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Short Communication

Qualitative Evaluation of Fodder Trees and Grasses in Hill Region

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ABSTRACT

Leaves from eleven trees and sixteen grasses were selected for evaluation of fodder quality. It was found that dry matter production was highest in *Kharak* (37.22%) and Lemon grass (19.25%). The organic matter was highest in ravines (92.15%) and broad leaf Pasfelum (71.48%). Manganese content was high in Utish (145.86 ppm) and Para (150.45 ppm). Iron was found higher in Betain (185.43 ppm) and Lemon grass (180.57 ppm). Calcium was found maximum in Betain (1.84%) and (180.57 ppm). The crude protein content was highest in Fanead (19.24%) and Cetoria cajungula (16.85%). Crude protein and calcium are the most important for feeding the ruminant. Thus fanead and cetoria cajungula are good source of crude protein and capable of providing energy sources to the ruminant. On the other hand Betain and Napier are also found significantly useful in terms of calcium. Thus, these trees and grasses species can be recommended to the farming community of hilly region for uplifting the nutritional demand for their ruminants.

Key words: Calcium, Crude protein, Fodder quality, Grasses, Trees.

INTRODUCTION

India has the largest livestock population in the world numbering 500 M which constitute about 15per cent of the global total. The contribution of livestock sector to the gross domestic product in India has increased from 4.82 to 5.37 per cent in recent times (Wangchuk *et al,* 2015). In the overall agricultural economy of the country, the livestock sector contributes about 25 per cent to the overall agricultural GDP. The fodder trees provide nutritious feed to the livestock population of hill farmers (Diriba, 2014). Even the landless labourers, keeping small herds of animals mostly depend on the top feed resources from trees growing near habitats. Fodder trees and grasses are one of the predominant land use systems in North-Western Himalaya and have always played a role in feeding livestock. Trees and grasses are increasingly recognized as important components of animal feeding, especially as suppliers of protein. In the present scenario the acute deficiency of nutrients leads to under nourishment, low productivity and predisposes the livestock to parasitism, epidemics and breeding problems. The misuse of rangelands has deteriorated the rangeland ecosystem. The ruminants' productivity is related to the supply of good quality fodder (Kohler *el al,* 2015). On an average, only 4 per cent of the sown area is under cultivable fodder production and the grazing land is only 3.5 per cent of the total geographical area. Of the total fodder requirement in India, 57 per cent is met from the forests.

During the last few years, many studies have been done on the chemical composition of browse species, and the protein, mineral and vitamin concentrations have in general been shown to be adequate for the maintenance requirement of grazing camels (Rani *et al,* 2015). Keeping the importance of fodder quality, the study was undertaken to assess the chemical composition and potential nutritive value evaluation of different fodder trees and grasses in the north western Himalaya. Emphasis

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was given on identification of quality trees and grasses as fodder for farmers of hill region.

MATERIALS AND METHODS

The experiment was carried out at Vivekananda Parvatiya Krishi Anusandhan Sansthan (VPKAS), Almora, Uttarakhand to evaluate the quality parameters of trees and grasses for identifying best fodder in the mountain region. Eleven trees and sixteen grasses were selected. The eleven selected trees are Kharak, Kachnar, Bhimal, Betain, Oak, Sehetud, Rovinea, Manipur oak, Fanead, Utish, Padam. The sixteen selected grasses are Kongo signal, Lemon grass, Desmodium, Napier, Ginni, Cetoria cajungula, Para, Khas-khas, Pangola, Rodus, Penicum chlorotum, Salum, Broad leaf pasfelum, Digiteria, Setaria nandi, Ons. Leave samples of different trees and grasses were collected dried in the hot air oven at 65ºC for 24h and ground to pass through 1mm sieve. These were analyzed for proximate principles (AOAC, 1995), *viz.*, dry matter (DM), organic matter (OM), crude protein (CP), (Goering *et al*, 1970). Tannin was also estimated as per the methodology of Sastry *et al* (1999). For mineral analysis, the samples were digested using di-acid mixture (HNO_3 + $HClO_4$). Calcium was determined using flame photometer and trace minerals (Fe and Mn) using Atomic Absorption Spectrophotometer. All the determinations were carried out in triplicate. Data were analyzed using completely randomized block design (CRBD) and various correlations were drawn as per Snedecor *et al* (1989).

RESULTS ANS DISCUSSION

Nutritive value of tree fodder

The data (Table 1) revealed that among the eleven trees dry matter production was highest in Kharak (37.22%), followed by Oak (36.18), Sehetud (35.64%) and lowest in Utish (29.45%). The organic matter was highest in Ravines (92.15%) followed by Kachnar (90.42%) and lowest in Sehetud (81.45%). Tannin content was found only in Manipur oak (0.37%) and Rovinea (0.14%). Manganese was high in Utish (145.86 ppm) followed by Bhimal (135.75 ppm) and lowest in Kachnar (60.48 ppm). Iron was found higher in Betain (185.43 ppm) followed by Manipur oak (174.28 ppm), Rovinea (156.23 ppm) and lowest in Oak (90.47 ppm). The most important element for animal is calcium and found maximum in betain (1.84%) followed by Oak (1.78%), Bhimal (1.65%), Sehetud (1.53%), Padam (1.48%), Rovinea (1.47%) and lowest in Manipur oak (0.95%) followed by Kharak (0.91%). The crude protein content in different trees was highest in Fanead (19.24%) followed by Manipur oak (18.53%), Betain (18.45%), Kachnar (17.26%), Rovinea (16.85%) and lowest in Padam (14.64%) followed by Kharak (13.45%).

Nutritive value of grasses

Results (Table 2) revealed that among the sixteen grasses, dry matter production was highest in Lemon grass (19.25%) followed by Setaria nandi (18.46%), Pangola (18.45%), Napier (17.64%) and lowest in Rodus (11.27%). The organic matter was highest in Broad leaf pasfelum (71.48%) followed by Setaria naidi (70.66%) and lowest in Kongo signal (50.45). Tannin content was found only in Pangola (0.13 %) and Setaria naidi (0.17%). Manganese was high in Para (150.45 ppm) followed by Digiteria (113.57 ppm) and lowest in Ons (15.45 ppm). Iron was found higher in lemon grass (180.57 ppm) followed by Pangola (167.58 ppm), Khas-khas (155.34) and lowest in Ginni (80.94 ppm) followed by Digiteria (50.57 ppm). Calcium is found maximum in Napier (1.15%) followed by Rodus (0.94%), Lemon grass (0.89%), Para (0.87%), Desmodium (0.76%) and lowest in Salum (0.37%) followed by Ons (0.31%). The most important parameter for fodder quality assessment is crude protein and was found highest in Cetoria cajungula (16.85%) followed by broad leaf Pasfelum (16.73%), Lemon grass (16.47%), Napier (15.84%), Khas-khas (15.75%), Salum (15.48%) and lowest in Desmodium (11.45%) and Ons (10.51%).

The values obtained for proximate principles in this study were in the normal range (Chander *et al,*

Table 1. Nutritive composition of eleven different trees.

	On dry matter basis percentage (%)					Mg/kg (ppm)	
Tree	**DM (%)**	**OM**	**CP**	**Tannin**	**Ca**	**Fe**	**Mn**
Kharak (*Celtis australis*)	37.22	87.15	13.45	-	0.91	110.12	117.84
Kachnar (*Bauhinia variegata*)	34.54	90.42	17.26	0.23	1.23	107.25	60.48
Bhimal (Grewia optiva)	30.89	84.63	14.25	-	1.65	135.75	135.75
Betain (*Dalbergia latifolia*)	32.87	86.45	18.45	-	1.84	185.43	50.86
Oak (*Quercus leucotrichophora*)	36.18	88.58	15.64	-	1.78	90.47	125.87
Sehetud (*Moras alba*)	35.64	81.45	14.78	-	1.53	95.75	90.78
Rovinea (*Robinea Pseudoacacia*)	34.28	92.15	16.85	0.14	1.47	156.23	98.45
Manipur Oak (Quercus serrata)	37.15	88.75	18.53	0.37	0.95	174.28	87.81
Fanead (*Prunus cerasoides*)	30.17	86.23	19.24	-	1.37	123.85	130.31
Utish (*Alnus nepalensis*)	29.45	83.57	15.47	-	1.27	132.67	145.86
Padam (*Anthocephalus kadamba*)	31.57	85.45	14.64	-	1.48	145.24	110.87

**DM= dry matter; OM= organic matter; CP= crude protein; TN= tannin*

Table 2. Nutritive composition of sixteen different grasses

	On dry matter basis percentage (%)					Mg/kg (ppm)	
Trees	**DM**	**OM**	**CP**	**Tannin**	**Ca**	**Fe**	**Mn**
Kongo signal (*Brachiaria ruziziensis*)	17.24	50.45	12.45	-	0.62	130.45	28.45
Lemon grass (*Cymbopogon citratus*)	19.25	67.45	16.47	-	0.89	180.57	35.48
Desmodium (*Desmodium intortum*)	12.54	55.75	11.45	-	0.76	90.45	33.27
Napier (*Pennisetum purpureum*)	17.64	62.78	15.84	-	1.15	120.57	87.45
Ginni (*Megathyrsus maximus*)	15.87	59.78	14.97	-	0.57	80.94	67.56
Cetoria cajungula	14.67	61.87	16.85		0.46	150.64	15.57
Para (*Brachiaria mutica*)	11.27	51.27	13.47	-	0.87	110.93	150.45
Khas-Khas (*Chrysopogon zizanioides*)	16.27	53.45	15.75	-	0.49	155.34	97.57
Pangola (Digitaria eriantha)	18.45	54.78	13.27	0.13	0.73	167.58	64.45
Rodus (*Chloris gayana*)	11.87	60.78	15.45	-	0.94	98.27	71.45
Panic grass (*Penicum chlorotum*)	16.45	62.48	14.63		0.67	113.67	49.48
Salum (*Panicum capillare*)	17.45	67.48	15.48	-	0.37	118.57	37.61
Broad leaf pasfelum (*Paspalum* mandiocanum)	16.75	71.48	16.73	-	0.49	85.17	91.27
Digiteria (*Digitaria sanguinalis*)	17.56	64.95	13.67	-	0.67	50.57	113.57
Setaria Nandi (*Setaria sphacelata* cv. Nandi)	18.46	70.66	11.73	0.17	0.58	137.37	97.37
Ons (*Pennisetum pedicellatum*)	15.32	54.85	10.54	-	0.31	125.61	15.45

*DM= dry matter; OM= organic matter; CP= crude protein; TN= tannin

2017). Leguminous trees had higher crude protein content than the non-leguminous ones, which is in agreement with other studies (Takele *et al,* 2014 and Santoso *et al,* 2013). In this experiment, all the trees and grasses possessed more than 10 per cent of crude protein. Below this level, rumen fermentation is adversely affected. Most of these species (trees and grasses) were rich in crude protein and the concentration was higher in trees than grasses. This supported the results of Setyawati *et al* (2016). The high crude protein contents of these trees and grasses will encourage their uses as high protein sources in some food formulations. It has been reported that protein-calories malnutrition deficiencies is a major factor responsible in nutritional pathology (Roger *et al,* 2005 and Fadiyimu *et al,* 2014). The range of tannin contents (0.13-0.37) in the present study was low and good for animal health. However, variability in tannin content in tree leaves and grasses at different places is expected owing to several factors *viz.,* geographical distribution of plant species, climate, maturity, etc. (Diriba 2014) Most of the trees and grasses were adequate to rich sources of Ca, Fe and Mn which will minimize reproductive disorders of dairy cattle in relation to mineral deficiency.

CONCLUSION

The results indicated that all these tree species and grasses have the potential to provide essential nutrients to the ruminant. Fanead and Cetoria cajungula were envisaged as a good source of crude protein, hence capable of providing energy to the ruminant and very good for the digestive system. Betain and Napier were also found significantly useful in terms of elemental resources; particularly Ca level. Sufficient attention need to be paid to farmer's knowledge about various trees and grasses fodder with regards to their feed value, biomass yield, palatability, fuel wood production, control of soil erosion, effect on crop production etc.

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