

Evaluation of Wild Edible Mushrooms for Amino Acid Composition

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Abstract: Five different species of genus *Lentinus* namely, *Lentinus sajor-caju* (Fr.) Fr., *L. connatus* Berk., *L. torulosus* (Pers.:Fr.) Lloyd, *L. cladopus* Lév and *L. squarrosulus* Mont. from Northern India were investigated. Out of the five wild edible species of *Lentinus*, aspartic acid was found to be predominated fatty acid. Aspartic acid content ranged from 0.25-0.37% with maximum in *L. squarrosulus* (0.37%) and minimum in *L. torulosus* (0.25%). Arginine content ranged from 0.21-0.29% with maximum in *L. torulosus* (0.29%) and minimum in *L. squarrosulus* (0.21%). Alanine content ranged from 0.09-0.15% with maximum in *L. torulosus* (0.15%) and minimum in *L. squarrosulus* var. *squarrosulus* (0.09%). Proline content ranged from 0.01-0.06 with maximum in *L. squarrosulus* (0.06%) and minimum in *L. connatus* (0.01). Similarly tyrosine content ranged from 0.16-0.24% with maximum in *L. cladopus* (0.24%) and minimum in *L. sajor-caju* (0.16%).

Key words: *Lentinus* • Amino acids • Wild mushrooms • Nutraceuticals

INTRODUCTION

Mushrooms have long been valued as highly nutritious tasty food items by many societies throughout the world [1]. In addition to their nutritional value, many edible mushrooms have long been investigated for their pharmaceutical constituents [2, 3]. At present, over 270 species of mushroom are reported with known therapeutic properties [4-6]. Medicinal mushroom extracts were considered as an important remedies for the prevention and treatment of many diseases for thousands of years especially in the Oriental regions [7-8]. Many of them are rich source of various bioactive molecules having anticancer and immunomodulatory potential. Such compounds are increasingly used in Japan as adjuvant to help support immune function in cancer patients during radio and chemotherapy and are reported to prolong survival times in some types of cancer [9]. Previous studies have shown that *Lentinus* Fr. mushrooms can lower both blood pressure and free cholesterol in plasma, as well as accelerate accumulation of lipids in the liver, by removing them from circulation [10]. Nucleic acids from *Lentinula edodes* have been reported to initiate significant platelet agglutinating inhibitory effects [11]. Currently 14,000 mushroom species

are known to exist. Out of these about 50% species are reported to possess varying degrees of edibility and almost 3000 species spread over 31 genera are regarded as prime edible mushrooms. To date only 200 of them are experimentally grown, 100 of them economically cultivated, approximately 60 commercially cultivated and about 10 have reached to industrial scale production in many countries [12]. Due to the wide use of wild mushrooms as a source of important compounds, amino acid composition of five wild edible mushrooms have been determined so as to support their culinary credentials.

MATERIALS AND METHODS

Samples: All the five fully mature samples were collected from various localities of North West India (Table 1). The samples were dried at 45°C and preserved in cellophane bags in air tight conditions with small amount of 1-4 para dichlorobenzene in porous packets to keep them insect free for further investigations [Table 1]. Taxonomic identification was done following the description given by [13]. The samples were deposited at the herbarium of Department of Botany, Punjabi University Patiala (Punjab) India under PUN [14].

Table 1: *Lentinus* species with their host and altitude range

Species	Host	Location	Altitude (m)
<i>Lentinus sajor-caju</i>	<i>Bauhinia variegata</i>	Sirmour (Himachal Pradesh)	672
<i>Lentinus conatus</i>	<i>Mangifera indica</i>	Chandigarh (Punjab)	200
<i>Lentinus torulosus</i>	<i>Pinus roxburghii</i>	Palampur (Himachal Pradesh)	850
<i>Lentinus cladopus</i>	<i>Albizia chinensis</i>	Palampur (Himachal Pradesh)	1200
<i>Lentinus squarrosulus</i>	<i>Albizia chinensis</i>	Palampur (Himachal Pradesh)	1200

Amino Acid Analysis: Samples were crushed and dried up to constant weight. Dried sample (0.1g) was extracted with 2.5ml of 70% aqueous methanol followed by 1.5ml and 1ml of 70% aqueous methanol. This extract was then centrifuged at 4000 rpm at 4°C for 10 minutes. Supernatant was collected and volume made up to 5 ml by dissolving 70% methanol. The extract was passed through Millipore filter (0.45 µm). Derivatisation was done with derivatising agent prepared by ethanol: triethylamine : water : phenylisothiocyanate (PITC). Mixed 10µl sample in a test tube and dried using vacuum oven. Added 20µl derivatising agent mix with it and re-dried it. Then left the sample for 25 minutes at room temperature. Allowed the vial to dry thoroughly to remove all traces of PITC. After proper drying added 1ml ethanol and injected into UPLC.

An Acquity UPLC from Waters India Pvt. Ltd. equipped with PDA (Photodiode array detector) and Pico. Tag column (3.9 X 150 mm) for amino acid analysis was used. Mobile phase A consisted of 0.1% TEA (triethylamine) in 940 ml water + 60 ml acetonitrile and mobile phase B consisted of 600 ml acetonitrile + 400 ml distilled water were used. Following parameters were used for separation of amino acid.

Time	Flow	A%	B%
0	1.00	100	0
11	1.00	50	50
20	1.00	100	0

Column temperature was 38°C and amino acids estimated at 254 nm.

Table 2: Amino acid composition of wild edible *Lentinus* species

Species	Aspartic acid	Arginine	Alanine	Proline	Tyrosine
<i>Lentinus sajor-caju</i>	0.33±0.002 a	0.25±0.001 a	0.12±0.002 b	0.03±0.002 c	0.16±0.001 a
<i>Lentinus conatus</i>	0.28±0.001 a	0.27±0.003 a	0.13±0.001 b	0.01±0.00 c	0.19±0.002 a
<i>Lentinus torulosus</i>	0.25±0.003 a	0.29±0.004 a	0.15±0.001 b	0.04±0.00 c	0.21±0.001 a
<i>Lentinus cladopus</i>	0.31±0.004 a	0.24±0.002 a	0.11±0.001 b	0.04±0.001 c	0.24±0.001 a
<i>Lentinus squarrosulus</i>	0.37±0.002 a	0.21±0.001 a	0.09±0.001 c	0.06±0.001 c	0.19±0.001 a

In each row and column different letters mean significant differences (p<0.5).

Statistical Analysis: Data obtained were statistically analyzed for analysis of variance (ANOVA) using computer software.

RESULTS AND DISCUSSION

Out of the five wild edible species of *Lentinus* evaluated, aspartic acid content was maximum in *L. squarrosulus* (0.37%) followed by *L. sajor-caju* (0.33%), *L. cladopus* (0.31%) and *L. conatus* (0.28%). Least amount of this amino acid was documented in *L. torulosus* (0.25%). The amount of arginine was maximum in *L. torulosus* (0.29%) followed by *L. conatus* (0.27%), *L. sajor-caju* (0.25%) and *L. cladopus* (0.24%). In comparison, minimum amount of arginine was documented in *L. squarrosulus* var. *squarrosulus* (0.21%). Maximum amount of alanine was recorded in *L. torulosus* (0.15%) followed by *L. conatus* (0.13%), *L. sajor-caju* (0.12%) and *L. cladopus* (0.11%). As compared minimum amount of alanine was documented in *L. squarrosulus* var. *squarrosulus* (0.09%). The amount of proline was maximum in *L. squarrosulus* (0.06%) followed by 0.04% in *L. torulosus* and *Lentinus cladopus*, 0.03% in *Lentinus sajor-caju* as minimum in *L. conatus* (0.01). Similarly tyrosine was maximum in *L. cladopus* (0.24%), followed by *L. torulosus* (0.21%), *L. squarrosulus* var. *squarrosulus* and *L. conatus* (0.19%). Least amount of tyrosine was evaluated in *L. sajor-caju* (0.16%). Amongst *Lentinus* species aspartic acid was found in highest proportion followed by arginine, alanine, tyrosine and proline.

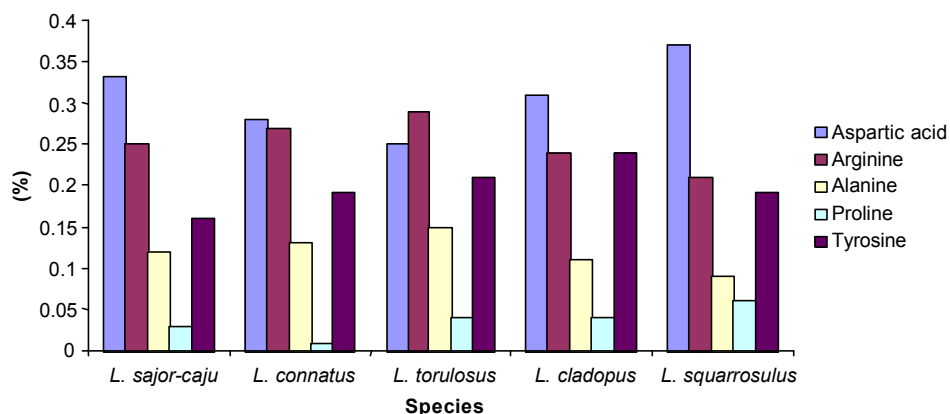


Fig. 1: Histogram depicting the comparative amino acid composition of five *Lentinus* species

While working on the wild edible *Boletus* species Valery [15] documented the dominance of aspartic acid over other amino acids, which is in conformity with the present observations [Table 2 and Figure 1]. In comparison the dominance of arginine in *Pleurotus* species [16]. Similar results were shown by Dembitsky [17] while working on wild edible mushrooms of genus *Boletus*. Whereas, edible mushrooms of western Siberia *Boletus edulis*, *B. sipellis*, *B. scaber* and *B. variegatus*, contained 23 kinds of total free amino acids in which lysine, arginine, threonine, valine, tryptophan, leucine, asparagine and glutamine were the dominant ones. *B. edulis* (8.8%) and *B. sipellis* (5.3%) were the richest in free amino acids. In present analyzed samples values are different because of the fact that the composition of amino acids depend upon the environmental factors. Composition of fresh samples of *Boletus* species varies from 18-22%, in which the arginine was found to be major amino acids [18].

CONCLUSIONS

All the five amino acids were found to be in substantial amount in these five wild edible mushrooms. Amongst five amino acids analyzed. As these five wild mushrooms are edible hence such type of study will enhance their popularization for the purpose of their commercialization.

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