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Phecelurus speciosus (Steud.) Hubb.: A Potential Fodder Grass of Northwest Himalayas

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Phecelurus speciosus (Steud.) Hubb., a perennial indigenous fodder grass of Nainital region (1900–2100 m altitude) of Kumaun Hills was investigated at different stages of development from July to October in 2001–02. This fodder grass was found to contain sufficiently high level of all the chemical ingredients and hence assessed as a good quality fodder.

Key Words: *Phecelurus speciosus* (Steud.) Hubb., Potential fodder, Himalayas.

INTRODUCTION

Kumaun hill region of northwest Himalayas consists mostly of mountainous terrains with poor farming conditions due to limited irrigation facilities and slopy terraces of agricultural land but is gifted with rich natural vegetation, *viz.*, grasslands and forests. Hence the farmers, dairy workers and livestock owners of this region are mostly dependent for their economy on animals and animal-based production. In order to increase the extent of lactation and strength of animals, a balanced and nutritious diet must be provided to them for which a proper and systematic selection of fodder is essential. Green grasses are used as the principal fodder for the cattle by the local people during monsoon season. *Phecelurus speciosus* is a common graminaceous fodder used as cattle feed throughout the northwest Himalayas which grows abundantly in the natural grasslands up to 2600 m altitude. It is also stored as hay for feeding the animals along with fodder tree leaves during the dry winter and summer seasons. Therefore, it was considered of interest to analyze this fodder grass for its chemical ingredients and assess its significance as fodder at different stages of development.

EXPERIMENTAL

Samples of *P. speciosus* grass were collected from various locations around Nainital (1900–2100 m altitude) in the middle of every month from July to October in the year 2001–02. Fresh forage samples were dried at 60–70°C in an electric oven and ground to powder for chemical investigation. The powdered samples were kept in polythene bags[1]. These samples were analyzed in the Chemical Laboratories, D.S.B. Campus, Kumaun University, Nainital for protein, amino acids, free sugars, total soluble sugars, starch, cellulose, lignin, ether extract (crude fat), crude fibre, total ash, soluble ash and minerals like Ca, P, Na, K and Fe. The *in-vivo* digestibility of the grass samples was determined at IVRI, Bareilly.

The protein content of the sample was determined by Kjeldahl method[2] in which total nitrogen and non-protein nitrogen were determined and with these values, protein percentage was calculated. The amino acids were detected, characterized and determined according to the method of Heathoote *et al.*[3] Total soluble sugars

were evaluated by using the method of Johnson *et al.*[4] Free sugars were detected by paper chromatography[5]. Starch was estimated by Stoddart's anthrone reagent method[6]. For cellulose and lignin, Colin's method[7] was employed. Ether extract and crude fibre of the samples were determined as per the methods of AOAC[8].

For the estimation of total ash, soluble ash and minerals, the methods of Misra[9], Paech and Tracey[10] were employed. *In-vivo* digestibility was evaluated by nylon bag technique of Neathrey[11].

RESULTS AND DISCUSSION

The findings of chemical investigation of *P. speciosus* recorded at monthly intervals during the growing season are given in Table-1.

TABLE-1
CHEMICAL CONSTITUENTS OF *PHECELURUS SPECIOSUS* AT DIFFERENT STAGES OF DEVELOPMENT
(percentage on dry matter basis).

Months. / Chemical constituents	July	August	September	October
Total nitrogen (TN)	2.10	1.65	1.31	0.96
Non-protein nitrogen (NPN)	0.36	0.32	0.26	0.16
Protein content (PC)	10.88	7.21	6.56	5.00
Total soluble sugars	3.88	3.21	4.58	4.54
Starch	2.11	2.64	3.80	4.68
Cellulose	24.20	26.56	30.50	31.42
Lignin	3.50	4.72	6.60	7.16
Ether extract	2.20	1.80	1.56	1.26
Crude fibre	29.12	33.65	39.01	41.21
In-vivo digestibility	52.84	46.16	38.28	32.22
Total ash	11.20	12.10	13.20	14.90
Soluble ash	8.90	9.10	9.80	9.40
Ca	0.50	0.40	0.38	0.36
P	0.20	0.22	0.24	0.165
Na	0.08	0.09	0.04	0.03
K	0.92	0.94	1.06	0.62
Fe	0.0084	0.0073	0.0057	0.0044
Silica content	2.30	3.00	3.40	5.52

As is evident from the table, total nitrogen, non-protein nitrogen and protein contents of the fodder grass samples were found to decrease continuously from July (TN: 2.10; NPN: 0.36; PC: 10.88%) to October (TN: 0.96; NPN: 0.16; PC: 5.0%). The amount of total water soluble sugars was recorded lower in August (3.21%) than in July (3.88%) and then increased in September (4.58%) but remained almost constant upto October (4.54%). A gradual increasing trend was found in the concentration of starch with increasing maturity (July: 2.11, Oct: 4.68%), Cellulose content also showed the same trend (July: 24.20, Oct.: 31.425%). High lignin

concentration was recorded in the samples during the whole sampling season and it increased from July (3.50%) to October (7.16%). The amount of ether extract showed a gradual fall from the first to the last cut (2.20–1.26%). Crude fibre level was found to have a remarkable change with plant maturity. Its amount increased from 29.12% in July to 41.21% in October. *In-vivo* digestibility of the grass samples decreased sharply from 52.84% in July to 32.22% in October.

Total ash content of the fodder samples increased regularly, though the overall change was small, from 11.20% in July to 14.90% in October but the amount of soluble ash increased only up to September (8.90–9.80%) and then decreased slightly in October (9.40%). The concentration of calcium was found to decrease regularly from July (0.50%) to October (0.36%) but the amount of phosphorus increased from July to September (0.200–0.240%) and then decreased in October (0.165%). Sodium percentage was found to vary irregularly and overall change in its amount was found from 0.09% in August to 0.03% in October. The concentration of potassium increased up to September (0.92–1.06%) and decreased sharply in October (0.62%). The amount of iron was found to decrease from 0.0084% to 0.0044% during the whole sampling season. A regular increasing trend was recorded in the amount of silica which changed from 2.30% in July to 5.52% in October.

The chromatographic analysis of the ethanolic water extract of the samples for the amino acids revealed twelve ninhydrin positive spots out of which ten were identified and characterized as cystine, lysine, aspartic acid, serine, glycine, glutamic acid, threonine, α-alanine, isoleucine and leucine. Their amounts were determined at monthly intervals by standard leucine curve method and are given in Table-2. The amounts of aspartic acid, glycine, glutamic acid and α-alanine were found to be appreciably higher than the other amino acids present in the samples during the whole sampling season. The quantities of all the amino acids were found in the decreasing order with advancing maturity reaching to very low amounts or even traces in some cases in October, the last sampling month. The amount of cystine was found in traces only in all the sampling months.

TABLE-2
AMINO ACID CONCENTRATION OF *PHECELURUS SPECIOSUS* AT DIFFERENT STAGES OF DEVELOPMENT
(percentage on dry matter basis)

Amino acids \ Months	July (pre flowering stage)	August (flowering stage)	September (post-flowering stage)	October
Cystine	0.008	T	T	T
Lysine	0.060	0.046	0.030	T
Aspartic acid	0.110	0.068	0.048	0.030
Serine	0.064	0.048	0.035	0.022
Glycine	0.098	0.076	0.044	0.028
Glutamic acid	0.080	0.066	0.040	0.026
Threonine	0.048	0.035	0.017	T
α-Alanine	0.074	0.060	0.042	0.018
Isoleucine	0.050	0.038	0.028	T
Leucine	0.042	0.030	0.018	T

T: Trace amounts.

Free sugars were also detected and characterized by chromatographic method in the fodder samples. Seven *p*-anisidine hydrochloride positive spots were visualized but only six were identified as maltose, sucrose, glucose, arabinose, fructose and xylose.

Adequate amounts of minerals are essential for the milk production, growth of animals and to restrain them from various diseases. NRC (USA, 1971)[12] has given the minimum requirement level of minerals as follows:

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

The amounts of these minerals except iron in the fodder grass analyzed have been found much higher than the required level while that of iron was recorded slightly lower during the whole season of sampling.

It is concluded that *P. speciosus* contained sufficient amounts of chemical constituents necessary for the cattle. From the digestibility data, it is revealed that the fodder grass has less digestibility during the post-flowering stages but is sufficiently digestible in the early months (pre-flowering and flowering stages). Thus, it may serve as the good quality fodder if fed selectively to the ruminants.

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