



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(3): 321-324
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www.thepharmajournal.com
Received: 21-01-2022
Accepted: 23-02-2022

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Proximate composition (%) of different fodder trees/grasses and straws offered to the goats in different seasons in Jabalpur district of Madhya Pradesh

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Abstract

Samples of fodder and tree leaves commonly offered to goats were collected and analysed for proximate principles. From every block of Jabalpur district, seven samples of each fodder and tree leaves (Peepal, Bamboo, Subabool, Plum, Guinea grass, Doob grass and Gram straw) were collected during summer, rainy and winter seasons. Thus, total no. of sample was 21 from each block of each fodder and tree leaves. A total of 14 samples of gram straw, 7 from each block during winter and summer season were collected for the analysis. Proximate principles of the samples *viz.* dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF), nitrogen-free extract (NFE) and total ash were analyzed by the standard methods (AOAC, 2012).

Keywords: Fodder tree peepal bamboo subabool Jabalpur proximate principles

1. Introduction

Livestock in India is mainly reared by the marginal and small farmers. Marginal and small households together comprised more than 60% of total rural households and possess 74% of country's cattle, 71% of buffaloes, 78% small ruminants, 89% pigs and 81% of poultry birds. However, their share to total land was only 44% (Birthal *et al.*, 2013). Small holder farmers tend to keep animals for family needs, rather than purely as an economic enterprise. In this system, livestock provide agricultural inputs, such as manure, and render the enterprise more secure by using residual capacities of production factors with low opportunity cost such as non-arable land, excess labour, by converting crops and crop residues into high value animal products and by balancing production and market risks (Jahnke, 1982).

Farming surveys are useful in describing the characteristics of a large population and are relatively inexpensive way to draw an outcome of their response. No other research method can provide this broad capability, which ensures a more accurate sample to gather targeted results to draw conclusions and make a hypothesis. Proximate principles of the samples *viz.* dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF), nitrogen-free extract (NFE) and total ash were analyzed from different blocks of Jabalpur district.

2. Materials and Methods

Samples of fodder and tree leaves commonly offered to goats were collected and analysed for proximate principles. From every block of Jabalpur district, seven samples of each fodder and tree leaves (Peepal, Bamboo, Subabool, Plum, Guinea grass, Doob grass and Gram straw) were collected during summer, rainy and winter seasons. Thus, total no. of sample was 21 from each block of each fodder and tree leaves. A total of 14 samples of gram straw, 7 from each block during winter and summer season were collected for the analysis. Proximate principles of the samples *viz.* dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF), nitrogen-free extract (NFE) and total ash were analyzed by the standard methods (AOAC, 2012) [1].

3. Result and Discussion

3.1 Proximate composition (%) of Peepal leaves (*Ficus religiosa*) in different seasons of Jabalpur district

The data present in table 1 represents the proximate compositions (%) of Peepal leaves, the DM, CP, CF, EE, NFE and ASH in Winter season were 46.86±0.14, 9.34±0.06, 26.95±0.26, 2.52±0.07, 45.71±0.24 and 15.48±0.17, respectively.

The proximate compositions (%) of Peepal leaves, the DM, CP, CF, EE, NFE and ASH in summer season, were 50.67±0.19, 9.18±0.11, 27.47±0.19, 2.29±0.06, 45.76±0.26 and 15.30±0.14 for summer season, respectively. The proximate compositions (%) of Peepal leaves, the DM, CP, CF, EE, NFE and ASH in rainy season were 44.05±0.45, 9.41±0.08, 26.06±0.25, 2.62±0.06, 46.71±0.19 and 15.19±0.15 for rainy season, respectively.

Table 1: Proximate composition (%) of Peepal leaves (*Ficus religiosa*) in different seasons of Jabalpur district

S. No.	Seasons	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	ASH (%)
1.	Winter (n=7)	46.86±0.14	9.34±0.06	26.95±0.26	2.52±0.07	45.71±0.24	15.48±0.17
2.	Summer (n=7)	50.67±0.19	9.18±0.11	27.47±0.19	2.29±0.06	45.76±0.26	15.30±0.14
3.	Rainy (n=7)	44.05±0.45	9.41±0.08	26.06±0.25	2.62±0.06	46.71±0.19	15.19±0.15
4.	Average	47.20±0.63	9.31±0.05	26.83±0.18	2.48±0.05	46.06±0.16	15.33±0.09

3.2 Proximate composition (%) of Bamboo leaves (*Bamboo bambos*) in different seasons of Jabalpur district

The data present in table 2 represents the proximate compositions (%) of Bamboo leaves, the DM, CP, CF, EE, NFE and ASH were 47.27±0.80, 7.49±0.13, 24.48±0.15, 3.42±0.08, 54.12±0.27 and 10.49±0.09 for winter season, respectively. The proximate compositions (%) of Bamboo leaves, the DM, CP, CF, EE, NFE and ASH were 55.94±0.18, 7.09±0.45, 26.41±0.30, 3.54±0.08, 52.15±0.55 and 10.80±0.12 for summer season were, respectively. The proximate compositions (%) of Bamboo leaves, the DM, CP,

The data present in table 1 represents the overall average proximate compositions (%) of Peepal leaves, the DM, CP, CF, EE, NFE and ASH were 47.20±0.63, 9.31±0.05, 26.83±0.18, 2.48±0.05, 46.06±0.16 and 15.33±0.09 of all seasons, respectively. Statistical analysis of the overall data indicated that there were non-significant differences among the proximate composition of Peepal leaves (*Ficus religiosa*) in different seasons.

CF, EE, NFE and ASH were 48.54±0.15, 6.56±0.88, 24.58±0.15, 3.51±0.11, 55.13±0.89 and 10.23±0.16 for rainy season, respectively.

The data present in table 2 represents the overall average proximate compositions (%) of Bamboo leaves, the DM, CP, CF, EE, NFE and ASH were 50.58±0.89, 7.05±0.33, 25.16±0.23, 3.49±0.05, 53.80±0.44 and 10.51±0.09 of all seasons, respectively. Statistical analysis of the overall data indicated that there were non-significant differences among the proximate composition of Bamboo leaves (*Bambos bambos*) in different seasons.

Table 2: Proximate composition (%) of Bamboo leaves (*Bambos bambos*) in different seasons of Jabalpur district

S. No.	Seasons	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	ASH (%)
1.	Winter (n=7)	47.27±0.80	7.49±0.13	24.48±0.15	3.42±0.08	54.12±0.27	10.49±0.09
2.	Summer (n=7)	55.94±0.18	7.09±0.45	26.41±0.30	3.54±0.08	52.15±0.55	10.80±0.12
3.	Rainy (n=7)	48.54±0.15	6.56±0.88	24.58±0.15	3.51±0.11	55.13±0.89	10.23±0.16
4.	Average	50.58±0.89	7.05±0.33	25.16±0.23	3.49±0.05	53.80±0.44	10.51±0.09

3.3 Proximate composition (%) of Plum/Indian jujube leaves (*Ziziphus mauritiana*) in different seasons of Jabalpur district

The data present in table 3 represents the proximate compositions (%) of Plum leaves, the DM, CP, CF, EE, NFE and ASH were 38.16±0.31, 7.90±0.11, 31.53±0.14, 1.53±0.08, 44.71±0.18 and 14.34±0.07 for winter season, respectively. The proximate compositions (%) of Plum leaves, the DM, CP, CF, EE, NFE and ASH were 40.80±0.24, 7.87±0.15, 35.19±0.23, 1.73±0.09, 40.59±0.23 and 14.62±0.11 for summer season, respectively. The proximate

compositions (%) of Plum leaves, the DM, CP, CF, EE, NFE and ASH were 38.43±0.14, 8.47±0.08, 30.15±0.16, 1.81±0.03, 45.21±0.22 and 14.35±0.16 for rainy season, respectively. The data present in table 3 and represents the overall average proximate compositions (%) of Plum leaves, the DM, CP, CF, EE, NFE and ASH were 39.13±0.30, 8.08±0.09, 32.29±0.49, 1.69±0.05, 43.50±0.48 and 14.44±0.07 of all seasons, respectively. Statistical analysis of the overall data indicated that there were non-significant differences among the proximate composition of Plum leaves (*Ziziphus mauritiana*) in different seasons.

Table 3: Proximate composition (%) of Plum/Indian jujube leaves (*Ziziphus mauritiana*) in different seasons of Jabalpur district

S. No.	Seasons	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	ASH (%)
1.	Winter (n=7)	38.16±0.31	7.90±0.11	31.53±0.14	1.53±0.08	44.71±0.18	14.34±0.07
2.	Summer (n=7)	40.80±0.24	7.87±0.15	35.19±0.23	1.73±0.09	40.59±0.23	14.62±0.11
3.	Rainy (n=7)	38.43±0.14	8.47±0.08	30.15±0.16	1.81±0.03	45.21±0.22	14.35±0.16
4.	Average	39.13±0.30	8.08±0.09	32.29±0.49	1.69±0.05	43.50±0.48	14.44±0.07

3.4 Proximate composition (%) of Subabool leaves (*Leucaena leucocephala*) in different seasons of Jabalpur district

The data present in table 4 represents the proximate compositions of Subabool leaves (%), the DM, CP, CF, EE, NFE and ASH were 27.76±0.33, 14.62±0.13, 17.75±0.17, 3.61±0.09, 42.71±0.19 and 21.31±0.23 for winter season were, respectively. The proximate compositions of Subabool leaves (%), the DM, CP, CF, EE, NFE and ASH were 28.44±0.14, 13.60±0.11, 19.33±0.15, 3.62±0.08, 40.98±0.32 and 22.54±0.09 for summer season, respectively. The

proximate compositions of Subabool leaves (%) the DM, CP, CF, EE, NFE and ASH were 28.37±0.33, 16.06±0.22, 16.58±0.09, 3.48±0.10, 43.42±0.30 and 20.45±0.13 for rainy season, respectively. The data present in table 4 represents the overall average proximate compositions of Subabool leaves (%), the DM, CP, CF, EE, NFE and ASH were 28.19±0.17, 14.76±0.24, 17.89±0.26, 3.57±0.05, 42.37±0.27 and 21.43±0.21 of all seasons, respectively. Statistical analysis of the overall data indicated that there were non-significant differences among the proximate composition of Subabool leaves (*Leucaena leucocephala*) in different seasons.

Table 4: Proximate composition (%) of Subabool leaves (*Leucaena leucocephala*) in different seasons of Jabalpur district

S. No.	Seasons	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	ASH (%)
1.	Winter (n=7)	27.76±0.33	14.62±0.13	17.75±0.17	3.61±0.09	42.71±0.19	21.31±0.23
2.	Summer (n=7)	28.44±0.14	13.60±0.11	19.33±0.15	3.62±0.08	40.98±0.32	22.54±0.09
3.	Rainy (n=7)	28.37±0.33	16.06±0.22	16.58±0.09	3.48±0.10	43.42±0.30	20.45±0.13
4.	Average	28.19±0.17	14.76±0.24	17.89±0.26	3.57±0.05	42.37±0.27	21.43±0.21

3.5 Proximate composition (%) of Doob grass (*Canis lupus familiaris*) in different seasons of Jabalpur district

The data present in table 5 represents the proximate compositions of Doob grass (%), the DM, CP, CF, EE, NFE and ASH were 26.11±0.82, 15.66±0.16, 27.22±0.41, 1.64±0.09, 44.80±0.58 and 10.68±0.11 for winter season. The proximate compositions of Doob grass (%), the DM, CP, CF, EE, NFE and ASH were 30.35±0.40, 14.62±0.10, 28.17±0.25, 1.44±0.07, 44.73±0.24 and 11.03±0.12 for summer season, respectively. The proximate compositions of Doob grass (%),

the DM, CP, CF, EE, NFE and ASH were 26.82±0.16, 16.58±0.10, 6.98±0.25, 1.73±0.09, 44.17±0.30 and 10.55±0.10 for rainy season, respectively. The data present in table 5 represents the overall average proximate compositions of Doob grass (%), the DM, CP, CF, EE, NFE and ASH were 27.76±0.51, 15.62±0.19, 27.46±0.21, 1.60±0.05, 44.57±0.23 and 10.75±0.08 of all seasons, respectively. Statistical analysis of the overall data indicated that there were non-significant differences among the proximate composition of Doob grass (*Canis lupus familiaris*) in different seasons.

Table 5: Proximate composition (%) of Doobgrass (*Canis lupus familiaris*) in different seasons of Jabalpur district

S. No.	Seasons	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	ASH (%)
1.	Winter (n=7)	26.11±0.82	15.66±0.16	27.22±0.41	1.64±0.09	44.80±0.58	10.68±0.11
2.	Summer (n=7)	30.35±0.40	14.62±0.10	28.17±0.25	1.44±0.07	44.73±0.24	11.03±0.12
3.	Rainy (n=7)	26.82±0.16	16.58±0.10	26.98±0.25	1.73±0.09	44.17±0.30	10.55±0.10
4.	Average	27.76±0.51	15.62±0.19	27.46±0.21	1.60±0.05	44.57±0.23	10.75±0.08

3.6 Proximate composition (%) of Guinea grass (*Megathyrus maximus*) in different seasons of Jabalpur district

The data present in table 6 represents the proximate compositions of Guinea grass (%), the DM, CP, CF, EE, NFE and ASH were 57.40±0.28, 7.60±0.12, 38.08±0.52, 1.46±0.07, 36.34±0.29 and 16.52±0.13 for winter season, respectively. The proximate compositions of Guinea grass (%), the DM, CP, CF, EE, NFE and ASH were 54.97±0.37, 5.59±0.12, 40.43±0.17, 1.49±0.11, 35.45±0.34 and 17.03±0.19 for summer season, respectively. The proximate

compositions of Guinea grass (%), the DM, CP, CF, EE, NFE and ASH were 49.70±0.39, 7.06±0.24, 38.97±0.23, 1.31±0.07, 37.04±0.23 and 15.76±0.21 for rainy season, respectively. The data present in table 6 represents the overall average proximate compositions of Guinea grass (%), the DM, CP, CF, EE, NFE and ASH were 54.02±0.74, 6.75±0.21, 39.16±0.29, 1.42±0.05, 36.28±0.21 and 16.44±0.15 of all seasons, respectively. Statistical analysis of the overall data indicated that there were non-significant differences among the proximate composition of Guinea grass (*Megathyrus maximus*) in different seasons.

Table 6: Proximate composition (%) of Guinea grass (*Megathyrus maximus*) in different seasons of Jabalpur district

S. No.	Seasons	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	ASH (%)
1.	Winter (n=7)	57.40±0.28	7.60±0.12	38.08±0.52	1.46±0.07	36.34±0.29	16.52±0.13
2.	Summer (n=7)	54.97±0.37	5.59±0.12	40.43±0.17	1.49±0.11	35.45±0.34	17.03±0.19
3.	Rainy (n=7)	49.70±0.39	7.06±0.24	38.97±0.23	1.31±0.07	37.04±0.23	15.76±0.21
4.	Average	54.02±0.74	6.75±0.21	39.16±0.29	1.42±0.05	36.28±0.21	16.44±0.15

3.7 Proximate composition (%) of Gram (*Cicer arietinum*) straw in different seasons of Jabalpur district

The data present in table 7 represents the proximate compositions of Gram straw (%), the DM, CP, CF, EE, NFE and ASH were 89.06±0.27, 6.97±0.43, 44.32±0.07, 0.55±0.02, 34.53±0.47 and 13.65±0.09 for winter season, respectively. The proximate compositions of Gram straw (%), the DM, CP, CF, EE, NFE and ASH were 89.49±0.21, 5.61±0.13, 44.49±0.24, 0.57±0.03, 35.79±0.24 and 13.55±0.08 for summer season, respectively. The proximate

compositions of Gram straw (%), the DM, CP, CF, EE, NFE and ASH were 89.28±0.18, 6.29±0.29, 44.40±0.12, 0.56±0.02, 35.16±0.31 and 13.60±0.06 of both summer and winter seasons, respectively. Statistical analysis of the overall data indicated that there were non-significant differences among the proximate composition of Gram straw (*Cicer arietinum*) in different seasons.

13.55±0.08 for summer season, respectively. The data present in table 7 represents the overall average proximate compositions of Gram straw (%), the DM, CP, CF, EE, NFE and ASH were 89.28±0.18, 6.29±0.29, 44.40±0.12, 0.56±0.02, 35.16±0.31 and 13.60±0.06 of both summer and winter seasons, respectively. Statistical analysis of the overall data indicated that there were non-significant differences among the proximate composition of Gram straw (*Cicer arietinum*) in different seasons.

Table 7: Proximate composition (%) of Gram (*Cicer arietinum*) straw in different seasons of Jabalpur district

S. No.	Seasons	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	ASH (%)
1.	Winter (n=7)	89.06±0.27	6.97±0.43	44.32±0.07	0.55±0.02	34.53±0.47	13.65±0.09
2.	Summer (n=7)	89.49±0.21	5.61±0.13	44.49±0.24	0.57±0.03	35.79±0.24	13.55±0.08
3.	Average	89.28±0.18	6.29±0.29	44.40±0.12	0.56±0.02	35.16±0.31	13.60±0.06

4. Related studies were conducted by following researchers

Azim *et al.* (2002) [3] evaluated the nutritional value of common fodder tree leaves with goats fed at 50% of total

ration. Leaves from six fodder tree species i.e. *Ailanthus altissima*, *Elaeagnus angustifolius*, *Morus alba* (Mulberry), *Populus spp*, *Robina pseudoacacia* and *Salix babylonica* were harvested in spring and winter from northern areas of

Pakistan, crude protein (CP) values were higher ($P<0.05$) in all the species during spring compared to winter (17.9% vs 12.0%). Arthington and Brown (2005) [2] found that there was year \times grass \times maturity interactions ($P<0.01$) for all measures of forage quality, except CP. Increased maturity resulted in a 37.8% decrease ($P<0.001$) in CP concentration when averaged across all forages. Four-week Bermuda grass contained the greatest ($P<0.05$) concentration of CP compared with all other grasses at both maturities. Datt *et al.* (2008) [4] Leguminous trees had high CP compared to non leguminous ones (18.30% vs 13.70%) and concluded that *Leucaena leucocephala* could be considered as good quality fodder as it had the highest level of IVDMD/IVOMD (65.20%/67.66%) and ME (7.95 MJ/kg DM) while *G. maculata*, *M. alba*, *A. indica*, *D. sissoo* and *S. saman* were of medium type fodder. Olaofe *et al.* (2013) [8] crude protein and total ash followed the trend of (g/100 g): leaves > root > stem) in *Moringa oleifera* tree. Dey *et al.* (2014) [5] assess the proximate compositions of commonly available feed stuffs in Bihar and found that the chemical compositions of leguminous crop residues (bhusa and dried plants) indicate that they contained fairly good amount of CP varying from 5 to 13%. Okunade *et al.* (2014) assessed fodder potential and acceptability of foliage of six selected trees, *Azelia africana*, *Daniellia oliveri*, *Acacia seyal*, *Entada africana*, *Pterocarpus erinaceus* and *Securmege virosa*, the DM, ash, cellulose, NDF, ADF and condensed tannins (CT) were highest in *Entada africana*, OM, non-fibrous carbohydrate (NFC) and ADL were lowest in the forage. Crude protein and ether extract (EE), and total carbohydrate and phytate were highest and lowest, respectively, in *Azelia africana*. Hemicellulose was lowest in *Securmege virosa*. Gaikwad *et al.* (2021) [6] determine the nutritive value of fodder tree leaves and shrubs from a dryland area in the Solapur district of Maharashtra and found that dry matter (DM), organic matter (OM), ash, crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), hemicelluloses, and proximate composition were measured in leaves of fodder trees and shrubs. DM, CF, CP, NDF, ADF and hemicelluloses had mean percent values of 32.66, 22.60, 4.79, 55.75, 47.97 and 7.81, respectively.

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