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Inventory of important fodder plants of Ladakh Himalaya

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Introduction:

In Ladakh, livestock rearing is a major activity in the livelihoods of the population and contributes greatly to income generation in the region and therefore alleviating poverty. In agro-pastoral animal husbandry systems of Leh, Khaltsey, and Nubra blocks and limited areas in Nyoma and Durbok, villagers live in settled communities and practice sedentary agriculture, but they also keep relatively large herds of livestock to augment income and meet dietary and fibre subsistence needs (Ahmed, 2002). Due to prolonged and extreme cold winter, the agriculture season is very short which starts from May and ends by September depending upon different altitudes. The major constraint to livestock production is winter season feed shortage. The annual growth rate of livestock is limited by forage quality and quantity especially in the winter season. The flora of cold desert Ladakh comes under alpine and high alpine zone, which is situated between 2700m to 6000m. The high altitude flora is mainly dominated by dwarf bushes or shrubs (Singh, 2009).

In most parts of the region, the livestock feed on alpine pastures and are to be stall fed for the remaining almost seven months as the land is covered with thick layers of snow. This necessitates production and storage of large quantities of fodder. Accordingly in single cropped areas, the farmers put more area under fodder crops than the cereal crops and further substantiate it with all kinds of grasses and edible plant material collected from areas beyond farmlands. The use of grasses, legumes and other browse trees and shrubs as supplementary feed is therefore seen as a panacea in bridging this nutritional gap for livestock production in the region (Jadhav *et al.*, 2009). While some information is available on the flora of Ladakh, this cannot be called satisfactory and final; as these include all kinds of plants, which may or may not be suitable as forage and fodder. Overall, lack of data and inventory on forage plant species is a hindrance to planning and formulation of schemes. Through this study, efforts have been made to document the available fodder plants for suitable future use.

Materials and Methods

The study was conducted in Leh, Ladakh region of Western Himalaya. Two blocks, Leh and Khaltsey were randomly selected in the region. District Leh is situated roughly between 32 to 36⁰N latitude and 75 to 80⁰E longitude and altitude ranging from 2300 m to 5000 m above mean sea level. District Leh with an area of 45100 sq km makes it 2nd largest district in the country after Kutch. The area because of its climatic conditions is classified as cold arid. With a temperature range of -60⁰C to +35⁰C; the area is subject to both seasonal and diurnal fluctuation of temperature, which affects not only the plant growth, cropping but also the livelihood options. Annual precipitation is scanty and ranges between 80 mm and 100 mm; that too mostly in the form of snow during November to March.

Local people possess traditional knowledge about useful fodder plant species and how and when they are used. Extensive surveys and enumeration of fodder plants in and around Leh were carried out from May 2011 to October 2012. Frequent field trips were made and detailed information regarding locality, season, distribution and vernacular names were recorded. We used semi-structured interviews, guided questionnaires, and direct observations to collect the data. The plants were identified with the help of various floras, monographs, monographs and the Herbarium of Field Research Laboratory, Leh.

Results and Discussion

Our results revealed a total of 61 species of fodder plants belonging to 18 families including grasses, legumes, trees and shrubs. Out of 61 plants, whole plant parts of 28 species, leaves of 11 species, leaves and twigs of 5 species, fruits and leaves of 6 species, pods and leaves of 4 species are used as fodder. A sizeable number of species belonged to the family of Poaceae followed by leguminosae and Salicaceae. *Medicago sativa* and *Medicago falcata* were the main cultivated

fodder plants in Ladakh. Such a variety of fodders available is of great importance under unfavourable cold, high altitude arid climatic conditions of Ladakh in Indian Trans-Himalaya particularly when no more than a dozen species are conventionally referred to and recommended for mountain areas (Singh, 1995). Livestock are stall-fed during the more severe winter months, starting after the harvest in September, and are fed willow leaves, stalks of cereal crops, alfalfa (*Medicago sativa*, *M. falcata*, and *M. media*), and other plant residues, in the morning and evening. During the day animals graze freely in fallow lands, or are staked and fed hay reserves. Large animals such as yak graze continuously without being tethered. Singh (1995) and Singh and Bohra (2005) have given the list of fifty fodder trees, shrubs and non-graminaceous plants occurring in mountain areas.

Important species of cold desert Ladakh belonging to 18 families being used for fodder purpose are described (Table 1) with family, plant name, vernacular name and plant part used.

Table 1: Important Fodder plants of Leh, Ladakh

Family Name	Plant Name	Vernacular Name	Plant part used
Poaceae	<i>Avena sativa</i> L.	Jayee	Whole plant
	<i>Hordeum vulgare</i> L.	Yangma	Straw and seed
	<i>Triticum aestivum</i> L.	Tochan	Straw
	<i>Panicum millaceum</i> L.	Millet	Straw and seed
	<i>Bromus spp.</i> Scop.	-	Whole plant
	<i>Elymus spp.</i> L.	-	-do-
	<i>Digitaria sanguinalis</i> (L.) Scop.	-	-do-
	<i>Festuca rubra</i> L.	-	-do-
	<i>Poa annua</i> L.	-	-do-
	<i>Poa pratensis</i> L.	-	-do-
	<i>Trisetum spp.</i> L.	Spang	-do-
	<i>Setaria spp</i> (L.) P. Beauv	-	-do-
	<i>Phragmites australis</i> Adans.	-	-do-
	<i>Pennisetum spp.</i> Rich.	-	-do-
Leguminosae	<i>Medicago sativa</i> L.	Yarkandi ole	Whole plant
	<i>Medicago falcata</i> L.	Ole	-do-
	<i>Medicago media</i> L.	Ole	-do-
	<i>Lotus corniculatus</i> L.	-	-do-
	<i>Astragalus spp.</i> L.	Serpang	leaves
	<i>Cicer microphyllum</i> L.	Sari	Pods and leaves
	<i>Robinia pseudoacacia</i> L.	Locust	-do-
	<i>Lathyrus sativus</i> L.	Sanma	-do-
	<i>Lathyrus humilis</i> L.	Kaown	-do-
	<i>Melilotus officinalis</i> L.	-	Whole plant
Cyperaceae	<i>Carex spp.</i> L.	-	-do-
	<i>Cyperus spp</i> L.	-	-do-
	<i>Kobresia spp</i> C.B.Clarke	-	-do-
Salicaceae	<i>Salix alba</i> L.	Malchang	Leaves and twigs
	<i>Salix tetrasperma</i> L.	Selchang	-do-
	<i>Salix elegans</i> L.	Thakchang	-do-
	<i>Salix sclerophylla</i> L.	Drokchang	-do-
	<i>Salix daphnoides</i> L.	Shoa	-do-
	<i>Populus balsamifera</i> L.	Yurpa	leaves
	<i>Populus euphratica</i> L.	Hoton	leaves
Elaeagnaceae	<i>Hippophaea rhamnoides</i> L.	Tsermang	Fruit and leaves
	<i>Elaeagnus angustifolius</i> L.	Shersing	Fruits and leaves
Saxifragaceae	<i>Ribes alpestre</i> L.	Askuta, Zasoot	Berries and leaves
	<i>R. orientale</i> L.	-	-do-
Moraceae	<i>Morus alba</i> L.	Oshe/toot	Leaves

	<i>Morus serrata</i> L.	Oshe/toot	leaves
<i>Polygonaceae</i>	<i>Rumex patientia</i> L.	Soma	leaves
	<i>Fagopyrum tataricum</i> Mill.	Drahma	Seed and leaves
	<i>Fagopyrum esculentum</i> Mill.	Drahma	-do-
	<i>Poligonum aviculare</i> L.	-	Whole plant
<i>Chenopodiaceae</i>	<i>Chenopodium album</i> L.	-	Leaves
	<i>Chenopodium botrys</i> L.	-	-do-
	<i>Kochia stellaris</i> (L.) A.J.Scott	-	-do-
<i>Brassicaceae</i>	<i>Capsella bursa-pastoris</i> (L.) Medik.	Shepherds purse	-do-
	<i>Lepidium spp.</i> L.	Sangsho	leaves
<i>Asteraceae</i>	<i>Artemisia siversiana</i> L.	-	Whole plant
	<i>Cichorium intybus</i> L.	-	-do-
	<i>Lactuca spp</i> L.	-	-do-
	<i>Taraxacum spp</i> L.	-	-do-
<i>Convolvulaceae</i>	<i>Convolvulus arvensis</i> L.	-	-do-
<i>Rosaceae</i>	<i>Rosa webbiana</i> L.	Siah, Madpo	fruits
	<i>Potentilla fruticosa</i> L.	-	Whole plant
<i>Berberidaceae</i>	<i>Berberis ulcina</i> L.	Khizer, Daruhaldi	Fruits and leaves
<i>Capparidaceae</i>	<i>Capparis spinosa</i> L.	Kabra	Fruits and leaves
<i>Iridaceae</i>	<i>Iris lactea</i> Pall.	Tesma	Whole plant
<i>Apiaceae</i>	<i>Prangos pabularia</i> Lindl.	-	-do-
<i>Amaranthaceae</i>	<i>Amaranthus caudatus</i> L.	-	Grain

Conclusion

The present study revealed that Leh region is rich in fodder species which are traditionally used to support livestock population. However, further studies for identification and improvement of forage species are needed on a large scale for ensuring fodder security. There is an urgent need to have a programme for collection, evaluation and conservation of forage germplasm of Ladakh. Such an effort would ensure conservation and utilization of desirable genetic characters of the native fodder species so that all available genetic potential could be exploited for sustainable livestock production in the region.

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