



SHORT COMMUNICATION

**NUTRITIONAL EVALUATION OF LEAVES OF
ZIZYPHUS IN GOATS**

P.N. DWIVEDI, B.K. BHADORIA, A.B. MOJUMDAR AND V.S. UPADHYAY

Division of Plant Animal Relationship,
Indian Grassland and Fodder Research Institute, Jhansi-284 003, India

(Received on August 30, 2003)

ABSTRACT

Twelve adult *Barbari* goats were randomly distributed in three equal groups. Sundried leaves of *Zizyphus jujuba*, *Z nummularia* and *Z zyiopyrus* were fed *ad libitum* to group I, II and III, respectively for 30 days and at the end 7 days metabolic trial was conducted. Proximate and cell wall composition of three species of *Zizyphus* were comparable except hemi-cellulose content which was low in *zyiopyrus*. The CP content was more in *Z nummularia* (12.60%) than *Z jujuba* (11.81%) and *Z zyiopyrus* (10.68%). The considerable amount of lignin, tannin and total phenol contents were present in these *Zizyphus* species and the highest content was observed in *Z jujuba*. The DMI was similar in the three groups of animals whereas, digestibility of DM was lower ($P < 0.05$) in *Z jujuba* than *Z nummularia* and *Z zyiopyrus*. Similarly, CP, CF, NDF, ADF and hemi-cellulose digestibilities were also lower in *Z jujuba*. Nitrogen retention was significantly higher ($P < 0.05$) in *Z nummularia* and *Z zyiopyrus* as compared to *Z jujuba*. Results revealed that *Z nummularia* and *Z zyiopyrus* were comparatively better than *Z jujuba* for feeding goats.

Key words : *Zizyphus species*, Feed intake, Nutritive value, Goat

Large number of unexploited shrubs and tree leaves available in different parts of the country need nutritional evaluation including assessment of the anti-nutritional factors for incorporation in the animal feed. The *Zizyphus species* are one of abundantly available shrubs of semi arid region and *Zizyphus nummularia* is considered as important source of nutrient supply for small ruminant. Other species of *Zizyphus* are grown on natural rangeland or forestland and which may serve as a good source of nutrient. Therefore, effort was made to evaluate the utilization of *Zizyphus* shrubs as animal feed in *Barbari* goat.

Three species of *Zizyphus* i.e. *Z. jujuba* (Ber), *Z. nummularia* (Jharberi) and *Z. zyiopyrus* (Ghont) were taken for their nutritional evaluation. Twelve adult male *Barbari* goats (body weight

17.21±1.06) were randomly distributed in three equal group of four in each. Sun dried leaves of *Z. jujuba*, *Z. nummularia*, and *Z. zyiopyrus* were fed as a sole feed, *ad libitum* to group I, II and III, respectively. All the animals were provided drinking water twice daily. After one month adaptation period, a metabolic trial of 7 days duration was conducted. The feed, fecal and urine samples were collected and analysed for proximate principals (AOAC, 1990) and fibre fraction (Goering and Van Soest, 1970). The *Zizyphus* samples were also analyzed for total phenols (Price and Butler, 1977) and tannins (Broadhurst and Jones, 1978). The data obtained were subjected to analysis of variance (Snedecor and Cochran, 1980).

Table 1 : Chemical composition of *Zizyphus species* (% DM)

Components	<i>Z. jujuba</i> (Ber)	<i>Z. nummularia</i> (Jharbari)	<i>Z. zyiopyrus</i> (Ghont)
Organic Matter	90.73	88.54	87.54
Total Ash	9.27	11.46	12.46
Crude Protein	11.81	12.60	10.68
Ether Extract	3.02	3.75	4.42
Crude Fibre	16.30	17.36	13.19
Nitrogen Free Extract	58.60	54.83	59.25
NDF	37.45	40.15	33.30
ADF	31.12	33.50	30.25
Hemicellulose	6.33	6.65	3.05
Acid Detergent lignin	9.59	7.28	7.85
Tannin	4.29	4.20	3.91
Total phenol (%)	13.55	10.83	6.42

Chemical composition of three species of *Zizyphus* was comparable, except hemicellulose content, which was low in *Z. Zyiopyrus*. The CP content was found higher in *Z. nummularia* (12.60%) than *Z. jujuba* (11.81%) and *Z. zyiopyrus* (10.68%). Antinutritional factors like lignin, tannin and total phenol contents were present in considerable amount in all the three species and highest amount was observed in *Z. jujuba* (Table 1). The similar range of lignin, tannin and total phenol content was also reported by Ramana, *et al.*, (2000) in different tree leaves.

Results of metabolic trial revealed that voluntary DMI was similar in all three species of *Zizyphus*. The DMI in different groups of animals were 2.56, 2.82 and 2.75 kg/100 kg BW in group I, II, and III, respectively (Table 2). The digestibility of DM was lower ($p < 0.05$) in *Z. jujuba* (42.2%) than *Z. zyiopyrus* (46.4%) and *Z. nummularia* (47.1%). Similarly, CP, CF, NDF, ADF and hemi-cellulose digestibility coefficients were also found lower in group fed *Z. jujuba*. However, digestibility of nutrients in group II (*Z. nummularia*) and group III (*Z. zyiopyrus*) were almost comparable. The lower digestibility of sole leaves diet also associated with higher ADF content. Ruminant livestock require fibre for normal rumen function but fibre also limits feed intake and digestibility (Albrecht and Broderick, 1990). The digestibility of DM observed in all the three

species of *Zizyphus* was in agreement to *in vitro* gas production and *in sacco* dry matter degradation values of same species of *Zizyphus* (Das *et al.*, 1996).

Table 2 : Feed intake and nutrients utilization in goats fed on *Zizyphus* species

Parameters	Group I	Group II	Group III	C.D. %
	<i>Z. jujuba</i>	<i>Z. nummularia</i>	<i>Z. zyiopyrus</i>	
Intake				
DM intake (g/d) / head	452±6.2	479±8.1	481±9.3	NS
DMI kg/100 kg B.W.	2.56±0.3	2.82±0.3	2.75±0.4	NS
DMI g/kg/bw 0.75	52.32±1.1	57.26±2.2	56.24±2.1	NS
Digestibility of nutrient (%)				
DM	42.25 ^a ±2.1	47.13 ^b ±2.7	46.41 ^b ±2.0	4.14
OM	43.56 ^a ±1.8	49.86 ^b ±1.7	50.35 ^b ±1.6	3.87
CP	32.00 ^a ±1.3	36.28 ^b ±0.9	39.62 ^b ±1.1	3.39
EE	34.13±1.7	36.41±1.5	36.24±1.2	NS
CF	34.49 ^a ±1.0	40.53 ^b ±0.8	41.22 ^b ±1.1	3.21
NFE	56.48±1.7	59.99±2.0	60.25±2.0	NS
NDF	35.79 ^a ±0.8	41.24 ^b ±0.7	42.49 ^b ±0.9	2.96
ADF	33.32 ^a ±0.3	38.88 ^b ±0.4	38.93 ^b ±0.2	1.72
HC	44.46 ^a ±1.3	46.72 ^a ±1.0	52.64 ^b ±2.0	4.09
N-balance (g/d)				
N-intake	8.54±0.3	9.66±0.4	8.22±0.4	NS
N-voided through faeces	5.81±0.1	6.16±0.2	4.96±0.1	NS
N-voided through urine	2.57±0.0	2.77±0.1	2.56±0.1	NS
N-retention	0.16 ^a ±0.0	0.72 ^b ±0.0	0.68 ^b ±0.0	0.12
% retention of absorbed -N	5.80 ^a ±1.0	20.55 ^b ±2.7	20.86 ^b ±2.0	5.73
DCP%	3.78 ^a ±0.4	4.54 ^b ±0.3	4.23 ^{ab} ±0.4	0.74
TDN%	43.82 ^a ±1.3	47.54 ^b ±1.6	48.97 ^b ±2.0	3.70

Figures with different superscripts in a row differ significantly ($P < 0.05$)

The digestibility of CP was relatively lower (39.6%) which might be due to presence of anti-nutritional factors in *Zizyphus* species. Phenolics are the major group in both diversity of structure and the level at which they occur in plants. On ingestion the paramount effect it exerts on the nutrient flow is through the interaction with protein (Reed, 1995). The lignin, tannin and total phenol contents were found highest in *Z. jujuba* resulting in lowest digestibility of CP and other nutrients. The tannin and total phenol content was lowest in *Z. zyiopyrus* and highest protein digestibility was observed in animals of group III. Presence of tannin significantly affects the digestibility of nutrients in browsing ruminants (Hanley *et al.*, 1992). Lignin is the compound most negatively correlated with degradability (Lapierre, 1993; Buxton and Fales, 1994; Dzowela *et al.*, 1995). The lignin, tannin and total phenol might be the factors responsible for lower intake and

digestibility in all three groups. Nitrogen retention was very poor (less than 1 g/d) in the animals of all three groups. However, percent retention of absorbed nitrogen was significantly higher ($P < 0.05$) in *Z. nummularia* (20.5%) and *Z. zizyphus* (20.9%) as compared to *Z. jujuba* (5.6%). The DCP and TDN values were lower in the animals of group I (*Z. jujuba*) as compared to the animals fed on *Z. nummularia* and *Z. zizyphus*. Results of the experiment revealed that *Z. nummularia* and *Z. zizyphus* were found comparatively better than *Z. jujuba* for feeding of the goats.

REFERENCES

- ALBRECHT, K.A. AND BRODERICK, G.A. (1990) Degradation of forage legume protein by rumen microorganisms. In: Agronomy Abstracts. American Society of Agronomy. Madison, WI, p. 185
- AOAC (1990) *Official Methods of Analysis*. 14th edition. Association of Official Analytical Chemists, Washington D.C., USA
- BROADHURST, R.B. and JONESW, J. (1978) Analysis of condensed tannin using acidified vanillin. *J. Sci. Food & Agric.*, 29: 788-794
- BUXTON, D.R. and FALES, S.L. (1994) Plant environment and quality. Forage Quality, Evaluation and Utilization. American Society of Agronomy. Madison, WI, pp. 200-228
- DAS, M.M., DWIVEDI, P.N., KARNANI, L.K. and UPADHYAY, V.S. (1996) *In vitro* gas production and rumen degradation characteristics of *Zizyphus* leaves. *Indian J. Anim. Nutr.*, 13: 142-147
- DZOWELA, B.H., HOVE L, TOPPS, J.H. and MAFONGOYA, P.L. (1995) Nutritional and anti-nutritional characters and rumen degradability of dry matter and nitrogen for some multipurpose tree species with potential for agro forestry in Zimbabwe. *Anim. Feed Sci. & Technol.*, 55: 207-214
- GOERING, H.K. AND VAN SOEST, P.J. (1970) Forage fibre analysis (apparatus, reagents, procedure and some applications) Agricultural Handbook No. 379:1-12. Agric. Research Services, USA
- HANLEY, T.A., ROBBINS, C.T., HAGERMAN, A.B., and Mc ARTHUR, C. (1992) Predicting digestible protein and digestible dry matter in tannin containing forages consumed by ruminants. *Ecology*, 73: 537-541
- LAPIERRE, C. (1993) Application of new methods for investigation of lignin structure. Forage Cell Wall Structure and Digestibility. ASA-CSSA-SSSA, Madison, WI, pp. 136-166
- PRICE, M.L. and BUTLER, L.G. (1977) Rapid visual estimation and spectrophotometric determination of tannin content of sorghum grain. *J. Agric. & food chemistry*, 25: 1268-1273
- RAMANA, D.B.V, SULTAN SINGH, SOLANKI, K.R. AND NEGI, A.S. (2000) Nutritive evaluation of some nitrogen and non-nitrogen fixing multipurpose tree species. *Anim. Feed Sci. & Tech.*, 88: 103-111
- REED, J.D. (1995) Nutritional toxicology of tannin and related polyphenols in forage legumes. *J. Anim. Sci.*, 73: 1516-1528
- SNEDOCOR, G.W. AND COCHRAN, W.G. (1980) *Statistical methods*, 6th ed. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi