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RESEARCH ARTICLE

FODDER TREES OF BUNDELKHAND REGION

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ABSTRACT

The importance of livestock in Indian agriculture is well recognised. In agriculture of Bundelkhand region, domestic animals play a vital role in the farmer's life. The present investigation comprises 22 species of fodder tree distributed in 17 genera belonging to 10 families. The observation of present study exhibited that the rural inhabitants of region used total 22 trees species. The leaf fodder availability period was give an idea about that green leaf fodder was available around the complete year. All studied 22 tree species produced leaf fodder in different months of year.

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INTRODUCTION

In Indian agriculture, domestic animals play a vital role in the farmer's life. The importance of livestock in Indian agriculture is well recognised. However the low productivity of livestock is a matter of concern, which is mainly due to the poor fodder and feed resources. Bundelkhand region is located in Central India in the Indo-Gangetic plains on the Vindhyan hilly tracts. This region suffers from several limitations, mainly high vulnerability of natural calamities and poor infrastructural development, which has made agricultural productivity very low and livelihood uncertain. The region is characterized as drought-prone and resource-poor from agriculture point of view. The small and marginal farmers and landless labourers are the worst affected, particularly during drought years. Alike other part of country, in Bundelkhand region , livestock plays vital role in the farmers life as they provide farm power, rural transport, manure, fuel, milk and meat, but also a major role in rural economy by providing income and employment to the small hold farmers and other weaker sections of the society (Chavan *et al.,* 2016). In the Bundelkhand region, the fodder production is not sufficient to meet the demand of livestock population and also the forages so produced are poor in quality. Fodder trees and shrubs are used as supplements to livestock especially during the dry seasons and fodder stress periods.

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They also serve other useful purposes such as the provision of food, drugs, firewood and building poles and recycling of nutrients. Over the past decade, much information has been accumulated on the potential of browse trees and shrubs as sources of feed in grazing systems (Chavan *et al* 2016). Keeping this in view, the present study was initiated, with an aim to explore some fodder trees Bundelkhand region, India.

MATERIALS AND METHODS

The rural areas of Bundelkhand region were extensively and regularly visited from July 2016 to June 2017 in different seasons for the collection of information regarding the fodder trees. These rural areas were selected after consulting the local administration and elderly people keeping in view that the selected villages would represent all characteristics of the region. The information, regarding the usages of different parts of tree as fodder, was collected by various direct meetings/discussions and interviewing elderly learned and experienced persons of villages who have knowledge about fodder value of trees in the villages of the surveyed district. During the present study, number of informants were consulted, who were between the ages of 45 to 75 years. Oral consent was sought out from each informant before the start of the discussion and interview. Interview and discussion were conducted in both Hindi and local regional Bundelkhandy language. The informants were interviewed in group of rural inhabitants. The questions were asked in stepwise manner by first asking about their age, address, level of education and occupation (Verma *et al.,* 2008). Following that, informants

were asked to share their traditional knowledge on the fodder value of trees.

Observations

1. Botanical name: *Acacia catechu*

- **Family**: Fabaceae
- **Local name/Common name:** Khair
- **Part used**: Leaves and pods
- **Fodder Availability period**: July to November
- **Utilization**: The rural people gave leaves and green pods to cattle as fodder. Livestock also browsed leaves and green pods of young tree in free grazing system.

2. Botanical name: *Acacia leucophoea*

- **Family**: Fabaceae
- **Local name/Common name:** Raionja
- **Part used**: Leaves and pods
- **Fodder Availability period**: July to December
- **Utilization**: The green leaves and tender pods are given as fodder to cattle by farmers. The leaves and pods are also browsed by cattle.

3. Botanical name: *Aegle marmelos*

- **Family**: Rutaceae
- **Local name/Common name:** Bel
- **Part used**: Leaves
- **Fodder Availability period**: May to November
- **Utilization**: The leaves are given as fodder to goats and other animals by the farmers.

4. Botanical name: *Albizia amara*

- **Family**: Fabaceae
- **Local name/Common name:** Siris
- **Part used**: Leaves and pods
- **Fodder Availability period**: November to February
- **Utilization**: Generally green foliage and green pods are given as fodder to cattle like goat and sheep by farmers. The leaves and pods of young tree are also browsed by cattle.

5. Botanical name: *Albizia lebbek*

- **Family**: Fabaceae
- **Local name/Common name:** Kalo Siris
- **Part used**: Leaves and pods
- **Fodder Availability period**: May to November
- **Utilization**: The green leaves and pods are used as fodder to livestock like goat and sheep by farmers. The leaves and pods of young tree are also browsed by cattle.

6. Botanical name: *Albizia procera*

- **Family**: Fabaceae
- **Local name/Common name:** Safed Siris
- **Part used**: Leaves and pods
- **Fodder Availability period**: June to November
- **Utilization**: The green pods and leaves are given as fodder to livestock like goat and sheep by farmers. The leaves and pods of young tree are also browsed by cattle.

7. Botanical name: *Anogeissus latifolia*

- **Family**: Combretaceae
- **Local name/Common name:** Dhau
- **Part used**: Leaves
- **Fodder Availability period**: June to November
- **Utilization**: The leaves fodder is given to cattle like cow, buffalo, Goat and sheep. The foliages are also browsed by cattle from lower canopy of trees.

8. Botanical name: *Anogeissus pendula*

- **Family**: Combretaceae
- **Local name/Common name:** Kardhai
- **Part used**: Leaves
- **Fodder Availability period**: July to November
- **Utilization**: The young green leaves fodder is given to cattle like cow, buffalo, Goat and sheep. The cattle also browsed green leaves while they freely grazed.

9. Botanical name: *Bombax ceiba*

- **Family**: Bombacaceae
- **Local name/Common name:** Semal
- **Part used**: Leaves and flowers
- **Fodder Availability period**: June to September
- **Utilization**: The young green leaves and flowers are used as fodder for cattle like cow, buffalo, Goat and sheep.

10. Botanical name: *Cassia fistula*

- **Family**: Fabaceae
- **Local name/Common name:** Amaltas
- **Part used**: Leaves
- **Fodder Availability period**: July to November
- **Utilization**: The foliages are fed to animal as fodder by rural people. The foliage also browsed by cattle from lower canopy of trees.

11. Botanical name: *Dalbergia sissoo*

- **Family**: Fabaceae
- **Local name/Common name:** Shisham
- **Part used**: Leaves
- **Fodder Availability period**: Whole year
- **Utilization**: The leaves are given to animal as fodder by rural people. The foliage also browsed by cattle from lower canopy of trees.

12. Botanical name: *Emblica officinalis*

- **Family**:Euphorbiaceae
- **Local name/Common name:** Aonla
- **Part used**: Leaves
- **Fodder Availability period**: May to October
- **Utilization**: The leaves fodder is given to cattle like cow, buffalo, Goat and sheep. The leaves are also browsed by cattle from lower canopy of trees.

13. Botanical name: *Flacourtia indica*

- **Family**: Salicaceae

- **Local name/Common name:** Kankar
- **Part used**: Leaves
- **Fodder Availability period**: May to October
- **Utilization**: Generally green foliages are given as fodder to cattle like goat and sheep by farmers. The leaves of young tree are also browsed by cattle.

14. Botanical name: *Helicteres isora*

- **Family**: Sterculiaceae
- **Local name/Common name:** Marodphali
- **Part used**: Leaves
- **Fodder Availability period**: June to November
- **Utilization**: The foliages are fed to animal as fodder by rural people. The foliage also browsed by cattle from lower canopy of trees.

15. Botanical name: *Holoptelia integrifolia*

- **Family**: Ulmaceae
- **Local name/Common name :** Chirola
- **Part used**: Leaves
- **Fodder Availability period**: May to November
- **Utilization**: Generally green foliages are given as fodder to livestock like goat and sheep by farmers. The leaves of young tree are also browsed by cattle.

16. Botanical name: *Lagerstromea parviflora*

- **Family**: Lythraceae
- **Local name/Common name:** Bakli
- **Part used**: Leaves
- **Fodder Availability period**: July to November
- **Utilization**: The leaves are given to animal as fodder by rural people. The foliage also browsed by cattle from lower canopy of trees.

17. Botanical name: *Leucaena leucocephala*

- **Family**: Fabaceae
- **Local name/Common name:** Subabool
- **Part used**: Leaves and pods
- **Fodder Availability period**: November to June
- **Utilization**: The green pods and leaves are given as fodder to livestock by farmers. The leaves and pods of young tree are also browsed by cattle.

18. Botanical name: Pithecellobium dulce

- **Family**: Fabaceae
- **Local name/Common name:** Jungal jalebi
- **Part used**: Leaves and pods
- **Fodder Availability period**: November to June
- **Utilization**: The green leaves and tender pods are given as fodder to cattle by farmers. The leaves and pods are also browsed by cattle.

19. Botanical name: *Prosopic juliflora*

- **Family**: Fabaceae
- **Local name/Common name:** Junglee kikar
- **Part used**: Leaves and pods
- **Fodder Availability period**: January to June
- **Utilization**: The rural people gave leaves and green pods to cattle as fodder. The cattle also browsed leaves and green pods of young tree in free grazing system.

20. Botanical name: *Terminalia arjana*

- **Family**: Combretaceae
- **Local name/Common name:** Arjun
- **Part used**: Leaves
- **Fodder Availability period**: June to November
- **Utilization**: Foliages are fed to animal as fodder by rural people.

21. Botanical name: *Terminalia bellerica*

- **Family**: Combretaceae
- **Local name/Common name:**
- **Part used**: Leaves
- **Fodder Availability period**: June to November
- **Utilization**: The leaves are given to animal as fodder by rural people. The foliage also browsed by cattle from lower canopy of trees.

22. Botanical name: *Zizuphus nummularia*

- **Family**: Rhamnacece
- **Local name/Common name:** Ber
- **Part used**: Leaves
- **Fodder Availability period**: November to June
- **Utilization**: Generally green foliages are given as fodder to livestock like goat and sheep by farmers. The leaves of young tree are also browsed by cattle.

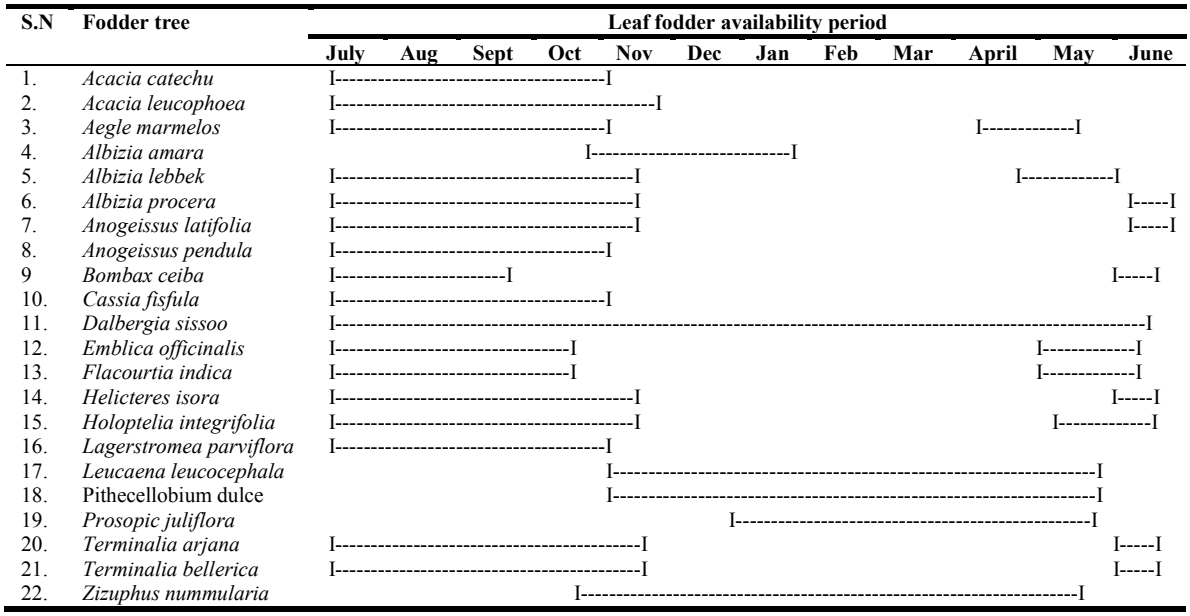
RESULT AND DISCUSSION

The present investigation comprises 22 species of fodder tree distributed in 17 genera belonging to 10 families. The observation of present study exhibited that the rural inhabitants of region used total 22 trees species namely *Acacia catechu, Acacia leucophoea, Aegle marmelos, Albizia amara, Albizia lebbek, Albizia procera, Anogeissus latifolia, Anogeissus pendula, Bombax ceiba, Cassia fistula, Dalbergia sissoo, Emblica officinalis, Flacourtia indica, Helicteres isora, Holoptelia integrifolia, Lagerstromea parviflora, Leucaena leucocephala,* Pithecellobium dulce, *Prosopic juliflora, Terminalia arjana, Terminalia bellerica and Zizuphus nummularia* were extensively used around the year for fodder to their livestock. The leaf fodder availability period was give an idea about that green fodder was available around the whole year *i.e.* from July to June, however fodder production period of tree species was vary significantly. All studied 22 tree species produced leaf fodder in different months of year as maximum 05 tree species (*Albizia procera, Anogeissus latifolia, Helicteres isora , Terminalia arjana, Terminalia bellerica*) produced leaf fodder from June to November while *Acacia catechu, Anogeissus pendula, Cassia fisfula and Lagerstromea parviflora* produced fodder from July to November. Rest 11 fodder tree were yield fodder in different months of year January to June (*Prosopic juliflora*), July to December (*Acacia leucophoea*), June to September (*Bombax ceiba*), May to November (*Aegle marmelos, Albizia lebbek, Holoptelia integrifolia*), May to October (*Emblica officinalis, Flacourtia indica*), November to February (*Albizia amara*),

Table 1. Specieswise leaf fodder availability months

S.N.	Fodder tree	Leaf fodder availability months	No. of species
1.	*Prosopic juliflora*	January to June	1
2.	*Acacia leucophoea*	July to December	1
3.	*Acacia catechu*	July to November	
4.	*Anogeissus pendula*	July to November	4
5.	*Cassia fisfula*	July to November	
6.	*Lagerstromea parviflora*	July to November	
7.	*Albizia procera*	June to November	
8.	*Anogeissus latifolia*	June to November	5
9	*Helicteres isora*	June to November	
10.	*Terminalia arjana*	June to November	
11.	*Terminalia bellerica*	June to November	
12.	*Bombax ceiba*	June to September	1
13.	*Aegle marmelos*	May to November	
14.	*Albizia lebbek*	May to November	3
15.	*Holoptelia integrifolia*	May to November	
16.	*Emblica officinalis*	May to October	2
17.	*Flacourtia indica*	May to October	
18.	*Albizia amara*	November to February	1
19.	*Leucaena leucocephala*	November to June	
20.	Pithecellobium dulce	November to June	3
21.	*Zizuphus nummularia*	November to June	
22.	*Dalbergia sissoo*	Whole year	1

Figure 1. Leaf fodder availability period of fodder trees in present study.



November to June (*Leucaena leucocephala,* Pithecellobium dulce, *Zizuphus nummularia*) and Whole year (*Dalbergia sissoo*). Fodder plants play an important role in the economy of tribal and rural inhabitants as they constitute the feed of their livestock population (Chaudhary *et al.,* 2003).Fodder trees are also one of the major component of agroforestry systems in India (Pathak and Roy, 1992). The results of this research show that there is a wealth of information for feeding domestic animals, with respect to the vegetation composition, nutritional value, palatability and the seasonal availability of the species in both communities, which is a finding similar to those of studies in other countries (Nahed *et al.,* 1997, Thapa *et al.,* 1997, Chettri *et al.*2009, Nunes *et al.,* 2015).Native plants are a valuable resource in the communities, as indicated by respondents. These species are distinguished by the availability and nutritional quality to meet the demands of providing animal weight gain and increase in milk production. Further research is needed for these species (Nunes *et al.,* 2015).

Native plants constitute a valuable resource, according to the indications of the informants. These species are highlighted because of their availability and nutritional quality for meeting animal's requirements, providing weight gain and an increase in milk production. In addition to the benefits of these plants, further study should take into consideration the ecological pressures on these species, which deserve greater attention with regard to management issues and sustainability (Nunes *et al.,* 2015). Recent research carried out in traditional communities in underdeveloped countries discloses a scenario similar to that found in this study regarding the high dependence on fodder plants in the maintenance of subsistence livestock (Aumeeruddy *et al.,* 2004, Nahed *et al.,* 1997, Thapa *et al.,* 1997, Okoli *et al.,* 2003, Tabuti *et al.,* 2009, Chettri *et al.,* 2009, Nunes *et al.,* 2015), as well as emphasizing the importance of local knowledge as a link in the process of the selection of potential plants for a program of sustainable management and conservation of biodiversity (Chettri *et al.,* 2009, Nunes *et al.,* 2015).

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