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Chemical composition of tree tops in Vindhya Region of Utter Pradesh

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Abstract
The present study was carried out during 2015-2017 at Department of Animal Husbandry and Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh (India). The result revealed that chemical composition in terms of proximate principles was analyzed in tree tops during spring seasons with a view of using them as feed for small and large ruminants in Vindhya Region of Utter Pradesh. Dry matter contents ranged from 18.98±0.34 to 55.75±0.67 %. Crude protein contents ranged from 7.71±0.09 to 20.75±0.02 %. The ether extract content varied from 1.87±0.06 to 10.55±0.33 and crude fiber content from 7.55±0.32 to 26.47±0.37 %. Ash contents were in the range of 7.88±0.11 to 18.68±0.61%, Acid insoluble ash contents ranged from 0.88±0.42to8.01±1.36 % and Nitrogen free extract were found in ranged from 37.80±0.54 to 65.60±3.73%. Tree leaves could be effectively used as feed for ruminants throughout the year according to their availability and on the basis of nutrient content.

Keywords: Tree tops, proximate composition, chemical composition

Introduction
Nutrition is the most important consideration in ruminant production systems. Supply of feed in inadequate amount and quality is responsible to a large extent for the low livestock productivity in the India. At present, the country faces a net deficit of 61.1% green fodder, 21.9% dry crop residues and 64% concentrate feeds (Datta, 2013) [7]. Simultaneously, Indian feeds and fodders for livestock are also having nutrients insufficiency of energy, protein and minerals. In ruminant production, the feeding value of forages depends on the balance between available nutrient and the quantity of the nutrient ingested by the animal. Animals are mainly grazed in fallow lands, bunds and harvested fields. The fodder value of tree leaves is often superior to herbaceous plants particularly in case of legumes. In arid and semi-arid zones, they provide the largest part of protein supply during the driest months (Rai *et al*. 2007) [16]. Although tree leaves and shrubs form an integral part of the diet of grazing small and large ruminants, there is little information on nutritive value and utility of the tree fodders available in Vindhya Region of Utter Pradesh. Trees and shrubs are important components of ruminant diet (Babayemi and Bamikole, 2006) [3] and they have been found to play an important role in the nutrition of grazing animals in areas where few or no alternatives are available (Van *et al*., 2005) [21]. Tree and shrub leaves have the huge potential for alleviating some of the feed shortages and nutritional deficiencies experienced in the dry season on small farm holders (Salem *et al.,* 2006) [18]. Although tree and shrub leaves are key sources of forage for ruminants, there is little information on the nutritive value of tree and shrub leaves.

Materials and methods
The representative samples commonly available tree tops in Vindhya Region of Utter Pradesh. These tree tops samples were selected for the study purpose. Representative samples of individual species were drawn immediately after collection and oven dried for estimation of dry matter (DM). Rest of the samples was oven dried, grinding the dry samples and to pass through 1mm sieve and used for analysis of proximate principles – crude protein (CP), crude fibre (CF), ether extract (EE), total ash (TA), acid insoluble Ash (AIA), and Nitrogen free extract (NFE) was calculated by difference on DM basis.

Results and discussion
As indicated earlier voluminous literature is available with respect to chemical composition of tree tops. The data available, however, are so variable and deceptive that their authenticity need further strengthening particularly of tree tops available from the Vindhya region of Uttar

Pradesh, India. Chemical Composition of tree tops is presented in table 1 which is revealed that the *Acacia catechu* (55.75±0.67) and *Zizyphus nummularia* (51.73±0.45) registered the highest total DM content (%) and the lowest value was shown by *Ocimum tenuiflorum* (18.98±0.34) and *Mores alba* (20.84±0.25). *Callistemon* and *Mangifera Indica* highly rich in CF (%) (26.47±0.37) and (25.77±0.06) respectively while lowest value were showed by *Moringaoleiferawere* and *Terminalia arjuna* (7.55±0.32) and (8.17±0.19) respectively. Moreover, out of the 30 tree leaves, 20 contained CF less than 18% indicating these could be more digestible in ruminants. Crude protein (CP) content in the tree samples varied among different species. *Moringaoleifera* (20.75±0.02) and Ailanthus *excels* (19.43±0.08) were rich sources of crude protein while *Syzygium cumini* (7.71±0.09) and *Madhukalangi folia* (7.72±0.08) were low in CP. Earlier reports (El-Shatnawi and Mohawesh, 2000) [8] suggested that ruminants require 7 to 9% CP for maintenance and 10 to 12% for lactation. These tree leaves can be used to meet the CP requirements of ruminants for maintenance and lactation.

Ash content in the tree samples varied among different species. *Aeglemarmelos* (18.68±0.61) and *Ficus racemosa* (16.67±0.23) were rich sources of ash (%), while *Syzygium cumini* and *Acacia catechu* were low in ash (%) (7.88±0.11) and (9.14±0.41) respectively. The EE (%) content varied from (1.87±0.06) and (3.03±0.02) in *Aeglemarmelos* and *Psidium guajava* respectively were low while *Tamarindus indica* and *Terminalia arjuna* are highly rich in EE (10.55±0.33) and (9.83±0.60) respectively.

Srivastava *et al.* (2006) [20] reported high CP contents of *M. alba*, 15.31-30.91% on DM basis. Proteins of mulberry leaves are of high quality and used with wheat flour to make parathas in the sub-continent. CP contents of all the species of this study were approximately higher than 10%, sufficient for medium level of production from ruminants has reported that a higher proportion of the CP in the fodder tree leaves is actually in the form available to ruminants. The fodder tree leaves are higher preferred by the farmers for their palatability and performance of the animal.

The Table 1 further reveals that *Tectonagrandis* and *Ficusreligiosa*are highly rich in AIA content (8.01±1.36) and (7.59±0.59). The lowest AIA percentage was recorded in *Syzygium cumini* (0.88±0.42) and *Callistemon* (1.31±0.34). NFE content in the tree samples varied among different species. *Madhukalangifolia* (65.60±3.73) and *Terminalia arjuna* (61.08±0.44) rich sources of Nitrogen free extract while *Dalbergiasissoo* (37.80±0.54) and *Ocimumtenuiflorum* (43.68±0.21) was low in NFE.

Table 1: The chemical composition of different tree tops used as feeds.

S. No.	Botanical name	Average composition % (dry matter basis)						
		DM%	CF%	CP%	EE%	TA%	AIA%	NFE%
1.	*Cassia fistula*	28.22±0.36	14.17±0.10	10.68±0.07	4.77±0.32	12.07±0.42	1.48±0.01	58.32±0.26
2.	*Ailanthus excels*	35.66±0.28	9.36±0.06	19.43±0.08	5.46±0.11	10.24±0.61	1.50±0.16	55.50±0.36
3.	*Callistemon*	40.85±0.58	26.47±0.37	9.44±0.07	7.45±0.15	10.56±0.16	1.31±0.34	46.08±0.29
4.	*Moringaoleifera*	33.27±0.65	7.55±0.32	20.75±0.02	5.66±0.18	14.55±0.58	2.01±0.27	51.48±0.45
5.	*Dalbergiasissoo*	25.53±0.33	24.60±0.47	16.15±0.08	8.55±0.28	12.90±0.27	3.52±0.24	37.80±0.54
6.	*Pithecellobiumdulce*	44.31±0.24	9.65±0.27	17.40±0.08	8.92±0.10	12.47±0.37	3.11±0.15	51.57±0.62
7.	*Syzygiumcumini*	37.47±0.38	20.91±0.15	7.71±0.09	5.57±0.33	7.88±0.11	0.88±0.42	57.93±0.28
8.	*Tamarindusindica*	47.33±0.62	11.73±0.19	11.08±0.01	10.55±0.33	13.63±0.50	3.55±0.45	53.01±0.63
9.	*Terminaliaarjuna*	41.28±0.16	8.17±0.19	9.13±0.08	9.83±0.60	11.79±0.43	2.56±0.37	61.08±0.44
10.	*PongamiaPinnata*	44.03±0.20	14.99±0.08	16.77±0.08	3.46±0.59	11.38±0.61	3.12±0.62	53.40±0.19
11.	*Laucaenaleucocephala*	26.43±0.39	14.74±0.07	14.28±0.08	4.01±0.19	10.32±0.01	1.57±0.31	56.64±0.21
12.	*Buteamonosperma*	47.27±0.35	18.99±0.26	12.88±0.08	4.13±0.07	16.29±0.20	6.66±0.16	47.72±0.31
13.	*Ocimumtenuiflorum*	18.98±0.34	14.12±0.07	16.68±0.14	9.35±0.23	16.17±0.23	2.31±0.12	43.68±0.21
14.	*Acacia catechu*	55.75±0.67	10.85±0.27	15.75±0.01	7.56±0.12	9.14±0.41	2.31±0.13	56.70±0.57
15.	*Zizyphusnummularia*	51.73±0.45	17.55±0.31	13.18±0.07	4.28±0.05	10.64±0.27	2.01±0.09	54.35±0.09
16.	*Azadirachtaindica*	38.42±0.36	15.44±0.20	15.68±0.26	4.53±0.37	10.42±0.04	2.80±0.54	53.93±0.05
17.	*Vachellianilotica*	49.59±0.41	15.07±0.31	15.50±0.10	5.02±0.38	9.63±0.33	1.72±0.35	54.79±0.35
18.	*Mores alba*	20.84±0.25	16.49±0.20	18.64±0.10	4.03±0.01	12.57±0.01	2.78±0.03	48.27±0.29
19.	*Madhukalangifolia*	34.97±0.36	10.18±0.74	7.72±0.08	5.08±0.06	11.41±2.87	3.89±1.04	65.60±3.73
20.	*Ficusreligiosa*	35.67±0.41	19.28±0.45	9.37±0.01	3.56±0.20	14.63±0.53	7.59±0.59	53.16±0.11
21.	*Tectonagrandis*	47.27±0.35	19.34±0.12	9.20±0.00	4.78±0.19	13.02±0.31	8.01±1.36	53.66±0.38
22.	*Artocarpusheterophyllus*	33.60±0.08	18.41±0.56	13.74±0.00	3.12±0.07	12.30±0.94	3.91±0.26	52.44±0.45
23.	*Annona reticulate*	37.89±0.39	13.73±0.44	11.56±0.00	7.07±0.10	13.57±0.54	3.90±0.76	54.06±0.20
24.	*MangiferaIndica*	31.74±0.61	25.77±0.06	9.45±0.08	8.24±0.22	11.72±0.15	4.40±0.87	44.83±0.35
25.	*Psidiumguajava*	39.28±0.32	17.44±0.37	11.53±0.01	3.03±0.02	10.75±0.09	1.98±0.27	57.25±0.45
26.	*Ficusracemosa*	30.21±0.31	9.19±0.62	12.65±0.00	5.64±0.27	16.67±0.23	6.03±0.06	55.85±0.66
27.	*Ficusbenghalensis*	25.60±0.22	25.21±0.43	8.90±0.00	3.51±0.19	11.33±0.15	2.60±0.36	51.05±0.38
28.	*Delonixregia*	41.27±0.13	21.32±0.16	14.67±0.01	5.81±0.06	11.70±0.80	2.29±0.75	46.50±0.70
29.	*Prosopis cineraria*	40.01±0.23	17.89±0.17	12.92±0.01	4.10±0.03	14.80±0.28	3.62±0.90	50.28±0.49
30.	*Aeglemarmelos*	30.59±0.26	12.48±0.31	12.31±0.01	1.87±0.06	18.68±0.61	3.38±1.13	54.66±0.36

Data are mean ± SD values of triplicate determinations

DM = Dry matter, EE = Ether extract, CP = Crude protein, CF = Crude fiber.

TA = Total ash, AIA = Acid insoluble ash, NFE = Nitrogen free extract.

Conclusion

Based on the findings of this study, it may be concluded that tree tops available in Vindhya Region of Utter Pradesh, these tree tops are good source of protein and low in fibre and can be used as feeds for small and large ruminants throughout the year. These tree tops are a good alternative for substituting commercial rations for ruminants animal.

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