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Biomass yield and chemical composition of *Macroptillium autro* purpureum and *Stylosanthes hamata*

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Abstract
The main aim of this research was to find out the biomass yield and chemical composition of two commonly used tree fodders i.e. *Macroptilium atropurpureum* and *Stylosanthes hamata* grown in veterinary college hebbal, Bengaluru, Karnataka. The tree fodders were grown and 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 from these tree fodders over a period of one year. The study revealed that biomass yield of *Macroptilium atropurpureum* and *Stylosanthes hamata* were 78.37 and 76.34 t/ha/yr respectively. The Proximate composition which includes crude protein, ether extract showed 13.73% and 15.07%, 2.45% and 2.02% respectively. NDF value and Metabolizable energy of these both fodder is around 47.78 and 54.42, 9.58 and 8.41MJ/kg respectively. Protein yield *Macroptilium atropurpureum* showed lower of 2.24 t/ha/yr compared to 3.37 t/ha/yr by *Stylosanthes hamata*.

Keywords: Nutritive evaluation, biomass yield, crude protein, fodder

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) [12] (Kim *et al.*, 2001) [5].The current status of the deficit of green and dry fodder were 63.50 and 23.56 percent, respectively in India and the projected deficit of CP and TDN were 45.76 and 33.71million tonnes analyzed at 2015 (IGFRI, 2013) [2]. 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 tree fodders and leguminous shrubs which contain high levels of crude protein, ether extract, gross energy minerals and many show high levels of digestibility. Fodder legume tree leaves and shrubs always role in the animal production system. However, anti nutritive factors (tannins, mimosine) can be a problem in some species (Paterson *et al.*, 1998) [9]. 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.
as *Argulus* is identified.

Study area and sample collection
The study was conducted in the fodder museum maintained under department of livestock production and 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.

Fig 1: *Macroptilium atropurpureum* and *Stylosanthes hamata*

Biomass yield

The biomass yields of *Macroptilium atropurpureum* and *Stylosanthes hamata* were recorded for the period of one year in a growing area of 450 sq.ft. This 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, Hebbal was analyzed for proximate/chemical composition. The dry matter content of feed samples was analyzed by drying the samples to a constant weight in 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 (A.O.A.C, 1995) [1]. The ether extract (EE) content in the feed samples was analyzed after extraction with petroleum ether using the procedure of A.O.A.C. (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) [11].

***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) [6] as follow.

Results and Discussion

Biomass yield

In this study biomass yield of *Macroptilium atropurpureum* and *Stylosanthes hamata* was observed to be 78.37 and 76.34 t/ha/yr, respectively. The present values is more than double compared to study carried out by IGFRI (2011) [2] for fodder *Macroptilium atropurpureum* (Jayaprakash *et al.*, 2016[4] and Alalade, 2014) for fodder *Stylosanthes hamata*, with values of 15-20 and 20 t/ha/yr, respectively. It is also in agreement The difference in biomass yields for fodders varieties might be due to change in soil moisture, fertilizer application and harvesting patterns (Reddy *et al.*, 2003) [10].

Proximate composition

The result are presented in Table1. The crude protein concentration of *Macroptilium atropurpureum* and *Stylosanthes hamata*were 13.73 and 15.07 per cent, respectively which were in agreement with studies carried out by (Njarui *et al.*, 2003) [8] and (Jayaprakash *et al.*, 2016)[4] for *Macroptilium atropurpureum* and *Stylosanthes hamata*with values of 14.71 and 13.90 per cent, respectively. The study also revealed that *Macroptilium atropurpureum* and *Stylosanthes hamata* showed ether extract value of 2.45 and 2.02 respectively which was in agreement with studies of (Jayaprakash *et al.*, 2016) [4] for *Stylosanthes hamata* with the value of 2.52%. Chellapandian *et al.* 2016 [3] observed that leguminous tree leaves contains 16.82% to 17.67% CP on DMB noted that tree leaves contains CP ranged between17.14% to 19.89% on DMB.

Fibre fractions

The study revealed NDF value of 47.78 and 54.42 per cent for fodder *Macroptilium atropurpureum* and *Stylosanthes hamata*, respectively. The present study value for *Macroptilium atropurpureum* are comparable with (Munpangwa *et al.*, 1997) [7] with value of 47.70 per cent whereas *Stylosanthes hamata* showed lower value of 54.42compared to 65.00 per cent compared to (Iji *et al.*, 1995) [3]. The ADF content of 37.85 and 41.57% for fodder *Macroptilium atropurpureum* and *Stylosanthes hamata*, respectively. The present study value for *Macroptilium atropurpureum* are comparable with study by Munpangwa *et al.* (1997) [7]. Whereas *Stylosanthes hamata* showed lower value of 41.57compared to 53.44 per cent as shown by Iji *et al.* (1995) [5].

Metabolizable energy and protein yield

Metabolizable energy for *Macroptilium atropurpureum* and *Stylosanthes hamata* were 9.58 and 8.41 MJ/kg DM, respectively. The *Macroptilium atropurpureum* showed lower protein yield of 2.24t/ha/yr compared to 3.37 t/ha/yr by *Stylosanthes hamata*.

Table 1: Average concentration of nutrients in tree and shrub leaves, percent DMB

	Nutrient	*Macroptilium atropurpureum*	*Stylosanthes hamata*
1.Proximate principles (% DMB)	Dry matter	93.46	93.74
	Organic matter	89.97	92.72
	Crude protein	13.73	15.07
	Ether extract	2.45	2.02
	Total ash	10.03	7.284
	NDF	47.78	54.42
	ADF	37.85	41.57
2.Honhenhiem gas test (ml/hr)	RIVGP@24hr	47.36	38.61
3. Energy (MJ/kg DM)	ME	9.58	8.41
4. (t/ha/yr)	Protein yield	2.24	3.37

Conclusion

From the present study it can be concluded that *Stylosanthes hamata* which showed highest crude protein and protein yield can be recommended over *Macroptilium atropurpureum*as fodder suitable for increasing animal productivity.

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