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Forest Fungi in the Aid of Tribal Health – A Case Study

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Abstract

Attempts were made to study the wild edible fungi commonly known as "Mushroom" which are collected and used in dietary in many parts of our country. In Madhya Pradesh, the tribal and rural poor were noticed to collect, consume and sell some wild fungi. It can be conjectured that unknowingly the tribal people supplement their requirement for essential protein, fat, carbohydrates and minerals by consuming wild edible fungi. During the course of study five edible fungi used by tribal people of Kundwara and Raoria villages have been identified, namely *Cantharellus sp., Podabrella microcarpa, Termitomyces heimii, T. clypeatus* and *Macrolepiota procera.* The Nutritional analyses for protein, sugars, fat, minerals and micronutrients were carried out for the edible fungi.

Keywords : Edible fungi, Tribal, Nutrition etc.

Introduction

Fungi have been eaten in all countries and at all times, and their value as to nourishment and flavour have been appreciated in varying degrees by different peoples at different periods. There has been a great deal of argument as to the nutritive value of fungi. Some of the older writers declaring that much of the protein they contained could not be digested. More recent work, however, goes to show that at least two thirds of the protein can be assimilated. But edible fungi vary considerably in their protein content. Dried mushrooms are richer in protein than any dried vegetable (excluding nuts). Dried or pickled fungi, especially milky caps (*Lactarius spp.*) used to be eaten in Russia during the fast ordained by the Orthodox Church when the eating of meat was forbidden . Many animals, even carnivores such as wolves, eat fungi and these, together with lichens, form an important part of the diet of reindeer in winter .

On the other hand to man's benefit they have given us life saving antibiotics, such as penicillin, they are invaluable scavengers in our woods, and the yeast fungi produce bread, beer and wine. They have always been a source of food and recent developments have opened up the way to large scale production of protein by growing fungi on cheap raw materials, thus producing valuable food stuffs to feed the world's ever increasing population.

Tribal are well acquainted of the habitat and period of occurrences of the fungi (Harsh *et al. 1993*). They collect them while gathering other food, fodder and fuel items for the family from the forests. There are reports that wild edible fungi, are collected from the forests of Madhya Pradesh and sold in the weekly markets (Dadwal et al. 1989, Harsh *et al*. 1989 and Harsh and Rai, 1990).

Determination of chemical composition constitutes the first steps in evaluation of nutritive value of food stuff. In the absence of definite nutritional studies, chemical composition can serve as good relative measure for composition with other food stuff of established nutritive value (Crisan and Sand, 1978).

The present study is aimed at analyzing nutritional values of important wild edible fungi used by the Gond tribe of Jabalpur district in Madhya Pradesh in central India.

Material and Methods

Tribal people of two villages namely Kundwara and Raoria of Jabalpur district of Madhya Pradesh are collecting and using fungi in food, medicine, etc. were identified to seek their help in the collection of particular fungi. During the time of their occurrence, details of habit, growing time, etc. were recorded.

These fungi were identified and confirmed up to species level through detailed macro and microscopic laboratory studies. The fruit bodies of fungi were preserved by drying under the sun or inside specially designed chamber with bulbs.

The air dried fruit bodies of six species of edible fungi were powdered in an electric grinder and stored in polythene bags for bio – chemical analysis at Forest Pathology Division, Tropical Forest Research Institute, Jabalpur.

For nutritional analysis, the protein content in the sample was determined by using conventional Micro-kjeldahl digestion and distillation procedure as given by A.O.A.C. (1965). The total carbohydrates were estimated by the acid hydrolysis process, free soluble sugar in the sample was extracted by 80% ethyl alcohol estimation of oil (fats) by Soxhlet apparatus and estimation of minerals viz., calcium, potassium, sodium, potassium, sulpher, iron, manganese, zinc and copper was done by diacid digestion method.

The micronutrients viz., Iron, Manganese, Copper and Zinc in the diacid digest were determined by atomic absorption spectroscopy. The instrument was first calibrated using respective standard solution. All the experiments were carried out in duplicate and mean values have been reported.

Results

The results of nutritional analyses have been presented in Table-1 and 2. Maximum moisture content was found in *Podabrella microcarpa* whereas minimum was in *Cantharellus* sp., however, there was no significant difference among these values. Protein content was found maximum in *Termitomyces heimii* (45.28%), followed by *Termitomyces clypeatus* (43.97%), whereas the minimum protein content was estimated in *Podabrella microcarpa* (24.08%). Significant difference in protein content was observed between all the fungi except between *T.heimii* and *T.clypeatus* and *Cantharellus sp.* and *P.microcarpa*.

Total carbohydrates were found maximum in T. heimii (27.77%) and minimum in Termitomyces clypeatus (15.37%). There were no significant difference for carbohydrate content between Termitomyces heimii and *Cantharellus sp*.; between *Cantharellus sp.* and *M. procera,* and *M. procera* and *P. microcarpa.*

Among the sugars, sucrose was estimated maximum in *T. clypeatus* (2.64m/g), whereas glucose was maximum in *M. procera* (3.35mg/g) and ribose was maximum in T. heimii (4.36 mg/g). For sucrose there was no significant difference between *Cantharellus sp.* and *M. procera*, between *M. procera* and *P. microcarpa* and T. heimii and T. clypeatus. For galucose content there was significant difference between all the fungi except between *P. microcarpa* and *T. clypeatus*. There was significant difference for ribose content between all the fungi except between *M. procera* and *P. microcarpa.* Fat content was estimated maximum for *P. microcarpa* (7.2%), followed by *T. heimii* (7.0%), whereas minimum fat was estimated in *T. clypeatus*, but there was no significant difference between the fungi.

Maximum estimated values for Sodium (0.19%), Calcium (0.04%), Sulpher (0.94%), Iron (18.05 ppm), Copper (1.96 ppm) and Mangnese (16.49 ppm) were found for *M. procera*, whereas potassium (0.49%) and phosphorus (1.45%) were found maximum for *T. heimii*. Maximum values of Zinc (143.3 ppm) were estimated for *M. procera* (Table-2). There was no significant difference for potassium content between *P. microcarpa* and *T. clypeatus* and between *M. procera* and *T. heimii*. For sodium content significant difference was found between *Cantharellus sp.* and *T. clypeatus*, *T. clypeatus* and *T. heimii, Cantharellus sp.* and *M. procera, Cantharellus sp.* and *T. heimii,* and *T. heimii* and *M. procera* only. For phosphorus content no significant difference was observed between *P. microcarpa* and *Cantharellus sp.,* and *T. clypeatus* and *M. procera.* There was significant difference for calcium content between all the fungi except between *Cantharellus sp.* and *P. microcarpa*. There was significant difference for sulphur, iron and zinc content between all the fungi. Significant difference was not observed for manganese content between *P. microcarpa* and *Cantharellus sp*. and between *T. clypeatus* and *M. procera.* There was significant difference between all the fungi for copper content except between *M. procera* and *T. clypeatus.*

Discussion

Determination of chemical composition constitutes the first step in evaluation of nutritive value of a foodstuff. In the absence of definite nutritional studies, chemical composition can serve as a good relative measure for comparison with other food stuff of established nutritive value (Crisan and Sands, 1978). In the present study the moisture content in the fruit body was found to vary from 88.27 per cent to 92.14 per cent. This is in conformity with the standard results obtained by Crisan and Sands (1978) that fresh mushrooms generally contain 85 to 95 per cent moisture.

Crisan and Sands (1978) recorded that protein content in fresh mushrooms varied between 4 to 44 per cent. In the present study the protein content varied from 16.13 percent to 45.28 per cent. They have reported 25.4 per cent protein in *Cantharellus cibarius*. In the present study the protein content in *Cantharellus sp.* was found to be 26.07 per cent.

Fresh mushrooms are reported to contain 3 to 32 per cent carbohydrates (McConnel and Esselen, 1947). In the present study carbohydrates were found to vary between 15.35 per cent to 27.77 per cent. 6 Hagan (1964) reported that on an average edible fungi contains 1- 8 per cent fat on dry weight basis. In this study fat content was found to vary from 4.7 per cent to 7.21 per cent.

Li and Chang (1982) have reported that potassium, sodium and phosphorus are main components available on higher side in mushrooms while calcium is low. In the present study phosphorus, potassium, sodium and sulphur were also found on higher side. Thus the nutritional analyses of the fungi provide clear indication that these mushrooms have useful amount of protein, carbohydrates, fat, minerals and micronutrients. Panday and Ghose (1996) stated that as a food the nutritional value of mushrooms lies between meat and vegetable and even called as “vegetable meat”. Investigations by Lintzel (1943) indicate that 100-200 g. of mushrooms (dry weight) are requried to maintain nutritional balance in a normal human being weighing 70 kg. These edible mushrooms are equivalent in their nutritional composition to *Morchella esculenta* (the prized guchchi mushroom) and *Agaricus biosporus* (button mushroom) and, therefore, should have the same business potential. It can be concluded that unknowingly the tribal people supplement their requirement for essential protein, fat, carbohydrates and minerals by consuming wild edible fungi.

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Table -1: Nutritional Analysis of Wild Edible Fungi

Name of Species	Moisture content (%)	Fat (%)	Protein (%)	Carbohydrates (%)	Sugar content (mg/g dry weight)		
					Sucrose (mg/g)	**Glucose** (mg/g)	**Ribose** (mg/g)
Termitomyces heimii	91.8	7.0 (2.62)	45.28	27.77 (5.27)	2.34	2.86	4.36
Cantharellus sp.	88.27	6.3 (2.49)	26.07	23.81 (4.87)	1.01	2. 10	3.27
Macrolepiota procera	89.90	5.67(2.35)	38.41	22.96 (4.78)	0.88	3.35	0.88
Podabrella microcarpa	92.14	7.20 (2.66)	24.08	19.33 (4.39)	1.52	1.50	1.09
Termitomyces clypeatus	90.88	4.70 (2.16)	43.97	15.35 (3.91)	2.64	1.31	2.15
CD (0.05)	NS	NS	3.40	0.43	0.74	0.43	0.27

Values Within Parentheses are Square Root Transformed Values.

Table – 2 : Minerals and Micronutrients in Edible Fungi

Name of Species	Minerals					Micronutrients (in ppm)			
	Potassium (K)	**Sodium (Na)**	**Phosphorus (P)**	**Calcium (Ca)**	**Sulphur (S)**	**Iron (Fe)**	**Manganese (Mn)**	**Copper (Cu)**	**Zinc (Zn)**
Termitomyces heimii	0.49%	0.17%	1.45%	0.022%	0.83%	11.75	12.71	1.56	79.33
Cantharellus sp.	0.34%	0.11%	0.416%	0.016%	0.33%	6.93	8.23	1.02	10.00
Macrolepiota procera	0.47%	0.19%	1.12%	0.036%	0.94%	18.05	16.49	1.96	143.3
Podabrella microcarpa	0.23%	0.12%	0.353%	0.016%	0.21%	7.48	7.36	1.34	34.00
Termitomyces clypeatus	0.18%	0.13%	0.99%	0.0026%	0.79%	14.11	14.83	1.96	124.00
$CD_{(0.05)}$	0.07	0.02	0.24	0.0052	0.03	0.59	2.11	0.15	5.60