

Nutrient composition and *in vitro* degradability of some tropical shrubs from Pakistan

M R Virk^{1,2}, A S Chaudhry¹

¹Newcastle University, Newcastle upon Tyne, United Kingdom, ²University of Agriculture, Faisalabad, Pakistan

Email: a.s.chaudhry@ncl.ac.uk

Introduction The range livestock production in Pakistan mostly depends on post harvest grazing or grazing on marginal or salty or waterlogged lands that are not suitable for traditional crops. Due to regional variations in the quality of grazing lands the forage availability for animal production is not always predictable. Unstable fodder availability with nutritional deficiencies can cause poor livestock production as animals have to rely mostly on poor quality feeds. Tree and shrub leaves can potentially alleviate some problems of feed shortages and nutritional deficiencies especially for range animals during fodder scarcity seasons. However, it would be essential to estimate the nutritive value of these leaves before their use for feeding animals. This study therefore evaluated different drought resistant and salt tolerant shrubs for their nutrient composition and *in vitro* dry matter (DM) degradability (IVD) alongside grass nuts (grass) as a good quality processed forage. The results of this study may help design future strategies for the use of these shrubs in ruminant diets to partly overcome the animal feed shortage in some tropical regions.

Materials and methods This 5x7 factorial study in triplicate compared the IVD of 5 plants including grass nuts as a control and 4 shrubs (Baker or *Adhatoda vasica*= AV; Sanatha or *Dodonea viscosa*=DV; Australian acacia or *Acacia ampliceps*= AA; and saltbush or *Atriplex lentiformis*= AL) at 7 incubation hours (0, 6, 12, 24, 48, 72, 96). A sample of grass nuts that has already been tested in this laboratory was used as a standard control whereas the shrub leaves were collected, dried and transported to the UK. These samples were re-dried and ground through 1mm sieve before determining in triplicate their nutrient and total phenolic (TP) contents. Rumen fluid was obtained from 2 fistulated sheep prior to their morning feeding, strained through a cheese cloth into pre-warmed flasks under CO₂ and mixed with a pre-warmed buffer at 1:4 ratio to prepare the inoculum which was kept at 39°C until used. About 0.4g of each sample was weighed into a marked test tube to which 40 ml of the inoculum were added under CO₂. The tubes were sealed with rubber stoppers and incubated at 39°C for the pre-determined times before placing these tubes in ice to stop fermentation. The residues were collected after centrifuging the tubes at 10,000 rpm for 10 minutes, washed with distilled water and dried at 60°C to determine IVD. The data were analyzed by using General Linear Model of SAS® to compare the differences between these plants for their nutrients and IVD for each incubation time at P<0.05. The effect of time or the plant x time interaction was not tested in this analysis. However, the Tukey's posthoc test was used to compare the treatment means for each time at P<0.05.

Results Table 1 shows significant differences between these plants for most nutrients and IVD at each incubation time (P<0.05). *A vasica* contained significantly more CP but less NDF and ADL than other plants including grass nuts (P<0.05). The patterns of change in IVD of shrubs with increasing times were comparable to that of grass nuts as a control. IVD increased significantly (P<0.001) with the increased incubation time (P<0.001). However, the extent of difference between mean IVD of shrubs depended upon the shrub type and the incubation time (P<0.001). In fact, IVD of AV and AL were closer to grass nuts but greater than those of DV and AA at most incubations times. *D viscosa* contained highest TP but lowest CP and IVD than other shrubs (P<0.001).

Table 1 Mean nutrient composition and IVD for different incubation hours of tropical shrubs and grass nuts

Items	Nutrient composition (g/kg or g/kg DM)							<i>In vitro</i> degradability at hours (g/kg)							
	DM	OM	CP	EE	NDF	ADL	TP	0	6	12	24	48	72	96	
<i>A vasica</i>	918	840	285	13	231	109	22	258	306	350	393	482	512	539	
<i>D viscosa</i>	922	942	83	17	311	119	73	210	239	259	287	312	339	348	
<i>A ampliceps</i>	937	874	155	14	574	320	10	199	228	250	289	326	349	391	
<i>A lentiformis</i>	955	780	106	9	445	134	7	229	263	291	301	398	450	534	
Grass nuts	940	921	168	29	606	ND	ND	190	240	287	306	414	473	535	
SEM	1.6	13.6	8	5.6	3.9	13.1	8	7	8	10	12	18	20	24	
Significance	*	***	***	NS	***	***	**	***	***	***	***	***	***	***	

ND=not determined; NS= non significant; *, ** and *** represent significance at P<0.05, P<0.01 and P<0.001 respectively

Conclusions Although these shrubs showed variable nutrients and IVD in comparison with the grass nuts, they appeared to have the potential for their use in formulating ruminant diets during the feed shortage seasons of different regions of Pakistan. Further studies will look at the suitability of different amounts of these shrubs as potential supplements for forage consuming livestock particularly in tropical countries where animal production is restricted by the feed shortages.

Acknowledgments Thanks to Pakistan Higher Education Commission for funding and Mehedi Khan, Helio Lima Neto and M Safdar Anjum for their help during the laboratory analysis