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Cross-Cultural Analysis of Medicinal Plants commonly used in Ethnoveterinary Practices at South Waziristan Agency and Bajaur Agency, Federally Administrated Tribal Areas (FATA), Pakistan

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ABSTRACT

Ethnopharmacological relevance: In remote areas, medicinal plants have an imperative role in curing various livestock's ailments. In Pakistan, people residing in remote areas including South Waziristan Agency and Bajaur Agency depend on traditional herbal remedies for treating their domestic animals. Medicinal plants are an important part of the medical system in these Agencies. The prime goal of the current study is to explore the ethnoveterinary practices in the two regions and discuss cross-cultural consensus on the use of medicinal plants. In this study, we have given detailed description on the ethnoveterinary usage of certain medicinal plants and their recipes. Moreover, we have also elaborated the ethnoveterinary potential of certain plants in relation to their ethnomedicinal, pharmacological and phytochemicals reports.

Methodology: Fieldwork comprised of two fields surveys conducted at South Waziristan Agency and Bajaur Agency. A total of 75 informants from South Waziristan Agency and 80 informants from Bajaur Agency were interviewed with the help of semi-structured questionnaires. Use reports (URs) were recorded for all the documented taxa. Data were quantitatively analyzed by using informant consensus factor (F_{ic}) index in order to find out information homogeneity provided by the informants. To analyze the cross-cultural consensus, the recorded data were tabulated as well as shown by Venn diagram.

Results: Overall, 94 medicinal plant taxa were recorded in the comparative analysis. Out of these, most of the plants species (72 species) were used at Bajaur Agency than South Waziristan Agency (37 species). Cross-cultural analysis showed that only 15 medicinal plants were used in common by the indigenous communities in both Agencies, which indicates a low interregional consensus with regard to the ethnoveterinary practices of medicinal plants. Apiaceae was the dominant family in both regions by representing maximum number of plant species (11 species). Gastro intestinal complexities were common in both regions having higher F_{ic} values (above 90). Moreover, the current investigation reported new ethnoveterinary uses of medicinal plants from South Waziristan Agency, which were *Sideroxylon mascatense, Raphanus sativus, Salix babylonica, Solanum nigrum, Sophora mollis, Taraxacum campylodes* and *Tulipa stellata*. On the other hand from Bajaur Agency, *Boerhavia erecta, Celtis australis*, *Chamaecyparis obtusa* var. *obtuse*, *Eryngium biehersteinianum*, *Gossypium arboreum*, *Narcissus tazetta*, *Opuntia littoralis*, *Streblus asper* were reported with new ethnoveterinary uses.

Conclusions: The current study has an important contribution towards the preservation of indigenous plants' based knowledge. Several plants are carrying important ethnoveterinary uses being practiced by the local people mostly against the gastrointestinal disorders in both regions. Importantly, the cross-cultural approach has reported some new traditional uses of plants against livestock's diseases. Hence, this is an opportunity to investigate such plants phytopharmacologically and toxicologically for the discovery of new drug sources.

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1. Introduction

Ethnoveterinary medicines (EVM) are a basic source of traditional knowledge for the maintenance of livestock's health. It's not only involves information related to the medication of livestock, but also addresses the social context onto these traditional practices (Mathias, 2004). Rural people mainly rely on domestic cattle for their incomes and livelihood in many parts of the world (Pica-Ciamarra et al., 2011). Domestic animals play pivotal role by improving the economy of mountain communities and considered a symbol of socio-economic status (Abbasi et al., 2013). That is why reliance of rural people on medicinal plants is higher in order to keep their livestock healthy.

In developing countries, medicinal plants significantly contribute in the treatment of livestock's disorders due to no or less access to allopathic medicines (Katerere and Luseba, 2010). Knowledge about the ethnoveterinary practices has been transferred from one generation to another generation through verbal communication. However, threat of extinction goes in parallel with the knowledge transfer due to decrease in natural resources and modernization. This may result in the elimination of precious hereditary knowledge if not properly documented. Indigenous communities have a key role in the preservation of knowledge related to the local uses of medicinal flora. The indigenous knowledge can be used as a tool to conserve the green diversity and scientific validation of medicinal recipes. Several studies have focused on the documentation of ethnoveterinary knowledge in South Asia (Eswaran et al., 2013; Galav et al., 2013). Studies related to the knowledge on ethnoveterinary practices carries great potential from the socio-economic perspectives. Therefore, it is necessary to secure and boost this valuable heritable knowledge to improve the revenue generation of native people.

Livestock is an important sub-sector of Pakistan's agriculture, which significantly contributes into the country's economy. Livestock sector has a share of 55.91% in the agriculture value added and 11.8% in national GDP, which has grown by 3.99% in year 2013–2014 (GoP, 2014). A study has shown about 40% of all the income arises from the livestock and their products (Shahid et al., 2012). People residing in remote areas are dependent on livestock for their livelihood. Nomadic grazers and farmers not only use plants as fodder, but also for treating various ailments of their livestock. There are several reports on the ethnoveterinary uses of plants from other regions of Pakistan (Deeba et al., 2009; Raziq et al., 2010; Abbasi et al., 2013; Ul Hassan et al., 2014; Mussarat et al., 2014; Ahmad et al., 2015). The study area comprised of Ladha a sub-division of the South Waziristan Agency and Bajaur Agency located in the Federally Administered Tribal Areas (FATA) of Pakistan. Due to their remoteness, the indigenous communities residing in these areas have less access to synthetic pharmaceuticals. In both areas, most of the people using medicinal plants are having no or little schooling. Lack of proper education and less access to the modern veterinary pharmaceuticals are the two major reasons behind the dependency of local people on natural sources of medicines for the livestock's healthcare.

Therefore, the people mainly rely on traditional therapies for curing diseases of their livestock. There are no such cross sectional studies and this is the very first systemic documentation highlighting the cross-culture medicinal values of plants used in the livestock health care system of the two study regions. As both of the regions are existing nearby, so the disappearance of EVM in both of the regions is mainly due to the speedy urbanization, increasing sedentarization, changing livestock systems from subsistence (extensive) to commercial (intensive), war and conflicts, increasing competition for natural resources and environmental degradation. Hence, there is a dire need to document the ethnoveterinary knowledge from the whole FATA regions.

Therefore, the current study was designed with the objective to record and document the traditional veterinary practices from unexplored regions of South Waziristan Agency and Bajaur Agency, and to discuss cross sectional consensus on the uses of medicinal plants. This is to evaluate the traditional acuity of plants based remedies as a right solution for the animals' health. This study would ensure the preservation of valuable ethnoveterinary knowledge of the regions and provide a base for the exploration of new phytochemicals.

2. Materials and Methods

2.1. Ethnographical background and description of study area

South Waziristan and Bajaur are the two out of total eight Agencies of the Federally Administrated Tribal Areas (FATA) of Pakistan. The regions are geographically isolated having variation with respect to biodiversity, topographic, climatic and cultural factors. The study area Ladha of South Waziristan Agency is comprised of mountains and rich in plants diversity. The total area covered by the Agency is 6619 km^2 and is situated at E 69°42′ longitude N 32°24′ latitude and with an altitude of 1250–2134 m above the sea level. The temperature falls below 0 °C in winter mostly at higher altitudinal places whereas summer is comparatively hot in the plain area. The average precipitation rate per annum is 152.4 mm. Ethnographically, the study area is populated by three ethnic groups including Mehsood, Wazir and Barki tribes who speak Pashto language. Mostly the local people are government servants, farmers, drivers and running their own businesses. Most of the people depend on domestic and foreign remittances, and marketing of forest products. The indigenous communities keep domestic cattle in their homes as a key source of their livelihood. The dominant flora of the Agency is *Quercus oblongata* D.Don, *Olea ferruginea* Wall. ex Aitch., *Pinus roxburghii* Sarg., *Pinus gerardiana* Wall. ex. D.Don, *Sideroxylon mascatense* (A.DC.) T.D.Penn., *Morus alba* Bureau., *Morus nigra* L., *Sophora mollis* (Royle) Graham ex Baker, *Withania coagulans* (Stocks) Dunal and species of genus *Mentha*. At lower elevation, the flora also consists members of the genus *Acacia*. No comprehensive literature is available mentioning the total number taxa in both regions.

Bajaur is the smallest Agency among FATA having hilly terrain. It shares 52 km borders with Afghanistan with Khar as the main headquarter of the Agency. This border is of the economic importance between the two countries. The study area laying at the altitude of 1125.93 m and geographically exists at E 71°30′ longitude and N 34°41′ latitude. The total area of the Agency is comprised of 1290 km^2. The Agency is surrounded to the west by Kunar Valley being separated by rugged Hindukush hills and other irregular mountain passes known as Nawa Pass, Ghakhi Pass and Letaisar. Mohmand Agency is bordered to the South of Bajaur Agency, while District Dir to the east and north side of the Agency. The Agency is laying at the extreme end of the Himalayan Range, which offers great variation in climatic conditions. The dominant vegetation in the area is comprised of *Olea ferruginea*, *Pinus roxburghii*, *Ficus carica* L., *Melia azedarach* L., *Morus nigra*, *Quercus baloot*, *Rumex hastatus* D.Don, *Ailanthus altissima* (Mill.) Swingle, *Morus alba, Eucalyptus camaldulensis* Dehnh.

Tarkani and Utman Khel are the two main tribes of Bajaur Agency who also speak Pashto language. The socio-economic background of the local people is comparatively poor with most people are farmers by profession. People with other professions are teacher, drivers and others in addition to the ones having their own small-scale businesses. A high proportion of the local populations also obtain remittances from other parts of the country or abroad. Almost every household has a herd of domestic animals that greatly help in the livelihood of local communities. No proper education system is available in the area. One veterinary hospital and 20 small dispensaries are present in the area in order to treat the domestic cattle. This is one of the reasons that the local people still use traditional recipes to treat their animals. Many of the plants present in the study area are being used by the local people for various medicinal purposes.