

Ethnobotanical enumeration of forage plant species in and around Colonel Sher Jung National Park, Simbalbara (CSJNPS), Sirmour (H.P.), India

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Abstract

National parks are known for its rich floral and faunal diversity. One of such geographically and edapho-climatically unique area falling in the Shivalik foot hills, encompasses nearly 27.88 sq km area known as Colonel Sher Jung National Park, Simbalbara, Sirmour, Himachal Pradesh having high diversity. Despite the rich floral diversity, little is known about the associated traditional knowledge of forage plants used for livestock by the trans-nomadic Gujjar and Gaddi tribe, the foremost local inhabitants around the protected area. Therefore, the study aims to investigate and document indigenous knowledge on forage plant species used by the local populace. Area explored thoroughly during January 2012-December 2016 and data were collected by using semi-structured interview, discussions and field observation. After critical analysis, finding reveals the use of 91 forage species of 72 genera falling in 32 families. Out of the total families Fabaceae was represented by 19 species (17.29%), followed by Poaceae 15 species (13.65%).

Keywords: National Park Simbalbara, Gujjar/Gaddi, fodder species

1. Introduction

India support nearly 20% of the world livestock and 16.8% human population on the land area of only 2.3%. It is leader in cattle (16%) and buffalo (55%) population and has world's second largest goat (20%) and fourth largest sheep (5%) population. The 19th Livestock Census (2012) has placed the livestock population at 512.05 million (Anonymous, 2014). For feeding such huge livestock various parts of shrubs and

trees especially leaves, pods, branches, stems and edible twigs are used as supplementary feeds for animals all over the world for centuries (Singh, 1982; Parkash & Hocking, 1986; Ivory 1990; Pokhriyal *et al.*, 1992; Purohit & Samant, 1995; Negi, 1997, 2000; Sood & Kaushal, 2008; Gagoti *et al.*, 2018). In dry land farming areas grasses account for 89% of livestock diets that consist of 11% shrubs and tree fodder (Nitis *et al.* 1990). The present studies carried to explore and document the fodder/forage species used by indigenous people and *trans*-nomadic Gujjar and Gaddi tribes in and around Col. Sher Jung National Park. Overgrazing by large numbers of livestock and illegal lopping are the major threats to the vegetation of the region. Such overgrazing and trampling by livestock can leads to environmental degradation and soil erosion (Cotton, 1996). Another major threat prevailing in the region is forest fire. In spite the efforts of the forest department in taking preventive measure to reduce chance of fire, there are incidences of fire on regular basis. Indigenous knowledge practiced by the inhabitant regarding ethnobotanical important fodder/forage species in the area recorded and compiled to guide the proper utilization, management and conservation of useful plant species of national park.

2. Materials and Methods

2.1 Study area and Location

The study was carried out in and around Col. Sher Jung National Park (CSJNP) Simbalbara (Geo coordinates North - 30°28'13''N & 77°28'43''E, East - 30°24'15''N & 77°33'55''E, South - 30°23'31''N &

77°33'44"E and West - 30°27'26"N & 77°27'40"E), having 27.88 sq km with an altitudinal range of 350m - 700m above msl, located in Paonta valley of Sirmour district, H.P. in the confluence of plains and the main Shivalik range in Western Himalaya in India (Fig. 1). The Col. Sher Jung National Park Simbalbara, located at the junction of the four states viz. Uttarakhand, Uttar Pradesh, Haryana and Himachal Pradesh, falls in Shivalik foot hill, and it share boundaries with three protected areas of two different states namely Kalesar National Park of Haryana towards the South and Rajaji National Park of Uttarakhand towards the East.

2.2 History of the National Park

The protected area was notified as a game sanctuary for the first time on February 8, 1958. Thereafter it has been declared as Simbalbara wildlife sanctuary on March 27, 1974 comprising an area of 19.00 sq km. Later on, state Govt. keeping in view the purpose of protecting, propagating and developing wildlife and its environment, upgraded the existing WLS into National Park Simbalbara by adding 8.88 sq km on June 07, 2013. After rationalization presently the total protected area is 27.88 sq km (Fig. 1).

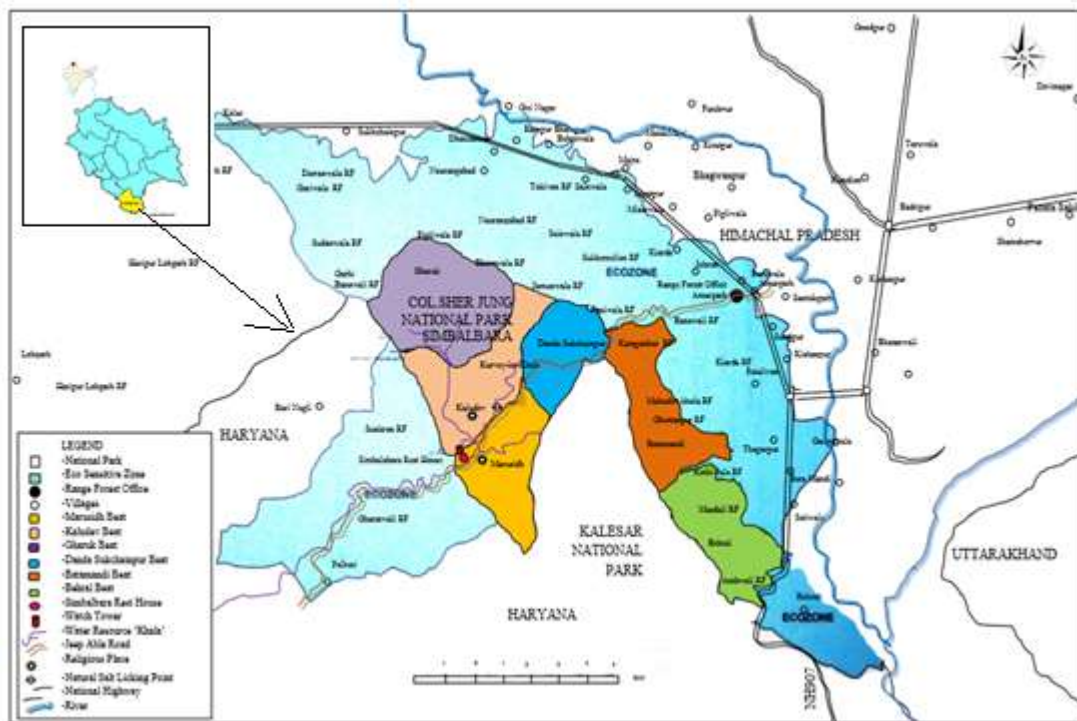


Fig. 1. Detail map of Col. Sher Jung National Park, Simbalbara, Sirmour, H.P., India (Inset: Location map of Sirmour in H.P.).

2.3 Climate and Geography

The temperature of area ranges from 4°C - 48°C and receives a mean annual rainfall of about 1260 mm while the relative humidity varies from 100% during monsoon to 26% in summer. The hills are composed of unconsolidated siltstone, sandstone and conglomerate that are more susceptible to erosion. The area is also traversed by two perennial streams which join at Simbalbara to form Nimbuwala khol. Beside there are as many as 32 small annual streams that contribute to the drainage system of the national park.

2.4 Vegetation and Wildlife

The vegetation of national park is mainly composed of thick Sal forests, and other deciduous species of

tropical and sub-tropical origin, providing food and shelter to animals like Goral, Sambar, Chittal, Spotted deer, Barking deer, Blue bull, Leopard, Wild boar, Pea fowl, Red jungle fowl, elephants, partridges, along with many species of the non-chordates and the chordates including fishes, amphibians, reptiles, birds and mammals.

2.5 People and Land Use

Trans-nomadic Gujjars are the foremost people residing around the park with their huge livestock and they migrate from the lowland plains in the winters to the upper hills of Himachal Pradesh during the summer season. Their economy depends mainly on selling milk and dairy products. They speak 'Gojri' and have

unique traditions, arts and crafts and food habits. Beside there are as many as 50 small villages in its periphery. People residing in the vicinity of the study area belong to varied caste, creed and religion. The major activities of local populace is agricultural practices and pastoralism for which they mainly depend upon the forest resources particularly regarding fodder, fuel wood and for grazing their cattle.

2.6 Study Period and Methodology

The present intensive field research work was initiated in the region from January 2012 till December 2016. The research work primarily focused in order to collect data of interest on ethnobotanically important fodder plants utilized by the local inhabitants for their livestock in adjoining villages around CSJNP, Simbalbara, field tours to these areas were made as per the procedure delineated by Schultes (1962) and Jain (1967, 1989). The duration of each visit in different seasons was of 2-3 months. Firsthand account of ethnobotanically interesting species either in flowering or fruiting stage was taken. Local people, family heads, old people and many local informants was contacted for getting a better understanding of fodder/forage species through semi structured questionnaire, interviewed and group discussions. The data collected was verified and cross checked by showing plant specimens to various informants and even to the same informants on different occasions. The species was identified with the help of treatises on Indian flora and carefully matched with authentic specimens housed in the herbarium of Northern Circle of Botanical Survey of India and F.R.I., Dehradun. Photographs of the forage plants were clicked in the natural habitat. The vernacular (local) name (s) and the name of the families have also been provided along with the valid botanical name. The voucher herbariums were submitted to the Ethnobotanical Herbarium, Department of Biosciences, Himachal Pradesh University, Summer hill, Shimla. The data were summarized and enumerated according to already published literatures by Singh (1982), Parkash & Hocking (1986), Pokhriyal *et al.* (1992), Purohit & Samant (1995), Negi (1997, 2000), and Sood & Kaushal (2008).

3. Results and Discussion

The finding reveals that local inhabitants, nomadic Gujjars and Gaddis extracted fodder from the nearby forests by cutting floor vegetation and looping trees. They also left their livestock free in forest area for grazing. So far as its diversity is represented by 91 species (74 dicots, 17 monocots) belonging to 72 genera under 32 families (Fig. 3; Table 1) of which species richness predominantly

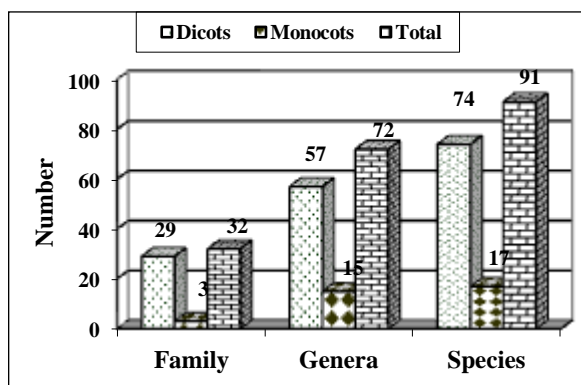


Fig. 3. Relative number of family, genera and species employed for fodder

Table 1: Relative disposition of forage plants employed under various plant divisions

S. No.	Division	Family	Genera	Species
1.	Dicots	29	57	74
2.	Monocots	03	15	17
	Total	32	72	91

belongs to Fabaceae 17.29% (19 species having 15 genera); Poaceae 13.65% (15 species, 13 genera); Moraceae 7.28% (8 species, 3 genera); Combretaceae 4.55% (5 species, 2 genera); Euphorbiaceae (4 genera and 4 species); Malvaceae (2 genera and 3 species); Meliaceae, Rubiaceae and Brassicaceae (3 genera 3 species each); Chenopodiaceae (1 genus and 2 species); Lamiaceae (2 genera and 2 species); Rhamnaceae and Tiliaceae (1 genus and 2 species each); Apocynaceae and Urticaceae (2 genera and 2 species each); Anacardiaceae, Arecaceae, Asparagaceae, Asteraceae, Asteraceae, Boraginaceae, Capparaceae, Convolvulaceae, Dipterocarpaceae, Lauraceae, Linaceae, Moringaceae, Papaveraceae, Salicaceae, Sapindaceae, Sapotaceae, Simaroubaceae and Sterculiaceae with one genus and one species each (Fig. 4; Table II). Habit-wise distribution reveals the use of 51 species (56%) of trees, herbs 26 (29%), shrubs 12 (13%), and lianas 2 (2%); of which 47 species are wild, 17 species are cultivated, and 27 species are semi-cultivated. Notably, high used forage genera in the region are: *Ficus* (5 species), *Terminalia* (4 species), *Bauhinia* (3 species), etc. Besides, the fodder requirements are also met with extensively cultivations of *Trifolium alexandrinum* as forage crop in the region. Further extensively lopped tree species for this purpose are *Desmodium oojainense*, *Terminalia tomentosa* and *Leucaena leucocephala*. Despite these, another unique feature of the present study not reported earlier in literature on Indian forages

(Anonymous, 1994; Sood & Kaushal, 2008) is the use of *Kydia calycina*, *Milletia extensa*, *Bauhinia malabarica*, *Calamus tenuis*, *Clerodendrum infortunatum*, *Gmelina arborea* and *Haldina cordifolia* as fodder resources from the region (Table II). Present

study has enabled in understanding the people of this region socio-culturally and their relation with the plants especially the uses of fodder/forage plants. All these species hold considerable scope of popularization in the country.

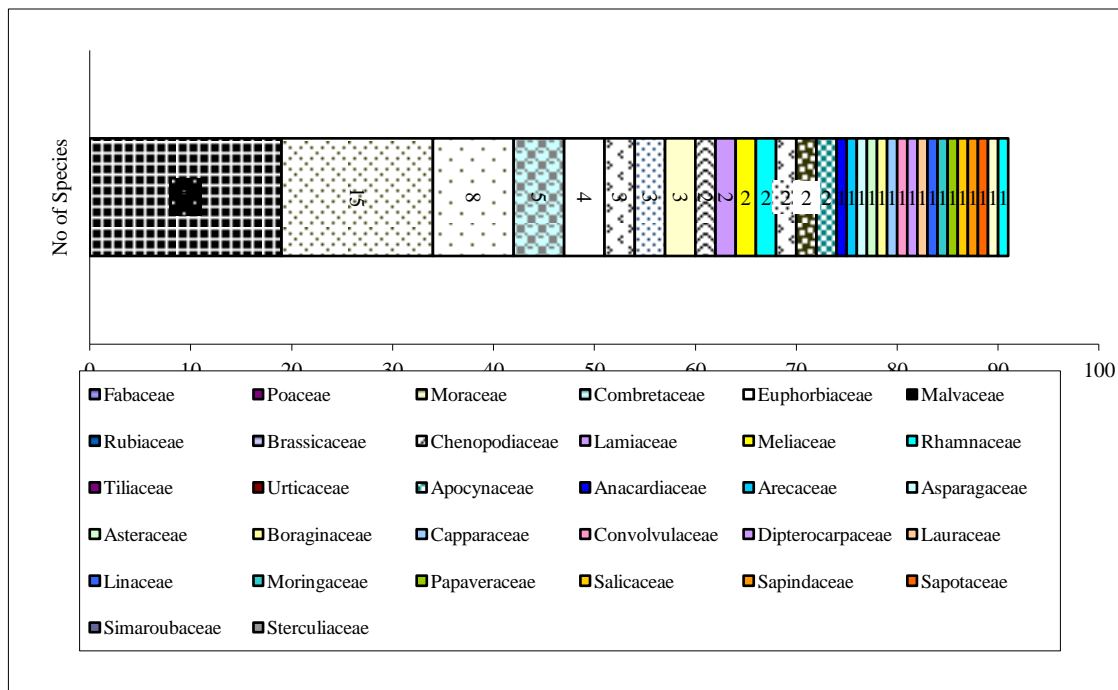


Fig. 4. Relative number of species and families employed for fodder purposes.

Table II: Forage plant used by the local inhabitants around the Col. Sher Jung National Park Simbalbara

S. No.	Botanical Name	Vernacular Name/s	Family	Habit	Flowering/ Fruiting Season	Part used	Wild/ Cultivated/ Semi-cultivated
A	B	C	D	E	F	G	H
1.	<i>Acacia catechu</i> (Linn.f.) Willd.	Khair	Fabaceae	T	June- Oct.	L., Br., B.	S. Cu.
2.	<i>Acacia nilotica</i> (L.) Del. subsp. <i>indica</i> (Benth) Brenan	Babol, Kikar		T	July-Dec.	L., S., Y.P.	W.
3.	<i>Albizia lebeck</i> (L.) Benth.	Siras		T	Fl: April-May Fr: Dec.-Jan.	L.	S. Cu.
4.	<i>Albizia procera</i> (Roxb.) Benth.	Safed Siras, Siranas		T	Fl: June-Aug Fr: Cold season	L.	S. Cu.
5.	* <i>Bauhinia malabarica</i> Roxb.	Aml, Khatua Khatti		T	Sep.- March	L.	W.
6.	<i>Bauhinia vahlii</i> Wight & Arn.	Maljhan, Malo		Li	April-July	L.	W.
7.	<i>Bauhinia variegata</i> Linn.	Kachnar, Kaliari Kartaid, Karyala		T	Feb.-April	L.	S. Cu.
8.	<i>Butea monosperma</i> (Lam.) Taub.	Dhak, Palas		T	Feb.-May	L.	S. Cu.
9.	<i>Cassia fistula</i> Linn.	Aahali, Amaltash, Gullakadi, Halyan		T	March-July	L.	S. Cu.

10.	<i>Dalbergia sissoo</i> DC.	Shisham, Tahli		T	March –June	L.	S. Cu.
11.	<i>Desmodium oojeinense</i> (Roxb.) H. Ohashi	Sandan, Shanan		T	March-June	L.	W.
12.	<i>Leucaena leucocephala</i> (Lam.) de Wit	Subabul		T	May-Aug.	L., G.P.	W.
13.	<i>Melilotus indicus</i> (L.) All.	Aspurk, Ban Methi		H	Jan.-April	A.P.	S. Cu.
14.	* <i>Millettia extensa</i> (Benth.) Baker	Gauj		Li	July-Sep.	P.	W.
15.	<i>Phyllodium pulchellum</i> (L.) Desv.	Jatsalpan		Sh	Aug.-Dec.	L.	W.
16.	<i>Pongamia pinnata</i> (L.) Pierre	Karanj		T	April-June	L.	C.
17.	<i>Prosopis juliflora</i> (Sw.) DC.	Vilayati Kikar		T	Fl.: March-April; Fr. May-June	L., Po.	S. Cu.
18.	<i>Tamarindus indica</i> L.	Imli		T	May-June	L.	C.
19.	<i>Trifolium alexandrinum</i> Linn.	Barseem, Barseem		H	March-May	A.P.	C.
20.	<i>Coix lacryma-jobi</i> L.	Sankhlu	Poaceae	H	July-Nov.	L.	W.
21.	<i>Cymbopogon citratus</i> (DC.) Stapf.	Lemon Ghass, Makoda Ghass		H	July-Dec.	L.	C.
22.	<i>Cymbopogon schoenanthus</i> (L.) Spreng.	Gandhbena, Rosha Ghass		H	Nov.-Jan.	L.	S. Cu.
23.	<i>Cynodon dactylon</i> (L.) Pers.	Dhruv, Doob, Drub, Khabbal		H	July-Dec.	L.	W.
24.	<i>Dendrocalamus hamiltonii</i> Nees & Arn. ex Munro	Bains		Sh	Once in life time	L.	S. Cu.
25.	<i>Dendrocalamus strictus</i> (Roxb.) Nees	Bans		Sh	November-April	L.	S. Cu.
26.	<i>Echinochloa colona</i> (L.) Link.	Sawank		H	April-July	L.	W.
27.	<i>Eleusine indica</i> (L.) Gaertn.	Jharua		H	Aug.-Nov.	L.	W.
28.	<i>Hordeum vulgare</i> Linn.	Jao		H	Jan.-Feb.	A.P.	C.
29.	<i>Oryza sativa</i> Linn.	Dhan		H	July-Sep.	A.P., Br., G	C.
30.	<i>Phalaris minor</i> Retz.	Mundsi, Phula		H	Feb.-June	A.P.	W.
31.	<i>Saccharum officinarum</i> Linn.	Ganna, Kamandi		H	Jan.-March	A.S., L.	C.
32.	<i>Setaria italica</i> (L.) P. Beauv.	Kangni		H	June-Aug.	L.	W.
33.	<i>Triticum aestivum</i> Linn.	Gandham, Gehun, Kanak		T	Jan.-April	A.P.	C.
34.	<i>Zea mays</i> Linn.	Challi, Makka		H	July-Aug.	P.	C.
35.	<i>Artocarpus lakoocha</i> Roxb.	Dephal, Dhau, Tao	Moraceae	T	March-Aug.	L.	S. Cu.
36.	<i>Ficus hispida</i> L.	Daduri, Kaksa, Gobha,		Sh	April-June	L.	W.
37.	<i>Ficus lacor</i> Buch.-Ham.	Pilkhan		T	Fr.: Feb.-Aug.	L.	W.
38.	<i>Ficus racemosa</i> L.	Gullar		T	Fl.: Spring season; Fr.: April-July	L.	W.
39.	<i>Ficus religiosa</i> Linn.	Peepal		T	Fl.: Summer; Fr.: rainy season	L.	S. Cu.
40.	<i>Ficus semicordata</i>	Jadphali		T	June-Nov.	L.	W.

	Buch.-Ham. ex Sm.						
41.	<i>Morus alba</i> L.	Toot, Tutri		T	Feb.-June	L., Tw.	S. Cu.
42.	<i>Morus nigra</i> L.	Shehtoot		T	April-Sep.	L.	S. Cu.
43.	<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Guillem. & Perr.	Bakli, Bankli, Chhal	Combretaceae	T	Fl.: May-July; Fr.: Nov.-March	L.	W.
44.	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Arjun		T	April-Dec.	L.	S. Cu.
45.	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bahera		T	May-Sep.	L.	S. Cu.
46.	<i>Terminalia chebula</i> Retz.	Harad, Harade		T	Fl.: April-June & Fr.: Nov.-March	L.	S. Cu.
47.	<i>Terminalia tomentosa</i> (Roxb. ex DC.) Wight & Arn.	Asain, Saaj, Sain		T	Fl.: June-July; Fr.: Feb.-March	L.	W.
48.	<i>Bridelia retusa</i> (L.) A. Juss.	Gagari, Gaya	Euphorbiaceae	T	Fl.: May-Aug.; Fr.: Oct.-Feb.	L.	W.
49.	<i>Euphorbia prostrata</i> Aiton	Chhoti Dudhi		H	Almost throughout the year but mainly during June-Aug.	P.	W.
50.	<i>Mallotus philippensis</i> (Lam.) Mull. Arg.	Kamela, Raenii		T	Sep.-April	L.	W.
51.	<i>Phyllanthus emblica</i> L.	Amla		T	Fl. Feb.-May; Fr.: Oct.- March	L.	S. Cu.
52.	<i>Gossypium arboreum</i> Linn.	Kapas	Malvaceae	Sh	Fl.: Dec.-Feb.; Fr. March-May	L., Se.	C.
53.	<i>Gossypium barbadense</i> L.	Kapas		Sh	Sep.-Nov.	L., Se.	C.
54.	* <i>Kydia calycina</i> Roxb.	Pula, Pulia		T	Sep.-Nov.	L.	W.
55.	<i>Melia azedarach</i> L.	Darek, Drek	Meliaceae	T	Feb.-Sep.	L.	S. Cu.
56.	<i>Toona ciliata</i> M. Roem.	Tun, Toon		T	March-July	L.	S. Cu.
57.	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Mainphal	Rubiaceae	Sh	Fl.: April-June; Fr.: Nov.-Jan.	L.	W.
58.	* <i>Haldina cordifolia</i> (Roxb.) Ridsdale	Haldu, Kadami		T	June-Jan.	L.	S. Cu.
59.	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Kaim		T	Fl: June-July; Fr: Nov.-Jan.	L.	W.
60.	<i>Brassica juncea</i> (Linn.) Czern.	Rai	Brassicaceae	H	Nov.-April	A.P.	C.
61.	<i>Brassica rapa</i> Linn.	Sarson		H	Nov.-April	L., S., Se.	C.
62.	<i>Eruca vesicaria</i> (L.) Cav.	Taramira		H	Jan.-April	L.	C.
63.	<i>Chenopodium album</i> Linn.	Batho, Bathu, Gahnau, Karohan	Chenopodiaceae	H	May-Nov.	A.P.	W.
64.	<i>Chenopodium murale</i> L.	Bathoo, Kharatua Bathu		H	June-Sep.	A.P.	W.
65.	* <i>Clerodendrum infortunatum</i> L.	Bhant, Karu	Lamiaceae	Sh	Fl.: Jan.-April; Fr.: Rainy Season	L.	W.
66.	* <i>Gmelina arborea</i> L.	Gambhar		T	Feb.-June	L.	W.
67.	<i>Ziziphus jujuba</i> Mill.	Ber	Rhamnaceae	T	Sep.-March	L., Br.	S. Cu.
68.	<i>Ziziphus nummularia</i> (Burm. f.) Wight & Arn.	Jharberi		Sh	Fl.: June-Sep.; Fr.: Cold season	L.	W.

69.	<i>Grewia optiva</i> Drumm. ex Burret	Beul	Tiliaceae	T	March-Dec.	L., S.	W.
70.	<i>Grewia serrulata</i> DC.	Bhansuli		T	Aug.-Nov.	L.	W.
71.	<i>Boehmeria macrophylla</i> Hornem.	Samrala	Urticaceae	H	June-Jan.	L., Y. br.	W.
72.	<i>Urtica dioica</i> L.	Bichhubooti		H	June-Sep.	A.P.	W.
73.	<i>Carissa spinarum</i> L.	Karunda	Apocynaceae	Sh	April-July	L.	W.
74.	<i>Holarrhena pubescens</i> Wall. ex G. Don.	Karu, Ramjau		T	June-Feb.	L.	W.
75.	<i>Lannea coromandelica</i> (Houtt.) Merr.	Jhinghan	Anacardiaceae	T	Fl.: Jan.-April; Fr.: May-July	Y. L.	W.
76.	* <i>Calamus tenuis</i> Roxb.	Bent	Arecaceae	Sh	Fl: July-Aug.; Fr.: Cold Season	L.	W.
77.	<i>Asparagus racemosus</i> Willd.	Satawari	Asparagaceae	Sh	June-Nov.	P.	W.
78.	<i>Sonchus wightianus</i> DC	Sadhi	Asteraceae	H	Dec.-Jan.	P.	W.
79.	<i>Cordia dichotoma</i> G. Forst.	Bhokra, Borla, Lasora	Boraginaceae	T	March-June	L.	W.
80.	<i>Capparis zeylanica</i> L.	Kanchan	Capparaceae	T	March-Oct.	L., Tw.	W.
81.	<i>Ipomoea batatas</i> (L.) Lam.	Shakarkandi	Convolvulaceae	H	Oct.-Dec.	A.P., L.	C.
82.	<i>Shorea robusta</i> C. F. Gaertn.	Sal, Shal	Dipterocarpaceae	T	March-July	L., Br.	W.
83.	<i>Litsea glutinosa</i> (Lour) C. B. Rob.	Chanana, Chandna	Lauraceae	T	Fl.: April-July & Fr.: Aug.-Oct.	L.	W.
84.	<i>Linum usitatissimum</i> Linn.	Alsi	Linaceae	H	April-Sep.	A.P.	C.
85.	<i>Moringa oleifera</i> Lam.	Sahanjana, Sunjana	Moringaceae	T	Jan.-June	A.P.	S. Cu.
86.	<i>Fumaria parviflora</i> Lam.	Pitpapra	Papaveraceae	H	Jan.-April	L.	W.
87.	<i>Populus deltoides</i> Bartram ex Marshall	Poplar	Salicaceae	T	May-July	L.	C.
88.	<i>Sapindus saponaria</i> L.	Dodan, Ritha	Sapindaceae	T	April-Sep.	L.	W.
89.	<i>Madhuca longifolia</i> var. <i>latifolia</i> (Roxb.) A. Chev.	Mahuwa	Sapotaceae	T	Fl.: Feb.-April; Fr.: April-July	L.	S. Cu.
90.	<i>Ailanthus excelsa</i> Roxb.	Maharukh	Simaroubaceae	T	Jan.-July	Tw., L.	S. Cu.
91.	<i>Helicteres isora</i> Linn.	Bhendu, Maror- phali	Sterculiaceae	T	Fl.: April-Dec.; Fr.: Oct.-June	L.	W.

Abbreviations:

Column B: * Additional fodder from the study area

E: T-Tree; Sh- Shrub; H- Herb; Li- Liana

G: L.-Leaf; Br.- Branch; B.- Bark, Y.P.- Young pods; S.- Stem; A.P. – Aerial Parts; G.P.- Green pod; P.-Plant; Po-Pods; Tw.- Twig; Se-Seed; Y. br.-Young branches; Y.L.- Young leaf.

H: W.-Wild; C-Cultivated; S. Cu.-Semi-cultivated

4. Summary

The diversity of forage around the Col. Sher Jung National Park Simbalbara is represented by 91 species belonging to 72 genera under 32 families. The high used fodder families belonging to Fabaceae (19 species), Poaceae (15 species), Moraceae (8 species), Combretaceae (5 species), Euphorbiaceae (4 species), and Brassicaceae, Malvaceae, Rubiaceae (3 species each). Based on uses, the frequently used forage genera from the region are those of *Ficus* (5 species), *Terminalia* (4 species), and *Bauhinia* (3 species). Additional fodder resources from the study area *Kydia calycina*, *Millettia extensa*, *Bauhinia malabarica*, *Calamus tenuis*, *Clerodendrum infortunatum*, *Gmelina arborea* and *Haldina cordifolia* are reported first time from the study area. It is pertinent to mention here that 52% of forage species are wild of which as many as 24 species are trees, 13 herbs, 8 shrubs and 2 lianas which clearly depict the high dependence on forests for feeding their livestock's. The data so generated can be further chemically evaluated in terms of quantity and quality to prove its efficacy and palatability for livestock and further utilized for improving present and future needs of forage crops through introduction in agroforestry and sustainable availability in future.

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