

## An Assessment of Nutrient Content of Different Grass Species of Similipal Tiger Reserve, Orissa

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**Abstract:** This study was carried out to assess the nutrient contents of ten grass species collected in two phases from both southern and northern parts of Similipal Tiger Reserve. The grasses are *Dentella repens*, *Cynodon dactylon*, *Eriochloa procera*, *Eleusine indica*, *Hybanthus enneapermus* (weed), *Apocopsis paleacea*., *Oropetium thomacum*, *Melanocentris jacquimontii*, *Tragus roxburghii* and *Paspalidium flavidum*. The moisture content in the grass species varied between 34.87±0.48 and 61.24±0.22% dry weight. Total protein content ranged from 1.78±0.19 - 6.81±0.24% dry weight, total soluble sugar varied between 0.56±0.01 and 9.14±0.10% dry weight, total starch ranged from 1.02±0.01-26.32±0.24% dry weight and total lipid ranged from 0.09±0.01 – 6.55±0.03% dry weight. Out of the ten grass species, *Hybanthus enneapermus*, *Melanocentris jacquimontii* and *Tragus roxburghii* showed high nutritive value.

### Key words:

### INTRODUCTION

Natural rangelands support and provide feed for a large number of livestock. These rangelands play a vital role in national economy through provision of animal products for local consumption and exports [1]. Grasses are the major constituents of natural rangelands, thus constituting one of the largest and most valuable group of flowering plants, with some 610 genera and about 10,000 species [2]. They rank third in terms of number of genera after the Compositae and Orchidaceae and fifth in terms of number of species after the Compositae, Orchidaceae, Leguminosae and Rubiaceae [3]. Grasses are more widespread than any other family of flowering plants. The adaptability of the different species has enabled them to thrive under the most varied conditions.

Marsh and swamp grasses exist together with the associated species of typha (cattails), *Carex* and *Cyperus* (Sedges) and provide food and cover for various species of birds and small animals [3, 4]. Grasses provide food in the form of cereals for man and forage for most animals. There can be no doubt that cereal and pasture grasses are economically the most important plants in the world and it would be quite impossible to imagine how mankind could continue agriculture without them. In the developed

countries like United States, the principal sources of meat and dairy food (basic constituents of diet) are cattle, sheep and swine. Dairy cattle are maintained in tame pastures. Many species of native and introduced grasses are utilized in improved pastures [5].

Similipal Biosphere Reserve lies between 20°10' - 22°12'N latitude and 85°58' - 86°42'E longitude. It covers an area of 5569 km<sup>2</sup>. It is situated in the central part of Mayurbhanj, a tribal dominated northern district of Orissa. The Similipal massif appears as three concentric bowl-shaped quartzite layers, which have a very high capacity to hold subterranean water. These conditions have favored the development of a very rich and varied flora and fauna. Similipal forest is the unique natural habitat of biodiversity harboring a number of endemic and rare plants and animals. It is natural habitat of Royal Bengal Tiger, Asiatic elephant, Deer, Hill myna and many other herbivores species. In Similipal, abundance of grasses is another remarkable feature of the area. The slopes of the hills and their flats summits are often grasslands. The herbivore populations like elephant, sambar, spotted deer and other ungulates graze on the grasslands for their primary food. The grasslands and meadows have been spread over various compartments of Similipal, which are rich in various grass species.

These animals prefer to graze the nutritious and palatable species. The congregation of these animals depends upon the availability of these grass species in the forestland. In this context an attempt has been made to study the nutrient contents of some grasses found in meadows in Similipal Biosphere Reserve, which can be helpful for the management of grasslands.

## MATERIALS AND METHODS

**Reagents and Chemicals:** All reagents and chemicals used in these experiments are of an analytical grade and are procured from Sisco Research Laboratories Pvt. Ltd., Mumbai, India and Merck Limited, Mumbai, India.

**Collection of Sample:** Grass samples from different meadows across Similipal Tiger Reserve were collected during the month of March and April 2007. In the first phase, samples were collected from the meadows of two areas such as Chahala and Joranda in the northern part of Similipal. In the second phase grass samples were collected from the meadows of four places viz., Nuagaon, Debasthali, Matughara and Bachurichara, which are situated in the southern part of Similipal Biosphere Reserve. A quadrant (1ft X 1ft) was marked in the meadow and all the grass species were uprooted by digging the soil and preserved in plastic bags. The sample of each grass species was immediately pressed in paper bags for herbarium specimen and identification.

**Biochemical Analysis:** Total moisture content and dry weight of the samples were determined by following standard procedures. About 2-5 gm of each grass sample was weighed and dried at 65°C till constant weight [6]. The difference between the initial and final weights was recorded as the moisture content and the final weight as the dry weights of the samples.

Total soluble sugar and total starch content were estimated according to the methods of Ashwell [7] and Carroll *et al.* [8] with slight modifications. Total lipids in grass samples were extracted using solvent mixture of methanol/ ethanol/ Ether in a ratio 1:1:1 and analyzed gravimetrically according to the methods of Trivedy *et al.* [6]. For the estimation of protein, about 5g each of the fresh grass samples were taken and homogenized in an electric homogenizer with about 3 ml of Phosphate buffer of pH 7.4 and determined by Folin reagent with bovine serum albumin serving as standard [9]. The results were expressed in percentage dry weight. Each data point was obtained by making at least 3 independent measurements.

The results were expressed as mean  $\pm$  SD (Standard deviation).

## RESULTS AND DISCUSSION

Grass samples were collected in two phases from both southern and northern parts of Similipal tiger reserve. A total of 10 grass species and about 15 accessory species were collected from different meadows and identified by experts from North Orissa University, Baripada and M.P.C. (Autonomous) College, Baripada (Table 1).

The grass species found in the southern part (Chahala and Joranda) of Similipal Tiger Reserve are *Dentella repens* (pita saga), *Cynodon dactylon*, *Eriochloa procera*, *Eleusine indica*, *Hybanthus enneapermus* (weed), *Apocopis paleacea* and the accessories found in these meadows are *Evolvulus nummularius* L., *Solanum virginianum* (Solanaceae), *Sphaeranthus thatoi* Rath axon (Asteraceae), *Vernoria cireraa*, *Vandellia brachiata*, *Evolvulus nummularius* L., *Eclipta prostrata*, *Mecardenia procumbers*, *Phyllanthus spp.* (Enphorbiaceae), *Rungia pectinata* (Acanthaceae), *Evolvulus alsinoides*. In the second phase grass samples were collected from the meadows in the northern part (Nuagaon, Debasthali, Matughara and Bachurichara) of Similipal Tiger Reserve. A total of six different species including *Oropetium thomacum*, *Melanocenchris jacquimontii*, *Tragus roxburghii* and *Paspalidium flavidum* and some accessories species found in these areas are *Eragrostis atrovirens andropogon pumilus*, *Hedyotis hispida* (Rubiaceae), common weed. The common characteristics of the grass species are summarized in Table 1. Findings from the biochemical analysis of these grass species revealed that the total protein content of all the grass species ranged from 1.78 $\pm$ 0.19 to 6.81 $\pm$ 0.24% dry weight (Figure B) which is comparable to other species in Table 2 [1]. Among the grass species the highest protein content was found in *Melanocenchris jacquimontii* (6.81 $\pm$ 0.24% DW) whereas lowest content was found in *Eriochloa procera* (1.78 $\pm$ 0.19% DW). To our knowledge, this is the first study reported to investigate the nutrient content and palatability of various grasses of Similipal forest. The moisture content in the grass species varied between 34.87 $\pm$ 0.48 and 61.24 $\pm$ 0.22% dry weight. Total soluble sugar varied between 0.56 $\pm$ 0.01 and 9.14 $\pm$ 0.10% dry weight, total starch ranged from 1.02 $\pm$ 0.01 to 26.32 $\pm$ 0.24% dry weight (Figure A). *Melanocenchris jacquimontii* (18.28 $\pm$ 0.32% DW) are rich source of total starch and

Table 1: Characteristics of different grass species collected from Similipal Tiger Reserve

Sl. No.	Meadows	Name of Grass Species	Characteristics	Accessories species found
1	Northern Part of Similpal Tiger Reserve (Chahala and Joranda)	<i>Dentella repens</i>	A small prostrate weed copiously sub-dichotomously branched. Leaves membranous narrow elliptic. Flowers solitary, very inconspicuous, sessile and white. Flowering and fruiting September and through out the cold season.	<i>Evolvulus nummularius</i> <i>L. Solanum virginianum</i> (Solanaceae), <i>Sphaeranthus axon</i> (Asteraceae), <i>Vernoria cireraa</i> , <i>Vandellia brachiata</i> , <i>Evolvulus nummularius</i> L., <i>Eclipta prostrata</i> , <i>Mecardenia procumbers</i> , <i>Phyllanthus spp.</i> (Euphorbiaceae), <i>Rungia pectinata</i> (Acanthaceae), <i>Evolvulus alsinoides</i>
2		<i>Cynodon dactylon</i>	A blue green, prostrate perennial, up to 30 cm high, culms, ascending from long, creeping stolons, slender, smooth, branched, with hairless nodes. Leaf sheath, hairless, except dense. Short hairs at mouth. Ligule, rim of hairs, less than 0.5mm long. Leaf blade, flat or rolled, hairless, very narrow, sharply pointed. Flowering period from September to October.	
3		<i>Eriochloa procera</i>	A densely tufted annual grass. Culms erect or ascending from a bent base, slender, smooth, many branched with hairless nodes. Leaf sheath hairless. Leaf blade flat, hairless, narrow, tapering to point, base rounded. Flowering period from mid August to mid September.	
4		<i>Eleusine indica</i>	A tufted annual up to 40cm high. Culms erect, slender, smooth, branched with hairless nodes. Leaf sheath, keeled, hairless, except sparse, long hairs at mouth. Leaf-blade flat or folded, hair less. Flowering period from late August to November.	
5		<i>Hybanthus enneapermus</i>		
6		<i>Apocopsis paleacea</i>	Stem usually simple, erect from a creeping rootstock, 1-2 ft high with erect narrowly lanceolate leaves, sheath and blades with spreading hairs, spikes 1-2, concurrent. Flowering period May to September.	
7	Southern Part of Similpal Tiger Reserve (Nuagaon, Debasthali, Matughara and Bachurichara)	<i>Oropetium thomacum</i>	A densely tufted perennial up to 10 cm high. Culms, erect, slender, smooth, branched with hair less nodes. Leaf sheath, hairless, except long hairs at mouth. Leaf blade, wiry, rolled or folded. Flowering period from mid August to October.	<i>Eragrostis atrovirens</i> <i>andropogon pumilus</i> , <i>Hedyotis hispida</i> (Rubiaceae), common weed
8		<i>Melanocenchris jacquimontii</i>	A blue green tufted annual, up to 15 cm high. Culms, ascending from a bent base, very slender, smooth, many branched, with dark coloured, hair less nodes. Leaf sheath, with long. Bulbous based hairs. Leaf blade flat or rolled, hair less except sparse, bulbous based hairs at base, narrow with sharply pointed or blunt tip. Flowering period from August to September.	
9		<i>Tragus roxburghii</i> (racemosus)	A leafy and with many spreading and flowering branches from the base. Leaves ovate to linear. Spikelets crowded. Flowering and fruiting August.	
10		<i>Paspalidium flavidum</i>	A tufted annual up to 50cm high. Culms ascending from a bent, creeping base, slender, smooth, branched with rooting hairless nodes. Leaf sheath keeled, hairless except short hairs at mouth. Leaf blade weak, flat or folded, hair less, wide, narrow, sharply pointed tip with minute projection. Flowering period from early August to mid September.	

Table 2: Biochemical composition of various grass species of Similipal Tiger Reserve

Samples	Moisture content (% DW)	Total protein (% DW)	Total lipids (% DW)	Total soluble sugar (% DW)	Total starch (% DW)
<i>Dentella repens</i>	37.32±0.31	2.5±0.04	0.28±0.03	0.56±0.01	26.32±0.24
<i>Cynodon dactylon</i>	37.31±0.23	2.16±0.01	0.38±0.03	0.73±0.1	11.08±0.12
<i>Eriochloa procera</i>	61.24±0.22	1.78±0.19	2.95±0.03	0.83±0.1	10.79±0.18
<i>Eleusine indica</i>	34.87±0.48	2.36±0.01	0.09±0.01	0.72±0.13	5.33±0.11
<i>Hybanthus enneapermus</i>	56.44±0.32	3.61±0.09	6.55±0.03	0.7±0.1	21.56±0.3
<i>Apocopsis paleacea</i>	54.23±0.08	4.89±0.08	0.60±0.05	0.728±0.1	8.23±0.28
<i>Oropetium thomacum</i>	41.55±0.34	5.07±0.02	3.63±0.01	3.52±0.09	1.02±0.01
<i>Melanocenchris jacquimontii</i>	41.29±0.25	6.81±0.24	3.33±0.01	5.18±0.24	18.28±0.32
<i>Tragus roxburghii</i>	50.21±0.12	6.48±0.89	5.97±0.01	9.14±0.10	4.39±0.07
<i>Paspalidium flavidum</i>	57.78±0.19	5.31±0.05	2.97±0.02	7.66±0.15	3.26±0.11

Keynotes: All data are expressed in MEAN±SD, DW = Dry weight.

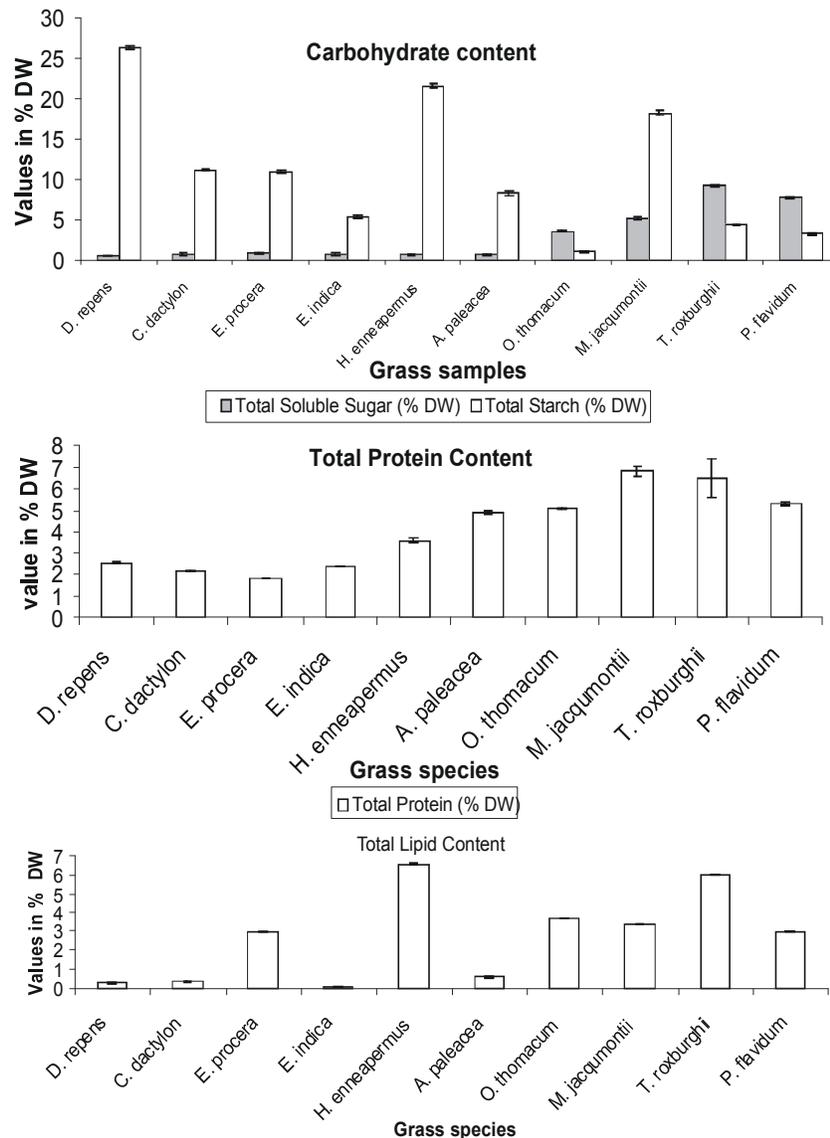


Fig. 1: Nutrient content of various grass species from Similpal Tiger Reserve. (A)- Total Carbohydrate, (B)- Total Protein, (C)- Total lipid content

*Tragus roxburghii* contains highest sugar content ( $9.14 \pm 0.10\%$  DW). The total lipid ranges from  $0.09 \pm 0.01$  to  $6.55 \pm 0.03\%$  dry weight (Figure C). From all the above experiments it was concluded that the nutrient content in the grass species *Hybanthus enneapermus*, *Melanocentris jacquimontii* and *Tragus roxburghii* is comparatively more than that of other grasses. Thus the grass species may be used in cattle fodder.

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