

## Prediction of Relative Nutritive Value of *Themeda Anathera* (Nees Ex. Steud) Hack of Kumaun Hills from Its Chemical Composition at Different Stages of Growth

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Chemical investigation of indigenous fodder grass, viz., *Themeda anathera* (Nees ex. Steud) Hack was carried out at different stages of growth from July to October. This fodder grass was found to contain sufficiently high level of protein, ether extract (fat), sugars, ash and minerals and hence assessed as a good quality fodder.

**Key Words:** Nutritive value, *Themeda anathera* Hack, Chemical composition, Kumaun, .

### INTRODUCTION

Kumaun region is rich in natural vegetation gifted as grasslands and forests, which serve as the principal sources of fodders. Due to poor farming conditions and low output from the crops, the farmers, dairy workers and livestock owners of this region are mostly dependent on animals and animal based production. The proper and systematic selection of fodder is essential to provide a balanced and nutritious diet to the ruminants to increase the lactation and strength and vigour of the cattle. Green grasses, climbers, shrubs and tree leaves constitute the principal fodder for the cattle during the monsoon season. *Themeda anathera* is a common graminaceous fodder used as cattle feed throughout the northwest Himalayas, which grows abundantly in the natural grasslands between 1200 m to 2500 m altitude. It is also stored as hay for feeding the animals during dry season by the local people. Therefore, it was considered of interest to analyze this fodder grass for its chemical constituents and assess its relative nutritive value at different stages of growth.

### EXPERIMENTAL

Samples of *Themeda anathera* grass were collected from different parts of Nainital (1850 m-2100 m altitude) at monthly intervals during the growing season in 1999-2000. Fresh forage samples were dried at 60-70°C in an electric oven and ground to powder for chemical investigation. The powdered samples were stored in refrigerator in polythene bags<sup>1</sup>. These samples were analyzed in the Chemical Laboratories, D.S.B. Campus, Kumaun University, Nainital for protein, free amino acids, ether extract (crude fat), nitrogen free extract, total available

carbohydrates, total soluble carbohydrates, starch, cellulose, free sugars, total ash, soluble ash, minerals like Ca, P, Na, K, Fe and crude fibre. The *in vivo* digestibility of the samples was determined at IVRI, Bareilly.

Crude protein, ether extract (fat), crude fibre and nitrogen free extract of the samples were estimated according to the methods of AOAC<sup>2</sup>. For protein Kjeldahl's method was employed in which total nitrogen and non-protein nitrogen were determined and percentage of protein was calculated. Free amino acids were detected, characterized and determined by employing the method of Heathoote *et al.*<sup>3</sup> Total available carbohydrates and soluble carbohydrates were evaluated by using the methods of Murphy<sup>4</sup> and Johnson *et al.*<sup>5</sup> respectively. Free sugars were detected by paper chromatography.<sup>6</sup> Starch was estimated by Stoddart's anthrone reagent method<sup>7</sup> and for cellulose Colin's method<sup>8</sup> was employed.

Ash and minerals were evaluated by using the methods of Misra<sup>9</sup> and Paech and Tracey<sup>10</sup>. *In vivo* digestibility was estimated by nylon bag technique of Neathrey.<sup>11</sup>

## RESULTS AND DISCUSSION

The findings of chemical investigation of *T. anathera* recorded at monthly intervals during the growing season are reported in Table-1.

Total nitrogen, non-protein nitrogen and protein contents of the grass were found the highest in July and the lowest in October (T.N.: 1.96–0.52%, N.P.N.: 0.40–0.18% and protein: 9.95–2.12%) showing a gradual fall up to September and a sharp decrease in October. Ten free amino acids were detected and characterized from twelve spots visualized in the chromatograms. Out of the identified amino acids glycine, lysine, aspartic acid and  $\alpha$ -alanine were found in fairly good quantities; serine,  $\alpha$ -aminobutyric acid and valine were present in moderate amounts and cystine, isoleucine and glutamic acid were found in trace amounts only. The concentration of these amino acids was found to decrease during the whole sampling season from first to the last cut.

Ether extract (fat) was found to decrease from July (1.39%) to October (0.69%). Total available carbohydrates showed an irregular trend having the lowest value in August (5.75%) and the highest amount in October (11.56%). Similar trend was observed in the case of water-soluble carbohydrates (2.11–4.02%). The amounts of starch and cellulose were found in increasing order from July (starch: 2.32%, cellulose: 25.45%) to October (starch: 5.02%, cellulose: 32.00%). Maltose, sucrose, glucose, fructose and xylose were the main free sugars detected chromatographically in the fodder throughout the sampling season.

Total ash content was observed to increase from July to September (13.10–14.20%) and then decreased in October (11.20%), but soluble ash had an irregular trend. It first decreased up to August (9.60–9.12%), increased in September (10.01%) and then there was a sharp decline in October (5.20%). Amount of calcium was found to increase up to September (0.51–0.62%) and then decreased in October (0.50%). Similar trend was observed in the concentration of phosphorous, *i.e.*, increased up to September (0.120–0.150%) and decreased in October (0.126%). Sodium and potassium had the highest amounts in August and the

lowest amounts in the last sampling month. Total variation in the amount of sodium was from 0.10 to 0.05% and that in the concentration of potassium was found to be 1.10 to 0.86% respectively. Iron showed a steadily decreasing trend with advancing maturity (0.082–0.048%).

TABLE-1  
CHEMICAL COMPOSITION OF *THEMEDA ANATHERA* AT DIFFERENT STAGES OF GROWTH (g per 100 gm dry matter)

Chemical constituents / months	July	August	September	October
Total nitrogen	1.96	1.52	1.10	0.52
Non-protein nitrogen	0.40	0.36	0.29	0.18
Protein	9.95	7.25	5.06	2.12
Ether extract	1.39	1.34	1.02	0.69
Total available carbohydrates	6.40	5.75	9.25	11.56
Water soluble carbohydrates	2.92	2.11	3.46	4.02
Starch	2.32	2.92	3.46	5.02
Cellulose	25.45	27.21	31.06	32.00
Total ash	13.10	13.40	14.20	11.20
Soluble ash	9.60	9.12	10.01	5.20
Ca	0.51	0.59	0.62	0.50
P	0.12	0.13	0.15	0.13
Na	0.10	0.11	0.06	0.05
K	1.10	1.16	0.96	0.86
Fe	0.08	0.070	0.065	0.05
Crude fibre	32.12	35.65	34.46	36.15
Nitrogen free extract	43.68	44.41	45.26	49.84
Imino digestibility	60.20	53.03	46.25	49.49

Crude fibre of the fodder was recorded to have an irregular trend from July to October. It slightly decreased in September and increased in October. Total variation was from 32.12% in July to 36.15% in October. Nitrogen free extract was found to increase regularly with plant maturity (43.68–49.84%).

Adequate amount of minerals is essential for the growth of animals, production of milk and to restrain them from various diseases. NRC (USA, 1971)<sup>12</sup> has given the minimum requirement level of minerals as follows:

Ca: 0.20 to 0.25%; P: 0.20%; Fe: 100 ppm.

The amount of these minerals except phosphorus in the fodder grass analyzed has been found much higher than the required level. The level of phosphorus is slightly below the required amount.

It is concluded that *T. anathera* contained sufficient amounts of all chemical constituents necessary for the cattle. The digestibility data reveal that this grass

may serve as a good quality fodder if selectively fed to the ruminants. This may be used as a fresh fodder and stored as hay for dry season.

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