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Ethnoveterinary plants for the treatment of camels in Shiwalik regions of Kathua district of Jammu & Kashmir, India

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ABSTRACT

Ethnopharmacological relevance: Camel is an important mode of transportation in the hot and hilly tracts of Shiwaliks of Kathua districts. The camel owners of the region lack the modern veterinary facilities and therefore depend heavily upon local treatments for the animal. This ethnoveterinary knowledge of plants is acquired by them from their forefathers and generally moves from one generation to another orally. The oral mode of transferring this valuable knowledge is vulnerable to erosion with the passage of time and generations.

Material and methods: Ethnoveterinary information was collected by interviewing 38 camel keepers and traditional healers as per the questionnaire. The data collected was analysed quantitatively using three indices viz. use-value (UV), informant consensus factor (ICF), and fidelity level (Fl %).

Results: A total of 41 plants were found to be of ethnoveterinary importance in the present study. Herbs and trees (41.5% each) were the most used life forms. The most used plant part was fruit (27.9%). Rhizome, root and whole plant parts collectively contributed to 18.6%. Most of the ethnoveterinary practices (65.9%) used oral mode of medication. The values of UV and Fl (%) shows that the most important species for curing the ailing camels were *Curcuma longa*, *Trachyspermum ammi*, *Brassica campestris*, *Tamarindus indica*, *Phyllanthus emblica*, *Cassia fistula*, *Eruca sativa*, *Plumbago zeylanica* etc. The high values of ICF (0.91–0.99) show that the informants share the knowledge for the treatment of camels amongst themselves on regular basis.

Conclusion: A good number of plants are utilised by the informants to cure camels. Most of the preparations used fruits and leaves. Only 18.6% of the practices required destructive collection and such species need sustainable use and conservation. Some of the species like *Tamarindus indica*, *Cassia fistula*, *Eruca sativa*, *Albizia lebbeck* and *Citrus medica* require further phytochemical and pharmacological studies.

1. Introduction

Camel (*Camelus dromedarius* L.) is raised in many parts of the world's arid and semi-arid zones for their unique characteristics especially, survival under the harsh environmental conditions (Schwartz and Dioli, 1992). They provide milk, meat, wool, hides and skin and their dung is used for fires. They are also used for riding and transport (Dirie and Abdurahman, 2003). Camel's milk is highly nutritious (Meiloud et al., 2011). Utility of camel remain stable in almost all seasons because they use water economically in almost all metabolic functions and can assimilate poor quality forage with higher crude fibre far better than the other herbivores (Raziq et al., 2008).

Camel is comparatively less susceptible to many of the diseases that affect other livestock species in the same area eg. foot and mouth disease, contagious pleuropneumonia and rinderpest (Dirie and Abdurahman, 2003; Raziq et al., 2010). But despite the general reputation for hardiness and resilience, camels are vulnerable to many infections (Werney et al., 2004) and parasitic agents, physical stress and occupational injuries (Bukachi et al., 2003; Chemuliti et al., 2003).

Due to restricted and sparse distribution in the state, documentation of ethnoveterinary plants and practices for the treatment of camel has not received any attention. In Jammu and Kashmir (J&K), the camel rearing is generally practiced in the Shiwalik regions where it is mainly used for transportation in the hot and hilly tracts. The camel owners live in far-flung areas that lack the modern veterinary facilities and therefore dependent heavily upon local treatments for the animal. These ethnoveterinary practices and knowledge

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of plants is acquired by them from their forefathers and generally moves from one generation to another orally. The oral mode of transferring this valuable knowledge is vulnerable to erosion with the passage of time and generations. Keeping this problem in consideration, the study was carried out in the Shiwaliks of Kathua district with an aim to document the ethnoveterinary practices and plants used by the camel owners and local animal healers to cure this valuable animal.

2. Material and methods

2.1. Study area

The present study was carried out in the Shiwalik regions of Kathua district. Kathua district is situated between 32° 14′ and 32° 55′N latitude and 75° 70′ and 76° 16′E longitude. Forest cover of Kathua is 1158 km^2 (FSI, 2013) and the altitude varies from 253 to 4162 m (Ashutosh et al., 2010; Sharma et al., 2012). The annual rainfall varies from 912 to 1801 mm while the mean minimum and maximum annual temperatures varies from 9 to 23 °C in the district (Ashutosh et al., 2010; Sharma et al., 2012).

The study site is a hilly terrain and has dry mixed deciduous tree vegetation (Ashutosh et al., 2010) with the dominance of *Lannea coromandelica*, *Anogeissus latifolia*, *Bombax ceiba*, *Acacia catechu*, *Phyllanthus emblica*, *Terminalia tomentosa*, *Acacia modesta*, *Cassia fistula*, *Ficus religiosa*, *Pinus roxburghii*, *Terminalia chebula*, *Mallotus philippensis* and *Dalbergia sissoo*.

2.2. Investigative method

Present survey was carried out in remote villages of Kathua district of J&K during 2013–2014. Ethnoveterinary information was collected by conducting interviews and group discussions with the Camel keepers and traditional healers on the indigenous uses of plant species as per the questionnaire. In all, 38 informants were interviewed. All the discussions with the informants were made in *Dogri* language for their ease.

The specimens of the plant species were collected from the study site and then identified from the herbaria of Department of Botany, University of Jammu, Jammu and Indian Institute of Integrative Medicine, Jammu, and with the help of various regional floras (Sharma and Kachroo, 1983; Swami and Gupta, 1998). The herbarium sheets were deposited to the Herbarium of Department of Botany, University of Jammu, Jammu (JUH). The International Plant Names Index (www.ipni.org) was followed for the botanical nomenclature of species.

2.3. Data analysis

The data collected from the direct interviews with the local people and traditional healers was analysed by applying various quantitative methods. The Microsoft Excel spread sheet was used to analyse the data.

The use-value (Phillips et al., 1994) was the first quantitative method used to analyse the data. It demonstrates the relative importance of species known locally or to the informants. The use-value (UV) of each species is therefore based objectively on the importance attributed by the informants and does not depend on the opinion of the researcher. The use-value was calculated as

$$UV = \Sigma U/n$$

where U is number of use-reports cited by each informant for a given species and n refers to the number of informants.

The second method employed in the data analysis was calculating the informant consensus factor (ICF) (Trotter and Logan, 1986; Heinrich et al., 1998; Gazzaneo et al., 2005). ICF values will be low (near 0) if plants are chosen randomly, or if informants do not exchange information about their use. Values will be high (near 1) if there is a well-defined selection criterion in the community and/or if information is exchanged between informants (Gazzaneo et al., 2005; Srithi et al., 2009; Sharma et al., 2012). The ICF is calculated as number of use-report in each category (n_{ur}) minus the number of species used (n_t), divided by the number of use use-report in each category minus one.

$$ICF = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

Because many plant species may be used in the same use category, it is interesting to determine the most preferred species used in treatment of particular ailment (Musa et al., 2011), which can be done with the help of third quantitative method i.e. fidelity level (Fl%) of Friedman et al. (1986)

$$Fl(\%) = \frac{N_p}{N} \times 100$$

where N_p is the number of use-reports cited for a given species for a particular ailment and N is the total number of use-reports cited for any given species. High Fl value (near 100%) is obtained for plants for which almost all use reports refer to the same way of using it, whereas low Fl value is obtained for plants that are used for many different purposes (Musa et al., 2011; Bhatia et al., 2014).

3. Results and discussion

3.1. Demographic characteristics of informants

The camel rearing is not a common practice in J&K. There is usually one camel in a bunch of 4–5 villages. In the present study, total 38 informants were interviewed from various villages of Shiwalik region. All the informants were males, as the camel keeping and curing is performed only by them. The average age of the informant was 56 years and 92% of them were illiterate.

3.2. Ethnoveterinary plants and practices

A total of 41 plants from 31 families and 40 genera were found to be of ethnoveterinary importance in the present study. Both Caesalpiniaceae and Poaceae, with 3 genera and 3 species each, were the most used medicinal families, followed by Asteraceae, Brassicaceae, Pinaceae, Rutaceae and Zingiberaceae (all having 2 genera and 2 species, each). As many as 23 families were represented by only one species each (Table 1).

Herbs and trees (41.5% each) were the most used life forms. The most used plant part was fruit (27.9%) closely followed by seed (20.9%) and leaves (18.6%). Rhizome, root and whole plant parts collectively contributed to 18.6%. Most of the ethnoveterinary practices (65.9%) used oral mode of medication (Table 1). Medicinal plants mainly trees and those herbs explored by excavating rhizome, root and whole plant parts in the formulations need sustainable use and conservation strategies because in most of the cases the collection of these plants is unscientific, and excavation or uprooting of a plant and scraping bark of trees reduces their chances of proliferation. To overcome these problems there is an urgent need to create awareness among the inhabitants of the study area about rationing i.e. sustainable collection, conservation, domestication, small scale (home garden for personal use) as well as large scale (for trade) cultivation of medicinal plants. This will also improve the socio-economic condition of the inhabitants as well as reduce pressure on natural resources (Bolson et al., 2015).

In all, 53 formulations were used by the informants to cure the common problems of the camels. In nearly 20.4% of these for-