

PROTEIN VALUE OF SOME WILD AND CULTIVATED TREE LEAVES FOR RUMINANT LIVESTOCK

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Abstract

Protein bound to acid detergent fiber (ADF-P) and *in sacco* digestibility of protein (ISPD) were determined in five wild (*Acacia modesta*, *Pistacia atlantica*, *Pistacia khinjik*, *Olea cuspidata* and *Zizyphus mauritiana*) and five cultivated (*Prunus dulcis*, *Pyrus malees*, *Prunus persica*, *P.domestica* and *Punica granatum*) tree leaves collected from three different locations in Balochistan. Tree species significantly influenced ADF-P ($P<0.001$) and ISPD ($P<0.001$) of the leaves. ADF-P was higher ($P<0.01$) in wild than cultivated tree leaves (19.23% vs 9.01%). Conversely, ISPD was higher ($P<0.001$) in cultivated than wild tree leaves (54% vs 18%). A negative relationship between ADF-P in tree leaves may be done of the major factor limiting bio-availability of protein. It is concluded that in tree leaves crude protein is not a good indicator of their protein value and in addition the leaves should be analyzed for ADF-P and or *in sacco* digestibility.

Introduction

Tree leaves due to their high protein contents are generally considered valuable forage for ruminants. However, tree foliage enormously vary in their chemical composition particularly with regard to anti nutritional factors which may limit bio-availability of important nutrients. The protein contents of feeds have been traditionally expressed as crude protein which is simple and do not indicate its biological value. For the purpose of applied nutrition relating to ruminants, it is highly desired to measure nitrogenous antinutritive factors such as acid detergent fiber-protein together with their degradability characteristics in the rumen (AFRC, 1987). Unfortunately, no information on these aspects of protein in local tree leaves is available in Pakistan. The present research was conducted to characterize protein in some wild and cultivated tree leaves for feeding to ruminant livestock.

Materials and Methods

Five species of wild tree leaves (*Acacia modesta*, *Pistacia atlantica*, *Pistacia khinjik*, *Olea cuspidata* and *Zizyphus mauritiana*) and five species of

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cultivated tree leaves (*Prunus dulcis*, *Pyrus malees*, *Prunus persica*, *Prunus domestica* and *Punica granatum*) were collected from three different locations in Balochistan as described by Niazi *et al.* (1999). The leaves were dried at 70°C in a laboratory oven and ground in a grinding mill to 1 mm particle size. ADF-N was analyzed according to Georing and Van Soest (1970) and *in sacco* protein digestibility was determined as described by Orskov *et al.* (1970) using an incubation time of 12 hours in tow rumen fistulated steers.

The data were analyzed with the analysis of variance procedure and the means were compared with the Tukey's Studentized Range Test (Steel and Torrie, 1980). Relationships among the parameters were calculated with the linear regression method.

Results and Discussion

Protein bound to ADF was calculated as percent of both dry matter and total protein. Protein bound to ADF (% in DM) ranged from 0.11% to 0.36% but the difference among the tree species, presumably due to high coefficient of variation of 67.71%, was statistically non-significant. However, ADF-P as percent in total CP was influenced ($P < 0.001$) by tree species and the mean values ranged from 5.34 to 26.40%. Wild tree leaves had higher ($P < 0.05$) ADF-P than the cultivated species (19.23 vs 9.01% in CP). Van Soest (1982) reported that proteins associated with ADF are mostly unavailable to animal and excreted in faeces. The present results suggested that protein in the wild tree leaves would be poorly utilized by the animal. This is supported by the negative correlation ($r = 0.86$, $P < 0.001$) of ADF-P with the previously reported (Niazi *et al.* 1999a) *in vitro* DM digestibility in the same tree leaves (Fig.1)

In sacco digestibility of protein (ISPD) in the leaves significantly responded ($P < 0.001$) to difference in the tree species (Table 1) and remained higher ($P < 0.01$) in cultivated than wild leaves (53.78 vs 17.48%). ISPD was adversely affected by ADF-P concentrations in the leaves and accounted for 64% of the variation in the results (Fig.2). These observations strongly support the findings of Hayat (1998), Zaman (1998) and Van Soest (1982) in ascribing negative index of feed value to ADF-P. The present results demonstrate that crude protein concentrations may not characterize feeding value of tree leaves and for estimating biological value of protein the proportion bound to ADF and its rumen digestibility should be measured.

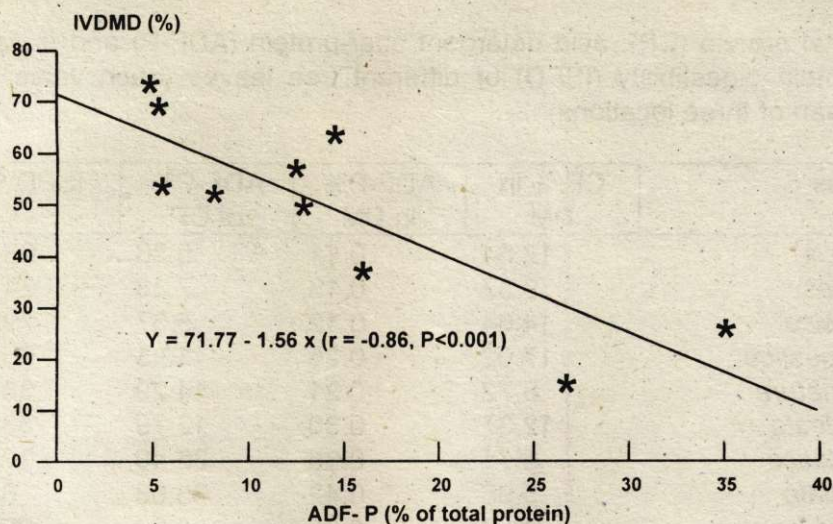


Fig.1. Relationship of acid detergent fiber-P(ADF-P) with *in vitro* DM digestibility (IVDMD) in tree leaves

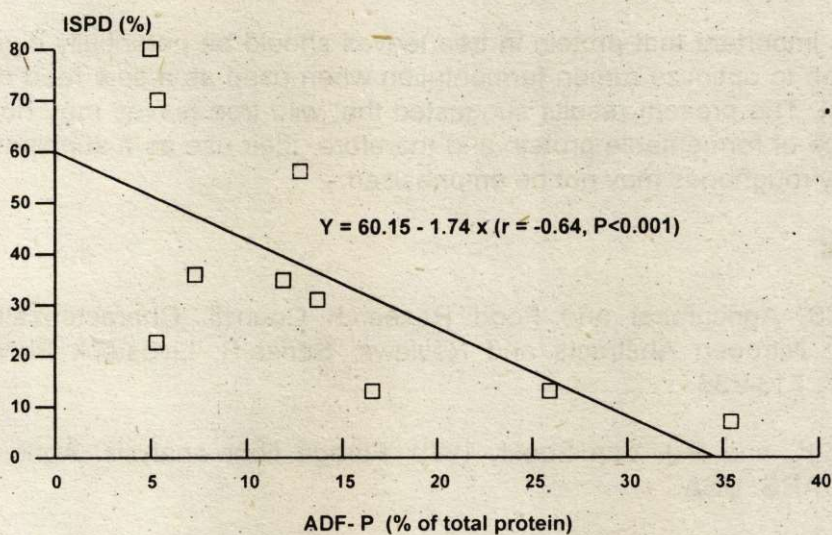


Fig.2. Relationship of acid detergent fiber-P (ADF-P) with 12 hours *in sacco* protein digestibility (ISPD) in tree leaves

Table 1. Total protein (CP), acid detergent fiber-protein (ADF-P) and *in sacco* protein digestibility (ISPD) of different tree leaves (each value is a mean of three locations)

Tree species	CP % in DM	ADF-P% in DM	ADF-P% of CP	ISPD %
<i>Prunus dulcis</i>	12.64	0.11	5.26	68.03
<i>Pyrus malees</i>	9.37	0.13	7.38	34.25
<i>Prunus persica</i>	14.64	0.12	5.37	79.88
<i>Prunus domestica</i>	17.02	0.25	12.3	55.82
<i>Punica granatum</i>	8.72	0.21	14.29	30.92
<i>Acacia modesta</i>	12.37	0.30	12.79	33.70
<i>Pistacia atlantica</i>	5.71	0.35	26.40	12.46
<i>Olea cuspidata</i>	5.96	0.42	35.03	6.94
<i>Pistacia khinjk</i>	4.62	0.09	5.34	22.48
<i>Zizyphus moritiana</i>	9.64	0.36	16.59	11.82
Mean	10.07	0.23	14.11	35.62
LSD (0.05)	3.27	0.34	20.20	11.50
Significance level	P<0.001	NS	P<0.001	P<0.001

It is important that protein in tree leaves should be potentially digestible in the rumen to optimize rumen fermentation when used as a sole feed or as a supplement. The present results suggested that wild tree leaves may not be a good source of fermentable protein and therefore, their use as a supplement to poor quality roughages may not be emphasized.

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