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Chemical Analysis of a Fodder Tree Leaves (*Millettia auriculata*)

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Protein, crude protein, ether extract, crude fibre, ash insoluble silica, carbohydrate, sugar, reducing sugars, minerals, trace elements and amino acids were found in the leaves of the *Millettia auriculata* plant.

Key Words: *Millettia auriculata*, Protein, Carbohydrate, Mineral, Amino acids.

INTRODUCTION

Millettia auriculata[1] Baker ex Brandis belongs to leguminosae family. Its Hindi name is Gauj or Gonj. It is a sub-erect shrub, more often a woody climber, found throughout the sub-Himalayan tract. It is common in sal forests and is often an obnoxious weed. Bark yellowish brown with small rough lenticels, leaves imparipinnate and flowers whitish or brownish. The leaves and twigs of the plant are lopped for cattle fodder.

EXPERIMENTAL

Leaves of the *Millettia auriculata* plant were collected trimonthly and analyzed for protein, amino acids, carbohydrates, sugars, reducing sugars, minerals and vitamin contents. Protein was analyzed by micro-Kjeldahl procedure[2]. Plant material was defatted with solvent ether and was macerated with 5 mL 80 % absolute alcohol in a mortar. The extract was filtered in a separating funnel and four volume of acetone was added into it and the separating funnel was shaken for few minutes. After keeping it an upright postion two layers appeared separately. The lower layer was discarded. Upper layer was used for the analysis of free amino acids[3,4]. Qualitative and quantitative estimation of free amino acids were performed by paper chromatography and spectrophotometer method[5,6]. The solvent system used for the development of chromatogram and *n*-butanol:acetic acid:water (4:1:1 v/v)[7] and *n*-butanol:acetic acid: pyridne:water (15:3:10:12)[8]. Developed and dried chromatograms were sprayed with 0.1 % solution of ninhydrin and products were visualized by the appearance of distinct coloured spots. These spots were cut with forceps and eluted with distilled water. The concentration of eluted complex was determined by spectrophotometer at 570 nm. Estimation was carried out by comparing the colour intensity of the

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unknown with that of the known (standard) and thus concentration was determined. Carbohydrates[9] are first hydrolyzed into simple sugar using dilute hydrochloric acid. In hot acidic medium glucose is dehydrated to hydroxymethyl furfural. This compound forms with anthrone a green coloured product with adsorption maximum at 630 nm. A standard graph was plotted between concentrations of the standards on the X-axis *versus* absorbance on the Y-axis. With the help of this graph the concentration of carbohydrate in the samples were calculated. The complete extraction of sugars from plant materials without solubilizing polysaccharides and protein and dissolving other interfering substances was accomplished by 80 % ethanol[10]. Extraction was performed by means of a Soxhlet. The sugar solution was then heated in a water bath, centrifuged and then clarification was performed. The sugar solution gave blue-green colour with anthrone reagent. Its intensity was determined by spectrophotometer at 760 nm. It was compared with the standard and thus the concentration was determined. Benedict's quantitative regent method was used for the estimation of reducing sugars[11]. Analysis of minerals was done by the methods reported by Misra[12]. Iron content was determined by using 2,2′-dipyridyl reagent, copper by cupron reagent, managanese by formaldoxime reagent and zinc by quinalidinic acid, respectively. Vitamin A was determined by antimony trichloride reagent[13] and vitamin C was determined by using 2,4-dinitrophenyl hydrazine (DNPH) reagent[9].

RESULTS AND DISCUSSION

Table-1 indicates that crude protein (30.80 %), ether extract (4.58 %), phosphorus (1.48 %), iron (0.070 %), carbohydratres (40.26 %), copper and vitamin A contents were more in the month of June, in comparison to other months. Crude fiber (28.65 %), sugars (3.65 %), reducing sugars (1.72 %) and non-reducing sugars (1.93 %) were found more in September while calcium (2.27 %), magnesium (2.30 %) and potassium (2.06 %) were more in December. Vitamin C and manganese contents were almost same in all months. Zinc content was same in March and June and then decrease, remains same in September to December.

Crude proteins, calcium, phosphorus, potassium, copper, reducing sugars and non-reducing sugars are minimum in the month of March, although these values are not below average value.

Table-2 shows amino acids composition of the leaves of the fodder tree *Millettia auriculata*. Fourteen amino acids in June and December while 13 were identified and estimated in March and June. The concentration of histidine (12.50), lysine (3.75) serine (3.10), glycine (6.80) and phenylalanine (3.70) were more in the month of June in comparison to other amino acids while cystine (4.00), alanine (2.30), tyrosine (3.60), valine (++), methionine (2.52), isoleucine (1.20) and leucine (1.16) content were more in September. The concentration of arginine and proline were more in March. The general concentration of amino acids are June > September > December > March.

TABLE-1
CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF *Millettia auriculata*

Dry matter basis (%)	March	June	September	December
Crude protein	25.76	30.80	30.28	26.31
Ether extract	2.62	4.58	2.11	3.42
Crude fiber	24.98	21.83	28.65	25.22
Ash	11.90	9.11	8.02	7.71
SiO_2	2.35	2.05	0.59	0.72
Calcium	1.74	1.95	2.22	2.27
Phosphorus	0.71	1.48	1.16	0.93
Magnesium	2.07	1.40	2.02	2.30
Potassium	1.37	1.75	1.88	2.06
Iron	0.068	0.070	0.052	0.070
Copper	++	+++	++	++
Manganese	+++	+++	+++	+++
Zinc	++	++	+	+
Carbohydrates	35.06	40.26	36.67	32.64
Sugars	2.36	3.42	3.65	2.80
Reducing sugar	1.42	1.56	1.72	1.36
Non-reducing sugar	0.94	1.86	1.93	1.44
Vitamin A	++	+++	++	+
Vitamin C	+++	+++	+++	+++

+ = In traces, ++ = Moderate amount, +++ = Good amount

TABLE-2
AMINO ACID COMPOSITION OF *Millettia auriculata*

Amino acids mg/100 g on dry matter basis	March	June	September	December
Cystine	1.65	2.10	4.00	1.92
Histidine	1.82	12.50	3.60	3.40
Lysine	0.40	3.75	1.18	0.56
Arginine	4.20	3.50	3.70	4.76
Serine	1.55	3.10	0.75	0.26
Glycine	2.20	6.80	1.98	3.26
Alanine	1.05	1.24	2.30	0.76
Proline	1.15	0.40	0.32	0.92
Tyrosine	0.65	1.48	3.60	1.22
Valine	–	+	++	-
Methionine	0.25	0.78	2.52	0.20
Phenylalanine	0.43	3.70	3.50	1.20
Isoleucine	0.64	1.10	1.20	0.85
Leucine	+++	1.05	1.16	0.75

– = Not detected, + = In traces, ++ = Moderate amount, +++ = Good amount

From the above discussion, it is concluded that the fodder shrub leaves of the plant contains adequate nutrients and can be used as a good fodder. The leaves can be profitably fed in combination with dry roughages such as straw and hay, which are poor in protein contents. From chemical analysis results, it is concluded that the

nutritive value of the leaves is more in the month of June followed by September. In reality farmers face problem in collecting gree fodder in hot and dry summer, fodder tree leaves are the best solution to feed and fodder scarcity. Therefore, farmers should propagate and cultivate best fodder trees in the community land of the village. In Himalayan region there are many villages where grazing is degrading, the knowledge of good quality fodder trees and their plantation is urgently needed for better use of such potential as well as in the present context of environmental degradtion, which is affecting the earth.

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