Effect of lopping intensities on fodder and fuel wood yield of *Prosopis cineraria* in arid zones of Thar.

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Abstract: *Prosopis cineraria* (L.) Druce is widely lopped for fodder and fuelwood by farmers in the arid zones of Haryana. The effect of different lopping intensities on the fodder yield of this species has been studied and the results are reported in the present paper. Field experiments were conducted to assess the impact of different lopping practices on fodder and fuel wood yield of *Prosopis cineraria* (*Khejri*), a multipurpose indigenous tree species of arid zones of Thar. The field studies were conducted at agricultural fields in Simlibass village, 30 kms west to Bhiwani in Haryana (a part of Thar Desert in India), for consecutive three years (2006-2009). Based on the above study, it can be concluded that the fodder yield was generally more from the trees that are lopped annually as compared to those lopped once in two years or once in three years. It was also observed that, the yield of forage increases as the tree girth increases. Similarly, fuel wood yield was also more in annually lopped treatment as comparative to lopping treatments done once in two years and once in three years. This study recommends that mature *Prosopis cineraria* trees (girth >75 cms) can be lopped annually to gain maximum fodder and fuel wood yield.

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Key words: Fodder, fuelwood, *Khejri*, lopping, *Prosopis cineraria*.

1. Introduction

Prosopis cineraria is a commonly grown perennial tree in dry-land agroforestry in dry and arid regions of Northern Western India (Garg et al, 2004). *Prosopis cineraria* (L). druce *(khejri),* a remarkable multi-purpose tree species belongs to family *Mimosaceae* (Shukla et al.,2004). It is also known as *Khejri*, kandi, jand, jandi, sami and ghaf and is found mainly in the dry and arid deserts of India (Arya et al, 1995). *Prosopis cineraria* is an evergreen, moderate sized, thorny, perennial, woody and leguminous tree. In the hot arid agro climatic zones of Thar Desert, *Khejri* play an important role in traditional agroforestry practices (Jatasra and Paroda, 1981). Every plant part of this versatile tree is utilized. The tree is revered by farmers and it is preferred by cultivators to grow in their fields largely due to their strong conviction of better growth underneath these plants since the time innominous (Jaimini and Tikka, 1998). In south-western parts of Haryana which is a part of Great Indian Desert (Thar), trees of *P. cineraria* are frequently lopped by villagers to obtain the leaves for animal fodder and small branches as firewood. As the people are practicing dry land farming and animal husbandry, hence top feed species such as *P. cineraria* are of prime importance in supplementing basic requirements of fodder and fuel wood in these agroclimatic zones. It supplies the bulk of the leaf fodder to cattle, camels and goats. This tree is heavily lopped in seasons when no other green fodder is available. The main lopping seasons are November-January and May-July. (Kumar and Tewari, 2000). In south western arid parts of Haryana this tree is lopped extensively by the villagers, but scientific information is lacking for most of the aspects related to fodder and fuelwood yield of *Prosopis cineraria*. Without adopting a scientific proven methodology for lopping practices of trees, this natural resource base cannot be utilized sustainably. To evaluate the impact of lopping intensities on fodder and fuel wood value of *P. cineraria*, a study was undertaken and an effort has been made to conclude the findings in this research article.

2. Material and methods

The field studies were conducted at agricultural fields in Simlibass village (29^0 10' N and 75^0 46' E), 30 kms west to Bhiwani in Haryana (an agroclimatic zone of Thar Desert), for assessment of fodder and fuelwood production of *Prosopis cineraria* under different lopping frequencies, for consecutive three years (2006-2009). The soil in the area is sandy and the climate is typical arid type. Temperature goes as high as 47^0C in summer and touches freezing point in winter. High velocity dust storms are frequent in summers. Annual rainfall is about 400mm occurring mainly from July to September.

The experimental lay out includes three intervals of complete lopping viz., annual lopping (T1), lopping once in two years (T2) and lopping once in three years (T3), with trees of three girth classes ranging from 45-60cm (G1), 60- 75 cm (G2) and 75-90 cm (G3). These were allotted at random to the three treatments of lopping intervals girthwise. Since each treatment has had three replications and each replication had 30 trees (10 trees from each girth class), a total of 90 healthy trees of Prosopis cineraria were selected. Initially in January 2006, all the trees were lopped completely. Thereafter, they were lopped annually, once in two years and once in three years as the case may be in the month of January. Leaf fodder yield and fuelwood yield data for each of these treatments were recorded and analysed.

3. Results and discussion

Data of sun dried leaf fodder yield (kg) and fuel wood yield (kg) per tree of *Prosopis cineraria* as obtained from trees of various girth classes and treatments are tabulated in Table 1 and Table 2 respectively. A comparison of fodder yield as obtained from trees under the three treatments indicated that the fodder yield was generally more from the trees that are lopped annually as compared to those lopped once in two years or once in three years. It was also observed that, the yield of forage increases as the tree girth increases. Similarly, fuel wood yield was also more in annually lopped treatment as comparative to lopping treatments done once in two years and once in three years. The study indicates that the *P. cineraria* trees should be lopped annually to gain higher benefits in the form of fodder and fuel wood.

Table 1: Sun dried leaf fodder yield (kg) per tree of *Prosopis cineraria*

Treatment	Girth class (cms)		
	G1 (45-60)	G2 (60-75)	G3 (75-90)
T1 Annual lopping	3.185	3.645	4.095
T2 Lopped once in two years	2.875	3.450	3.845
T3 Lopped once in three years	2.610	3.115	3.670
Mean	2.890	3.403	3.870
SEM	0.166	0.154	0.123
CD (5%)	0.714	0.665	0.530

Table 2: Sun dried fuel wood yield (kg) per tree of *Prosopis cineraria*

Treatment	Girth class (cms)		
	G1 (45-60)	G2 (60-75)	G3 (75-90)
T1 Annual lopping	13.800	14.680	15.250
T2 Lopped once in two years	12.740	14.350	14.870
T3 Lopped once in three years	12.425	13.690	14.275
Mean	12.988	14.240	14.798
SEM	0.415	0.291	0.283
CD (5%)	1.789	1.252	1.220

Table 3: Analysis of variance data for fodder yield.

Source of Variation	SS	df	MS	F	P-value	F crit
Rows (Treatment)	0.390172	2	0.195086	74.71383	0.00068	6.944272
Columns (Girth classes)	1.441689	2	0.720844	276.0681	0.000052	6.944272
Error	0.010444	4	0.002611			
Total	1.842306	8				

Table 4: Analysis of variance data for fuelwood yield.

Source of Variation	SS	df	MS	F	P-value	F crit
Rows (Treatment)	1.861489	2	0.930744	22.22084	0.006818	6.944272
Columns (Girth classes)	5.154506	2	2.577253	61.53001	0.000991	6.944272
Error	0.167544	4	0.041886			
Total	7.183539	8				

Previous studies also reveal the results and concluded that annual lopping of *Prosopis cineraria* gives maximum forage yield without adversely effecting the growth of the trees. Similar results were obtained by Srivastava (1978), which reports that *Prosopis cineraria* (*Khejri*) can withstand recurrent and severe lopping without detriment to its growth and subsequent leaf yield. The fodder yield can be increased by 94 to 145% and 288 to 316% when they were lopped annually as compared to two or three years interval, respectively (Srivastava, 1978). A high intensity of lopping had a positive impact on height growth of *Acacia tortilis* (Tewari, 1998). It may be because of the fact that more and more new branches come out due to recurrent lopping and that there is more efficient utilization of reserved food material. An another study revealed that the degree of lopping as such has no significant effects on the year to year height and dbh growth and fodder yield of this tree (Kumar and Tewari, 2000).

In contrast, Bangarwa and Hooda (2007) reported that *Khejri* should be lopped at an interval of three years to gain maximum benefits as annual lopping harms the tree growth and adversely affects the fodder and fuelwood yield. Heavy lopping has been found to affect growth rate of *Acacia nilotica* trees adversely in semi arid zone of Haryana (Rawat, 1993). The analysis shows that girth classes have more significant effect on fodder and fuelwood yield as compared to lopping treatments (Table 3 and 4).

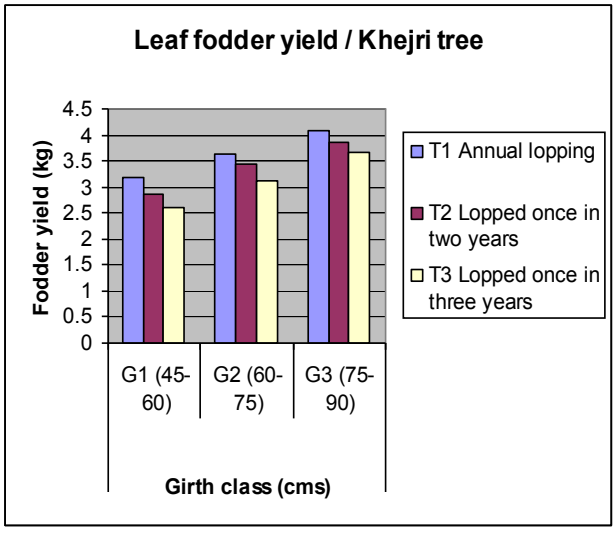

Figure 1: Sun dried leaf fodder yield (kg) per tree of *Prosopis cineraria*

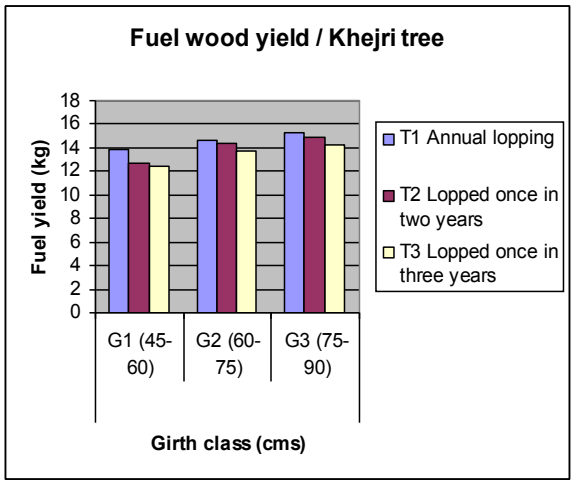

Figure 2: Sun dried fuel wood yield (kg) per tree of *Prosopis cineraria*

Conclusion:

The study revealed that *Prosopis cineraria* tree plays a vital role in providing fodder for domesticated animals and fuel wood for domestic purpose in arid areas of Thar. The results obtained led to the conclusion that *P. cineraria* trees should be lopped annually to gain maximum fodder and fuel wood yield. It can also be concluded that the trees above 75 cms girth should be lopped for higher returns in the form of fodder and fuel wood. Trees at a young age should not be lopped as previous studies indicate that lopping affect growth of trees at young age adversely. Hence, annual lopping of mature trees of *Prosopis cineraria* should be practiced to gain sustainable benefits in the form of fodder and fuelwood.

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