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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(10): 481-484

www.thepharmajournal.com
Received: 25-07-2022
Accepted: 30-08-2022

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Estimation of biomass yield, chemical composition of five commonly used varieties of leguminous fodder

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Abstract
The main moto of this research was to find out the biomass yield, chemical composition and gas production of five commonly used leguminous fodders *i.e.* Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata. These fodders were grown in veterinary college Hebbel, Bengaluru, Karnataka. The grown fodders samples were collected and analyzed for DM (Dry Matter), CP (Crude Protein), Ash, EE (Ether extract), NDF (Neutral Detergent Fibre), ADF (Acid Detergent Fibre), ME (Metabolizable energy) and protein yield as well as biomass yield was analyzed. In this study biomass yield of Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata were 115.15, 299.62, 290.04, 78.37 and 76.34 t/ha/yr respectively. Proximate Principles for various leguminous fodders were analyzed and Stylosanthes hamata showed highest organic matter NDF and ADF (92.72±0.03, 54.42±0.39 and 41.57 respectfully). Sesbania grand flora had highest dry matter and Crude protein content i.e. 23.65±2.43 and 93.90±0.26 respectively. Whereas Moringa oleifera showed highest Ether extract content (4.63%). *Macroptilium atropurpureum* (Siratro) showed significant effect (p>0.005) in Honhenhiem gas test (47.36±2.32ml/hr). Highest Metabolizable energy and crude protein yield content was observed with *Macroptilium atropurpureum* (Siratro) and Sesbania grandiflora (9.58 MJ/kg and 15.52 t/ha/yr) respectively.

Keywords: Ether extract, biomass yield, proximate principle, acid detergent fibre, dry matter

Introduction
Fodder production forms a major component of dairy cattle and sheep production management. The quality and quantity of fodder are influenced by the type of soil and stage of growth (Yar and Waheed, 1991 [18]; Kim *et al.*, 2001 [9]). The current status of the deficit of green and dry fodder were 63.50 and 23.56 per cent, respectively in India and the projected deficit of CP and TDN were 45.76 and 33.71 million tones analyzed at 2015 (IGFRI, 2011). To overcome this deficit dairy farmers resort to the enhanced use of costly concentrate feeds, which ultimately increase the cost of production. To control the cost of feeding one has to go towards feeding of different fodder sources like leguminous fodders which contain high levels of crude protein, ether extract, gross energy, minerals and many show high levels of digestibility. However, anti-nutritive factors (tannins, mimosine) can be a problem in some species. Fodders available for feeding livestock differ in their chemical composition depending on factors such as the variety of fodder, composition of soil, type of fertilizer, irrigation pattern, harvesting pattern and stage of maturity at the time of harvest.

Materials and Methods
Location and climate
The study area is Bengaluru, which is located in the eastern dry zone region at an elevation of 900 m above mean sea level with an annual rainfall of about 679 to 889 mm. The type of soil is been red loamy in major areas with lateritic in remaining areas. The main crops cultivated being Ragi, Rice, Pulses, Maize and Oil seeds.

Study area and sample collection
The study was conducted in the fodder museum maintained under department of livestock production management, Veterinary College, Hebbal, Bengaluru. Representative samples been taken, grounded passing in the mesh size of 1mm and stored in plastic bottles for laboratory analysis.

The biomass yields of five leguminous fodders were recorded for the period of one year in a growing area of 450 sq.ft. Which is then extrapolated to per hectare by doing simple multiplication.

Chemical analysis

Proximate principles

The Samples of different fodders grown in the Fodder Museum, Veterinary College and Hebbel was analyzed for proximate/chemical composition. The dry matter content of feed samples was analyzed by drying the samples to a constant weight in a forced hot air oven at 105 °C. The ash content in the samples will be estimated as residue obtained after incineration of samples at 600 °C for 3 hours. Crude protein (N × 6.25) was analyzed using Gerhardt digestion and distillation unit that agrees with Kjeldahl standards (AOAC, 1995) [1]. The ether extract (EE) content in the feed samples was analyzed after extraction with petroleum ether using the procedure of (AOAC 1995) [1].

Fiber fractions

The neutral detergent fiber (NDF) and acid detergent fiber (ADF) was determined according to the methods described by Van Soest *et al.* 1991 [17].

In vitro evaluation

All the fodder varieties were subjected to rumen in vitro incubation for gas production (RIVIGP) and the ME (MJ/kg DM) was estimated by using procedures of Menke and Steingass 1988 [11] as follows.

Medicago sativa (Lucerne)

Moringa oleifera

Sesbania grandiflora

***Macroptilium atropurpureum* (Siratro)**

Stylosanthes hamata

Fig 1: Five varieties of leguminous fodders

Results and Discussion

Biomass yield

In this study biomass yield of Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata were 115.15, 299.62, 290.04, 78.37 and 76.34t/ha/yr respectively.

The results are in agreement with Fernandes *et al.* 2005 [4] for Medicago sativa (Lucerne) with 120 t/ha/yr whereas lower yields of 100.7, 15-20 and 20 t/ha/yr were noticed by Sanchez *et al.*2006 [16] for fodder Moringa oleifera, IGFRI 2011 [6] for fodder *Macroptilium atropurpureum* (Siratro) and Jayaprakash *et al.* (2016) [8] for fodder Stylosanthes hamata, respectively. There are not many studies on this aspect for other fodders. The differences in the biomass yields for respective leguminous fodder varieties might be due change in agronomical practices, soil fertility, soil moisture, fertilizer application and harvesting patterns (Reddy *et al.*, 2003)[15].

Proximate composition

Crude protein content for fodder Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata were 21.6, 23.65, 12.27, 13.73 and 15.07 per cent, respectively. The results are in agreement with the findings of Fernandes *et al.* (2005)[4] for Medicago sativa (Lucerne), Nouman *et al.* (2014) [14] for Moringa oleifera, Jayaprakash *et al.* (2016)[8] for Stylosanthes hamata, Njarui *et al.* (2003)[13] for *Macroptilium atropurpureum* (Siratro) and Devendra (1991)[3] for Sesbania grandiflora with values of 20.30, 15.31, 13.90, 14.71 and 22.61 per cent, respectively.

Ether extract content of Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata were 3.63, 3.68, 4.63, 2.45 and 2.02 per cent, respectively. The results of the present study are in agreement with studies of Fernandes et al. (2005) for Medicago sativa (Lucerne), Nouman *et al.* (2014) [14] for Moringa oleifera, Jayaprakash *et al.* (2016) [8] for Stylosanthes hamata and Devendra (1991)[3] for Sesbania grandiflora with the values of 2.71, 3.0, 2.52 and 2.10 per cent respectively.

Total ash present in fodder Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata were 11.11, 8.51, 8.96, 10.03 and 7.28 per cent respectively. The results obtained are similar to the results found by Fernandes *et al.* (2005) [4] for Medicago sativa (Lucerne), Nouman *et al.* (2014) [14] for Moringa oleifera, Njarui et al. 2003 [13] for *Macroptilium atropurpureum* (Siratro) and Devendra (1991)[3] for Sesbania grandiflora with values of 10.21, 12.00, 13.31 and 9.30 per cent respectively. Whereas the per cent of TA was higher (7.28%) in present study for Stylosanthes hamata compared study by Jayaprakash *et al.* (2016) [8] with value of 3.72. The variation in most of the chemical composition as compared the other studies done elsewhere as discussed above might be due to the present study was conducted during rainy season. This might have led to the proper growth and development of crop (Chauhan *et al.*, 1987 [2]; Fernandes *et al.*, 2005[4]).

Fibre fractions

The per cent of NDF values for fodder Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata in the present study were 50.17, 33.01, 45.72, 47.78 and 54.42, respectively. The results in the present study are in accordance with Fernandes *et al.* 2005 [4] for Medicago sativa (Lucerne), Hang *et al.* 2005 [5] for Sesbania grandiflora, Munpangwa *et al.* (1997) for *Macroptilium atropurpureum* (Siratro) with values of 47.50, 37.8 and 47.70 respectively whereas lower per cent of 21.99 by Sanchez *et al.* (2006) [16] for Moringa oleifera and higher per cent of 65.00 by Iji*et al.* (1995) [7] were noticed for fodder Stylosanthes hamata respectively.

ADF content for fodder Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata were 30.20, 28.44, 37.73, 37.85 and 41.57 per cent respectively. The findings in present study are in concurrence with results of Fernandes et al. (2005) for Medicago sativa (Lucerne), Hang *et al.* 2005[5] for Sesbania grandiflora and Munpangwa *et al.* (1997) for *Macroptilium atropurpureum* (Siratro) with values 38.00, 30.80 and 32.60 respectively whereas higher per cent of 53.04 by Iji*et al.* (1995) [7] for Stylosanthes hamata and lower per cent of 12.00 were observed Nouman *et al.* (2014) [14] for fodder Moringa oleifera, respectively.

Metabolizable energy and protein yield

Metabolizable energy content for Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata were 9.28, 9.49, 9.01, 9.58 and 8.41 MJ/kg respectively. The results are similar to the findings of Makkar and Becker 1996 [10] for Moringa oleifera with value of 9.5 MJ/kg. There are not much research has been conducted in this aspect for other fodders.

The crude protein yield of leguminous fodder varieties Medicago sativa (Lucerne), Sesbania grandiflora, Moringa oleifera, *Macroptilium atropurpureum* (Siratro) and Stylosanthes hamata 5.36, 15.52, 7.36, 2.24 and 3.37 t/ha/yr.

Biomass yield and Chemical composition by five commonly used varieties of leguminous fodder

	Nutrient	Medicago sativa (Lucerne)	Sesbania grandiflora	Moringa oleifera	*Macroptilium atropurpureum* (Siratro)	Stylosanthes hamata
Total yield(t/ha/yr)		115.15	299.62	290.04	78.37	76.34
Proximate principles (% DMB)	Dry matter	91.21±0.36	93.90±0.26	92.51±0.15	93.46±0.66	93.74±0.17
	Organic matter	88.89±0.86	91.48±0.28	91.03±0.23	89.97±0.29	92.72±0.03
	Crude protein	20.30±0.35	23.65±2.43	12.27±0.34	13.73±0.52	15.07±0.19
	Ether extract	3.63±0.01	3.68±0.02	4.63±0.04	2.45±0.02	2.02±0.05
	Total ash	11.11±0.84	8.518±0.28	8.969±0.15	10.03±0.19	7.284±0.03
	NDF	50.17±0.55	33.01±0.24	45.72±0.42	47.78±0.20	54.42±0.39
	ADF	30.20±0.08	28.44±0.25	37.73±0.47	37.85±0.23	41.57±0.09
Honhenhiem gas test (ml/hr)	RIVGP@24hr	40.87±1.35^{a}	40.91±0.56^{a}	40.52±0.81^{a}	47.36±2.32^{b}	38.61±0.11^{a}
Energy (MJ/kg DM)	ME	9.28±0.17^{ab}	9.49±0.21^{a}	9.01±0.11^{ab}	9.58±0.33^{a}	8.413±0.01^{b}
Protein yield (t/ha/yr)		5.36	15.52	7.36	2.24	3.37

Conclusion

From the present study it can be concluded that Sesbania grandiflora which showed highest biomass yield, crude protein, ME and protein yield can be recommended over

Moringa oleifera, Medicago sativa (Lucerne), Stylosanthes hamata and *Macroptilium atropurpureum* (Siratro) as leguminous fodders suitable to be grown in and around Bengaluru region for increasing animal productivity.

References

1. AOAC. Official methods of analysis, Association of Official Analytical Chemists, 15th Ed. Arlington, VA; c1995.
2. Chauhan TR, Mehndiratta PD, Sidhu BS. Chemical composition, IVDMD and nutrient production potential of three different strains of Lucerne. Indian J. Dairy Set. 1987;40:292-95.
3. Devendra C. Malaysian feeding stuffs, Malaysian agricultural research and development institute, Serdong, Selangor, Malaysia; c1991. p. 145.
4. Fernandes AP, Mahase A, Fulpagare YC. Anarase SA.Nutritional evaluation of Lucerne varieties in different seasons. Indian J. Anim. Nutr. 2005;22(4):226-228.
5. Hang BP, Lam V, Trang TT, Preston TR,Ledin L. Effect of replacing Melastoma (*Melastoma affine*, DDon) foliage with *Sesbania grandiflora* on intake, digestibility and N retention on growing goats. Angiang University, Faculty of Agriculture and Resources, Vietnam; c2005. bphang@agu.edu.vn
6. IGFRI. Forage crops varieties. Golden jubilee publication Indian grassland and fodder research institute, Janshi; 2011. p. 284003.
7. Iji PA, Alawa JP, Umunna NN, Chionuma P. Regeneration of *Stylosanthes hamata* on pastures subjected to grazing at different stocking densities and cropping. J. Appl. Anim. Res. 1995;8:171-184.
8. Jayaprakash G, Shyama K, Gangadevi P, Ally K, Anil KS, Asha K,*etal.*, Biomass yield and chemical composition of *Calliandra calothyrsus*, *Desmanthus virgatus* and Stylosanthes hamata. Int. J of Sci. Environ. Technol. 2016;5:2290-2295.
9. Kim JD, Kwon CH. Kim DA. Yield and quality of silage corn as affected by hybrid maturity, planting date and harvest stage. Asian-Aust. J. Anim. Sci.2001;14(12):1705-1711.
10. Makkar HPS. Becker K. Nutrional value and whole and ethanol anti-nutritional components of extracted Moringa oleifera leaves. Anim. Feed Sci. Technol. 1996;63:211-228.
11. Menke KH, Steingass H. Estimation of the energetic feed value obtained from chemical analysis and *in vitro*gas production using rumen fluid. Anim. Res. Devpt. 1988;28:7-55.
12. Mupangwa JF, Ngongonib NT, Topps JH, Ndlovub P. Chemical composition and dry matter degradability profiles of forage legumes *Cassia rotundifolia* cv. Wynn, *Lablab pulpureus* cv. High worth and *Macroptilium atropurpureum* cv. Siratro at 8 weeks of growth (pre-anthesis). Anim. Feed Sci. Technol. 1997;69:167-178.
13. Njarui DMG, Mureithi JG, Wandera FP. Muinga RW. Evaluation of four forage legumes as supplementary feed for Kenya dual-purpose goat in the semi-arid region of eastern Kenya. Tropical and Subtropical Agro ecosystems. 2003;3:65-71.
14. Nouman W, Basra SMA, Siddiqui MT, Yasmeen A, Gull T, Cervantes MC, *et al.* Potential of Moringa oleifera L. as livestock fodder crop: a review. Turk. J. Agric. For. 2014;38:1-14.
15. Reddy BVS, Reddy PS, Bidinger F, Brummel M. Crop management factors influencing yield and quality of crop residues. Field Crops Research. 2003;84:57–77.
16. Sanchez NR, Ledin S,Ledin I. Biomass production and chemical composition of Moringa oleifera under different management regimes in Nicaragua Agroforestry Systems. 2006;66:231-242.
17. Van Soest PJ, Robertson JB. Andlewis BA. Methods for dietary, neutral detergent fiber, and non-starch polysaccharides in relation to animal nutrition. J. Dairy Sci. 1991;74:3583-359.
18. YAR A, Waheed A. Testing of different varieties of millet for multicity properties. 12th annual report, Livestock Production Institute, Bahadur Nagar, Okara, Pakistan; c1991. p. 95-96.