Asian Journal of Chemistry Vol. 16, No. 2 (2004), 1013–1016

Chemical Constituents and Relative Nutritive Value of *Bromus unioloides* B.H.K. of Kumaun Hills at Different Stages of Development

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Chemical investigation of indigenous fodder grass, *viz; Bromus uniolodes* B.H.K. of Nainital was carried out at different stages of development from July to October 2000 to assess its relative nutritive value as it is commonly used as green fodder by local people during monsoon season and also stored as hay for feeding the cattle during dry witer and summer seasons. This grass was found to containing sufficiently high level of chemical constituents, *viz.*, protein, ether extract extract (crude fat), sugars, ash and minerals and hence is assessed as a good quality fodder.

Key word: *Bromus unioloides* B.H.K., Chemical constitutents, Nutritive value, Kumaun hills.

INTRODUCTION

Kuman region is gifted with rich natural vegetation, *viz.*, grasslands and forests. The livelihood of most of the population of Kumaun hills is dependent on animals and animal based production due to poor farming conditions and low output from the crops. To improve the economic condition of local people, a balanced and nutritious diet has to be provided to the ruminants so that the lactation and strength of the cattle could be increased. For this, a proper and systematic selection of fodder is essential. During monsoon season, green grasses are used as the principal fodder for the cattle. *Bromus unioloides* is an important graminaceous fodder used as cattle feed throughout the northwest Himalayas which grows abundantly in the natural grasslands in between 1900 and 2600 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 nutritive value at various stages of maturity.

EXPERIMENTAL

The samples of *Bromus unioloides* were colledted from various locations around Nainital (1900–2100 m altitude and N-29°16′ latitude) at monthly intervals from July to October 2000. Fresh forage samples were chopped, dried at 60–70°C in an electric oven and ground to powder. The powdered samples were kept in polythene bags and stored in a refrigerator[1]. These samples were

analysed for protein, free amino acids ether extract (fat), free sugars, total soluble sugars, total available carbohydrates, starch, cellulose, total ash, soluble ash, minerals like Ca, P, Na, K, Fe and crude fibre in the Chemical Laboratories, D.S.B. Campus, Kumaun University, Nainital and for *in vivo* digestibility at Indian Veterinary Research Institute, Bareilly.

Protein, ether extract (fat) and crude fibre of the samples were estimated according to the methods of AOAC[2]. For protein, Kjeldahl's method was used in which total nitrogen and non-protein nitrogen were determined and with these parameters the percentage of protein was calculated. Amino acids were detected and determined by employing the method of Heathcote *et al.*[3] Soluble sugars and total available carbohydrates were evaluated by using the methods of Murphy[4] and Johson *et al.*[5] Free sugars were detected by paper chromatography[6]. For estimating starch, Stoddart's anthrone reagent method[7] was used. Cellulose was determined by Colin's method[8].

Ash and minerals were evaluated by using the methods of Misna[9] and Paech and Tracey[10]. *In vivo* digestibility was determined by nylon bag technique of Neathrey[11].

RESULTS AND DISCUSSION

The chemical constituents of *Bromus unioloides* recorded at different stages of development are reported in Table-1.

TABLE-1
CHEMICAL CONSTITUENTS OF *BROMUS UNIOLOIDES* AT DIFFERENT STAGES OF DEVELOPMENT (g/100 g dry matter).

Chemical constituents	July	August	September	October
Total nitrogen	2.60	1.96	1.71	1.10
Non-protein nitrogen	0.48	0.41	0.29	0.20
Protein	13.35	9.69	8.87	5.62
Ether extract (crude fat)	2.25	1.68	1.60	1.45
Total available carbohydrates	8.12	6.25	11.21	14.01
Water soluble carbohydrates	3.21	3.01	4.21	5.62
Starch	3.48	4.56	7.82	8.52
Cellulose	23.10	26.40	28.01	29.19
Total ash	11.35	12.25	14.20	12.08
Soluble ash	6.95	8.25	10.60	7.10
Ca	0.60	0.62	0.82	0.62
P	0.20	0.25	0.243	0.214
Na	0.13	0.10	0.08	0.07
K	1.65	1.83	1.11	1.01
Fe	0.05	0.038	0.078	0.048
Crude fibre	27.65	30.90	31.80	32.58
In vivo digestibility	68.95	61.20	50.80	45.20

Total nitrogen, non-protein nitrogen and protein contents were found highest in July and lowest in October (T.N.: 2.60–1.10%; NPn: 0.48–0.20%; protein: 13.35–5.62%) indicating a gradual fall with advancing maturity. Out of twelve spots visualized in the chromatogram during the detection and characterisation of free amino acids, eleven were identified. Among the identified amino acids serine, glycine, glutamic acid and α-alanine were found in good quantities, aspartic acid, threonine, amino butyric acid, valine and isoleucine were present in relatively low amounts and cystine and lysine were present in trace amounts only. The concentration of these amino acids was found to decrease during the whole sampling season from the first to the last cuts.

Ether extract (crude fat)was found to decrease from July (2.25%) to October (1.45%). Total available carbohydrates and water-soluble carbohydrates showed a decreasing trend from July to August and then increased up to the last cut. Minimum TAC in August was 6.25% and WSC value was 3.01%. Maximum values for these parameters were recorded at 14.01% and 5.62% respectively. The amounts of starch and cellulose were found in increasing order from July to October (starch: 3.48–8.52% and cellulose: 23.10–29.19%). Main free sugars detected chromatographically were maltose, sucrose, glucose, arabinose, fructose and xylose.

Total ash and soluble ash contents were observed to increase from July to September (Total ash: 11.35–14.20%) and then decreased in October. Concentration of calcium was found to have an increasing trend up to the third cut (0.60–0.82%) with a decrease in the last cut (0.62%). Percentage of phosphorus increased up to August (0.200–0.250%) and then decreased continuously with plant maturity (0.243–0.214%). Sodium showed a steady decreasing trend throughout the sampling season (0.13–0.07%) but potassium had highest amount in August (1.83%) and lowest in October (1.01%). Iron percentage had an irregular trend. Total variation noticed was from 0.038 to 0.078%).

Crude fibre of the fodder was recorded to have a regular increasing trend from 27.65% in July to 32.58% in October. *In vivo* digestibility in rumen suspension for 72 h showed a regular fall with advancing maturity (68.95–45.20%).

Adequate amount of minerals is essential for the growth of animals, production of milk and to restrain them from various diseases. NRC (USA, 1971)[12] 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 in the fodder chosen for present study has been found much higher than the required level.

In view of the above discussion, it is concluded that *Bromus unioloides* is a nutritious fodder grass for the cattle. It contains all the chemical constituents in sufficient amounts. It may serve as a rich source of protein, fat and minerals at early stages of growth. It may be selectively fed as fresh fodder as well as stored as hay after harvesting in the month of September or October for the dry season.

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(*Received*: 29 August 2003; *Accepted*: 23 December 2003) AJC-3309