ullathi  | 32   | Chinnakaria Mund     | Near Pykara | 56   | Pekukal Mund          | Kodanadu |
| 9    | Neethi Mund          | Ullalthi (Thalaikundha) | 33   | Kalmothi Mund        | Parsens Valley | 57   | Ponkadu Mund          | Kodanadu |
| 10   | Marli Mund           | Dhavane  | 34   | Eererkodu Mund       | 7th Mile    | 58   | Nerveni Mund          | Kodanadu |
| 11   | Muthanadu Mund       | Thalakundha | 35   | Anirkuthkul Mund     | Sandynallah | 59   | Nedi Mund             | Ullikal |
| 12   | Pagalkodu Mund       | 9th Mile | 36   | Kallakor Mund        | Parsens Valley | 60   | Pudu Mund             | Glenmargan |
| 13   | Karimmuli Mund       | Near Kamarajasagar | 37   | Narikilku Mund       | 9th Mile    | 61   | Kakodi Mund           | 9th Mile |
| 14   | Karia Mund           | Pykara   | 38   | Thavuttukodu Mund    | Sandynallah | 62   | Kombuthukki Mund      | Near Thalaikundha |
| 15   | Perattathalai Mund   | 9th Mile | 39   | Pathankodu Mund      | Dunsandal estate | 63   | Thenadu Mund          | Near Thalaikundha |
| 16   | Thalappatheri Mund   | 9th Mile | 40   | Kenkodu Mund         | Dunsandal estate | 64   | Thoodakorai Mund      | 9th Mile |
| 17   | Emikkal Mund         | 8th Mile | 41   | Malikodu Mund        | Dunsandal estate | 65   | Mekkkodu Mund         | Parsens Valley |
| 18   | Eepkodu Mund         | 8th Mile | 42   | Kerada Mund          | Dunsandal estate | 66   | Nerkodu Mund          | Kadanadu |
| 19   | Aganadu Mund         | Parsens Valley | 43   | Pashhtar Mund        | Dunsandal estate | 67   | Thukkur Mund          | Parsens Valley |
| 20   | Kunthikodu Mund      | Parsens Valley | 44   | Arthol Mund          | Glenmargan | 68   | Erkodu Mund           | Solur via |
| 21   | Aanakkal Mund        | Parsens Valley | 45   | Kopumin Mund         | Glenmargan | 69   | Pilkodu Mund          | Kokkal |
| 22   | Pennappal Mund       | Sandynallah | 46   | Thuvalikodu Mund     | Glenmargan | 70   | Nedukodu Mund         | Parsens Valley |
| 23   | Naththanar Mund      | Sandynallah | 47   | Taranad Mund         | Glenmargan | 71   | Osa Mund             | 9th Mile |
Western Ghats is very rich in floral diversity with high endemism and particularly, Berberis tinctoria Lesch. and Strobilanthes foliosis (Wight) Anders were the endemic flora of the Nilgiri hills. Therefore, efforts are needed to conserve these floral species as they have high ethnoveterinary and medicinal value. Furthermore, the use of chemical drugs is not only ineffective but also causes side effects. Hence, plant based drugs are increasingly important in the field of ethnoveterinary medicine to control various diseases. In this scenario, knowledge about the indigenous and traditional medicines used by tribal people of Nilgiri hills is of great significance to the scientific community to treat human and veterinary diseases. The study concludes that the Nilgiri hills harbors a majority of endemic flora that was used by Toda tribes in ethnoveterinary practices. But still, a large proportion of flora remains unexplored in Nilgiri hills and studies are further needed to reveal the ethnoveterinary medicinal values of these flora.

Conclusion

The tribal people of India play an important role in the conservation of biodiversity as they possess indigenous knowledge on the medicinal value of plants in the hills. In this study, the list of wild plants used by Toda tribes in the Nilgiri hills will provide basic information for future research in the field of ethnoveterinary medicine. Many studies concerning the medico – ethnobotany (when implied to human treatment) of the Toda tribes in the Nilgiri hills have been attempted in the past, but have not properly reached to scientific communities. Now, this survey would be very useful to young researchers to further explore the ethnoveterinary plants of the Toda tribes in the Nilgiri hills. This study may also be helpful to develop ecofriendly effective medicines and vaccines to treat veterinary diseases.

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