Full Length Article

# BIOMASS YIELD AND NUTRITIONAL COMPOSITION IN NATURAL PASTURES IN NORTH-EASTERN AGRO-CLIMATIC ZONE OF TAMIL NADU

**Haripriya Chapa[1], S. Meenakshi Sundaram[2] and R. Venkataramanan[3]***

*ICAR-Network Project on Sheep Improvement*
*Post Graduate Research Institute in Animal Sciences*
*Tamil Nadu Veterinary and Animal Sciences University*
*Kattupakkam - 603 203, Tamil Nadu*

**ABSTRACT**

*A study was conducted to evaluate the biomass yield and proximate composition of biomass from the natural pastures of Madras Red sheep. Eight villages were selected from the habitat of Madras Red sheep and 40 samples each during rainy and summer season were collected to assess the biomass yield and proximate composition. The study showed that biomass yield and proximate composition were higher during the rainy season during which these sheep completed their breeding, reproduction and lactation. The total dry matter content was higher during the summer season which was able to meet maintenance requirement of sheep during these months. Farmers managed these animals without any supplementary feeding, but during summer the animals were let in the harvested fields where they had access to crop residues for grazing.*

**Keywords:** Range lands, biomass yield, Madras Red sheep, proximate composition

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## INTRODUCTION

Madras Red breed is a medium sized tropical hair sheep of Tamil Nadu. It is a meat type breed mainly distributed in northern districts of Tamil Nadu namely Chennai, Kancheepuram, Tiruvallur, Villupuram, Vellore, Cuddalore and Thiruvannamalai and some of the areas from Chennai to Nellore. This breed is adapted to the hot and humid conditions prevailing in the region. The system of management is extensive, where sheep graze in the natural range lands for most part of the year. During summer when the natural grasses are limited, farmers allow these animals in the harvested lands where they graze on the left over crop stumps and

[1]Postgraduate Student

[2]Director, Centre for Animal Production Studies, TANUVAS, MMC, Chennai – 51

[3]Professor, Office of the Vice-Chancellor, TANUVAS, MMC, Chennai – 51, corresponding author Email id: venkyvet@gmail.com

other weeds. It is important to evaluate the nutritional components of grasses in the natural range lands during different seasons as these animals are entirely dependent on grazing for their nutritional needs. This study will not only help in understanding the nutritional availability for extensively managed animals but also helpful to formulate suitable interventions to make up for deficiencies if any through appropriate supplementation.

## MATERIALS AND METHODS

The study was based on eight beneficiary villages covered under the ICAR-Network Project on Sheep Improvement-Madras Red Field Unit (NWPSI), functioning at Postgraduate Research Institute in Animal Sciences, Kattupakkam, Kanchipuram, Tamil Nadu, India. The area of coverage under the scheme is illustrated in Fig. 1. The Mean annual maximum and minimum temperature recorded were 34.83°C and 23.05°C respectively, with maximum temperature of 38.2°C in the month of May 2017 and minimum temperature of 22.4°C in the month of February 2018. The mean annual rain fall of Kanchipuram district is 923.6 mm, with maximum of 275.6 mm recorded in the month of November 2017. The season in the region could be divided in to two distinct parts; dry summer with no rainfall from January to May and wet rainy season from June to December. The first rains are generally received during June and maximum rainfall during North-East monsoon from October to December. Relative humidity ranged from 66 to 85 per cent.

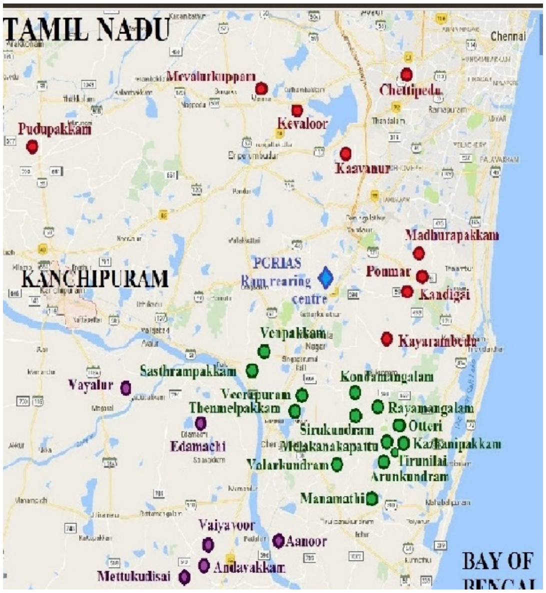


**Fig. 1. Area of coverage under the study**

The samples for wet season were collected during October and those for dry season during May. In total, 80 grass samples (five samples each from 8 villages (40) in winter and summer seasons), were collected from pasture in which the field flocks of Madras Red sheep were grazing. Each sample was collected from 1 sq.m area of land (Onatibia *et al.,* 2018; Kumar *et al.,* 2017) and the place of collection was selected at random by throwing a stick from the centre of grazing area. Each sample represents different (mixed grass sample) grass species that were present above ground level and were collected by using scissors from the quadrant of 1 sq.mtr area (Onatibia *et al.,* 2018; Kumar *et al.,* 2017) and live sample weight was recorded by using a digital balance. Samples were analysed for proximate composition (AOAC, 2000).

Statistical analysis was carried out for all proximate composition parameters using a general linear model with village and season as fixed factors.

## RESULTS AND DISCUSSION

The species identified from the biomass collected in the habitat of Madras Red sheep is presented in Table 1.

The biomass yield and proximate composition of the grass samples collected in the grazing field of Madras Red sheep are presented in Table 2. Statistical analysis revealed a significant ($P<0.01$) difference in the biomass yield, dry matter content and proximate composition of grasses collected between rainy and summer seasons. Biomass yield (gm/m$^2$) was high ($122.59 \pm 7.87$) during rainy season compared to summer season ($42.74 \pm 7.999$). The total dry matter per cent was higher during summer while all the nutrients *viz.* crude protein, ether extract, crude fibre and total ash were higher in the samples collected during rainy season. In general, total ash is found to be high during summer compared to the tender shoots obtained during monsoon season. The contrary results with respect to total ash in this study could be due to the composition of total biomass collected from pasture. Reduction in the proportion of legumes during summer could be a possible reason for the lower crude protein and total ash content in biomass obtained during summer (Peterson *et al*., 1992).

Similar observations were made by Sawal *et al.* (2011) who reported that the plant density in the ground cover decreased from 8.0/m² during October (monsoon) to 3.5/m² during March (autumn) with declining Cenchrus species and annual herbages. DM yield (gm/m$^2$) in Monsoon and autumn was 68.3 and 61.9g respectively indicating fibrous nature of the vegetation. The authors also reported higher CP% during monsoon rainy season with 9.9 per cent on DM basis as compared to 6.6 per cent in autumn. On the other hand, the DM content of biomass was in autumn compared to monsoon (61.6%). Singh and Kashyap (2006) also proved that the seasonal vegetation had higher crude protein than perennial grasses and therefore meets the nutritional needs of the livestock. Sawal and Sharma (2013) reported that the crude protein content of pasture was higher (12.2%) in monsoon than in autumn (7.2%).

In spite of the low nutritional composition of biomass during summer, the sheep were able to sustain in the extensive system of management. These animals have their main lambing season from October to December and hence wean their lambs by March. The nutrient requirement for the animal during dry months of summer is needed only for their maintenance and the additional dry matter content is an advantage. Farmers to some extent are able to use their vacant agricultural lands where the animals graze on leftover crop stumps. Fynn (2012) reported that functional dry season habitats (key resources) provide sufficient nutrients and energy to minimize reliance on body reserves and are critical for maintaining

**Table 1. Species identified from biomass collected in the habitat of Madras Red sheep**

| S.No. | Scientific name | Common name | Family name |
|---|---|---|---|
| 1. | *Ludwigia Parviflora* | Water prime rose | Oragraceae |
| 2. | *Eragrostis unicoides* | Chinese loree grass | Poaceae |
| 3. | *Bergia ammannoides* | Jerry water fire | Elantinaceae |
| 4. | *Coniza canadensis* | Canadian horseweed | Asteraceae |
| 5. | *Scoparia dulcis* | Licorice weed | Scrophulariaceae |
| 6. | *Phyllanthus virgatus* | Narrouw piss weed | Euphorbiaceae |
| 7. | *Brachiaria reptans* | Running grass | Poaecea |
| 8. | *Leptochloea chinensis* | Chinese sprangle top | Poaecea |
| 9. | *Evolvus alsinoides* | Slender dwarf morning glory | Convolvulaceae |
| 10. | *Evolvulus nummularius* | Round leaf bird weed | Convolvulaceae |
| 11. | *Vicia hirsute* | Tiny vetch | Fabaceae |

population stability, whereas functional wet season habitats dominated by short, nutritious grasses facilitate optimal intake of nutrients and energy for lactating females and for building body reserves.

Shinde *et al.* (1998) observed that the preference index for CP in hot and arid range lands of Rajasthan by sheep were 1.2 in monsoon and increased to 2.1 and 3.0 in winter and summer respectively indicating better nutrient selective behavior of sheep in sparse and poor pasture conditions. They also revealed that daily DM intake of rams in monsoon, winter and summer was 1.4, 2.4 and 2.0% of their body weight respectively and the annual mean dry matter intake was 1.9% of the body weight or 946 g/day.

The village wise differences in proximate composition and biomass yield were found to be significant. Factors that could cause such differences are location, topography, grazing density and type of agriculture (Beckers *et al.,* 2020). Villages near Chennai city (sub-urban) are under pressure of urbanization.

Such a study on yield and nutritional composition of biomass from natural grasslands is important keeping in view urbanization and climate change. These results will help in understanding the species type and nutritional availability from pastures throughout the year. As such Madras Red sheep is able to sustain from the available feeding resources in spite of the significant differences between seasons. Venkataramanan *et al.* (2015) observed that supplementary feeding did not improve growth traits in Madras Red sheep.

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**Table 2. Biomass yield and proximate composition of grass samples collected in the habitat of Madras Red sheep (Mean±SE)**

| Factor | Sub factor | N | Biomass yield /sqm (g) | Dry matter% | On % dry matter basis | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Crude Protein | Crude Fibre | Ether Extract | Total Ash | Nitrogen Free Extract |
| **Season** | | | ** | ** | ** | * | ** | ** | ** |
| **1** | **Rainy** | 40 | 122.59 ± 7.87 | 40.71 ± 0.8 | 9.95 ± 0.13 | 23.01 ± 0.56 | 2.36 ± 0.07 | 16.06 ± 0.37 | 48.58 ± 0.64 |
| **2** | **Summer** | 39 | 42.74 ± 7.99 | 67.28 ± 0.81 | 6.86 ± 0.13 | 21.34 ± 0.57 | 2.04 ± 0.07 | 8.3 ± 0.37 | 61.44 ± 0.65 |
| **Villages** | | | ** | ** | ** | **NS** | ** | ** | * |
| **1** | **Aanoor** | 10 | 41.34 ± 15.74$^{c}$ | 48.73 ± 1.6$^{de}$ | 8.35 ± 0.27$^{bc}$ | 20.58 ± 1.12 | 2.62 ± 0.15$^{ab}$ | 11.73 ± 0.74$^{bc}$ | 56.69 ± 1.28$^{ab}$ |
| **2** | **Kayarambedu** | 10 | 73.72 ± 15.74$^{bc}$ | 53.67 ± 1.6cd | 8.45 ± 0.27$^{bc}$ | 22.34 ± 1.12 | 1.82 ± 0.15$^{c}$ | 12 ± 0.74$^{bc}$ | 55.37 ± 1.28$^{abc}$ |
| **3** | **Kondamangalam** | 10 | 101.76 ± 15.74$^{b}$ | 64.54 ± 1.6$^{b}$ | 7.88 ± 0.27$^{c}$ | 23.8 ± 1.12 | 2.27 ± 0.15$^{bc}$ | 13.28 ± 0.74$^{ab}$ | 52.74 ± 1.28$^{bc}$ |
| **4** | **Madhurapakkam** | 9 | 75.48 ± 16.69$^{bc}$ | 61.68 ± 1.69$^{a}$ | 9.2 ± 0.28$^{a}$ | 20.43 ± 1.19 | 1.85 ± 0.16$^{c}$ | 12.63 ± 0.78$^{ab}$ | 55.86 ± 1.35$^{abc}$ |
| **5** | **Mettukudusai** | 10 | 62.03 ± 15.74$^{bc}$ | 57.19 ± 1.6$^{bc}$ | 8.37 ± 0.27$^{bc}$ | 23.08 ± 1.12 | 1.93 ± 0.15$^{c}$ | 11.67 ± 0.74$^{bc}$ | 54.93 ± 1.28$^{abc}$ |
| **6** | **Otteri** | 10 | 72.81 ± 15.74$^{bc}$ | 49.09 ± 1.6$^{de}$ | 7.84 ± 0.27$^{c}$ | 22.69 ± 1.12 | 2.8 ± 0.15$^{a}$ | 14.66 ± 0.74$^{a}$ | 51.99 ± 1.28$^{c}$ |
| **7** | **Rayamangalam** | 10 | 78.44 ± 15.74$^{bc}$ | 48.89 ± 1.6$^{de}$ | 8.18 ± 0.27$^{bc}$ | 20.71 ± 1.12 | 2.03 ± 0.15$^{c}$ | 11.25 ± 0.74$^{bc}$ | 57.81 ± 1.28$^{a}$ |
| **8** | **Vayalur** | 10 | 155.76 ± 15.74$^{a}$ | 48.17 ± 1.6$^{e}$ | 8.99 ± 0.27$^{ab}$ | 23.76 ± 1.12 | 2.29 ± 0.15$^{bc}$ | 10.24 ± 0.74$^{c}$ | 54.7 ± 1.28$^{abc}$ |

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