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Comparative Study of Alkaloid Composition in Ten Wild Fungal Species from North West India

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Abstract: In the present study a comparative account of alkaloid percentage is given. Ten wild fungal species [*Lentinus sajor - caju*, *Lentinus connatus*. *Lentinus* torulosus, *Lentinus cladopus*, *Lentinus squarrosulus*, *Pleurotus cystidiosus*, *Pleurotus floridanus*, *Pleurotus sapidus*, *Pleurotus pulmonarius* and *Pleurotus sajor - caju*] belonging to genus *Lentinus* and *Pleurotus* have been collected and evaluated from different regions of North West India for their alkaloids compositions. Among the ten species maximum percentage of alkaloids were documented in *Lentinus cladopus* (0.89 ± 0.11) followed by *Lentinus torulosus* (0.86 ± 0.7), *Lentinus sajor-caju* (0.80 ± 0.2), *Pleurotus sapidus* (0.74 ± 0.11), *Pleurotus cystidiosus* (0.70 ± 0.2), *Pleurotus pulmonarius* (0.66 ± 0.4), *Lentinus squarrosulus* (0.65 ± 0.3), *Pleurotus floridanus* (0.63 ± 0.21), *Pleurotus sajor - caju* (0.62 ± 0.2) whereas, minimum amount of the alkaloid percentage was recorded in *Lentinus connatus* (0.52 ± 0.03).

Key words: Basidiomycetes · *Lentinus* · *Pleurotus* · Alkaloids

INTRODUCTION

Mushrooms are the source of nutrients and nutraceuticals. Genus *Lentinus* belongs to the family polyporaceae and order polyporales. Forty species of this genus is reported worldwide, whereas Genus *Pleurotus* is represented by 20 species the world over [1]. Species of Genus *Lentinus* and *Pleurotus* mushrooms are wood inhabitating. Mushrooms are reported to be the rich sources of pharmaceutical compounds. The important alkaloids are also reported in mushrooms in considerable amount [2-7]. There are several reports on the mushrooms to contain several active compounds like psilocin and psilocybin (the active compounds) [8-13]. The amount of these present depends upon factors such as species, developmental stages, climatic conditions and the availability of soluble nitrogen and phosphorous in the soil [14-15]. Presence of alkaloids and other pharmaceutical compounds make mushrooms important items of commerce [16-17]. Wild tropical mushrooms are rich in pharmaceutical as well as nutritional compounds [18-19]. Alkaloids are quite useful in the pharmaceutical industries for drug manufacture [20]. From the health benefits alkaloids are useful because they are stimulants and act by prolonging action of hormones [21]. Mushrooms have been discovered to have therapeutic values. The considerable pharmacological activities of mushrooms make them of interest in pharmacological industries. *Pleurotus squarrosulus* and *Russula* species are reported to contain alkaloids, phenols, saponins and flavinoids [22]. Alkaloids also play a defensive role in higher plants [23-24]. Based on the significance of alkaloids, the present study was therefore mainly designed to investigate the comparative documentation of alkaloids in ten different fungal species collected from different habitats and belonging to two different genera.

MATERIALS AND METHODS

Collection of Fungal Samples: Ten fungal samples were collected from different localities and varying altitudes

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Table 1: Different species showing the account of their collections including host, location as well as altitude range.

Species	Host	Location	Altitude (m)	Type of forest
Lentinus sajor-caju	*Bauhinia variegata*	Sirmour (Himachal Pradesh)	672	Mixed
Lentinus connatus	*Mangifera indica*	Chandigarh (Punjab)	200	Plains
Lentinus torulosus	*Pinus roxburghii*	Palampur (Himachal Pradesh)	850	Pine forest
Lentinus cladopus	*Albizzia chinensis*	Palampur(Himachal Pradesh)	1200	Mixed
Lentinus squarrosulus	*Juglans regia*	Palampur (Himachal Pradesh)	1200	Mixed
Pleurotus floridanus	*Ficus benghalensis*	Patiala (Punjab)	250	Plains
Pleurotus pulmonarius	*Albizia chinensis*	Palampur (Himachal Pradesh)	1200	Mixed
Pleurotus sapidus	*Grevillea robusta*	Palampur (Himachal Pradesh.)	950	Plains
Pleurotus cystidiosus	*Mangifera indica*	Patiala (Punjab)	250	Plains
Pleurotus sajor- caju	*Albizia chinensis*	Palampur (Himachal Pradesh.)	1200	Plains

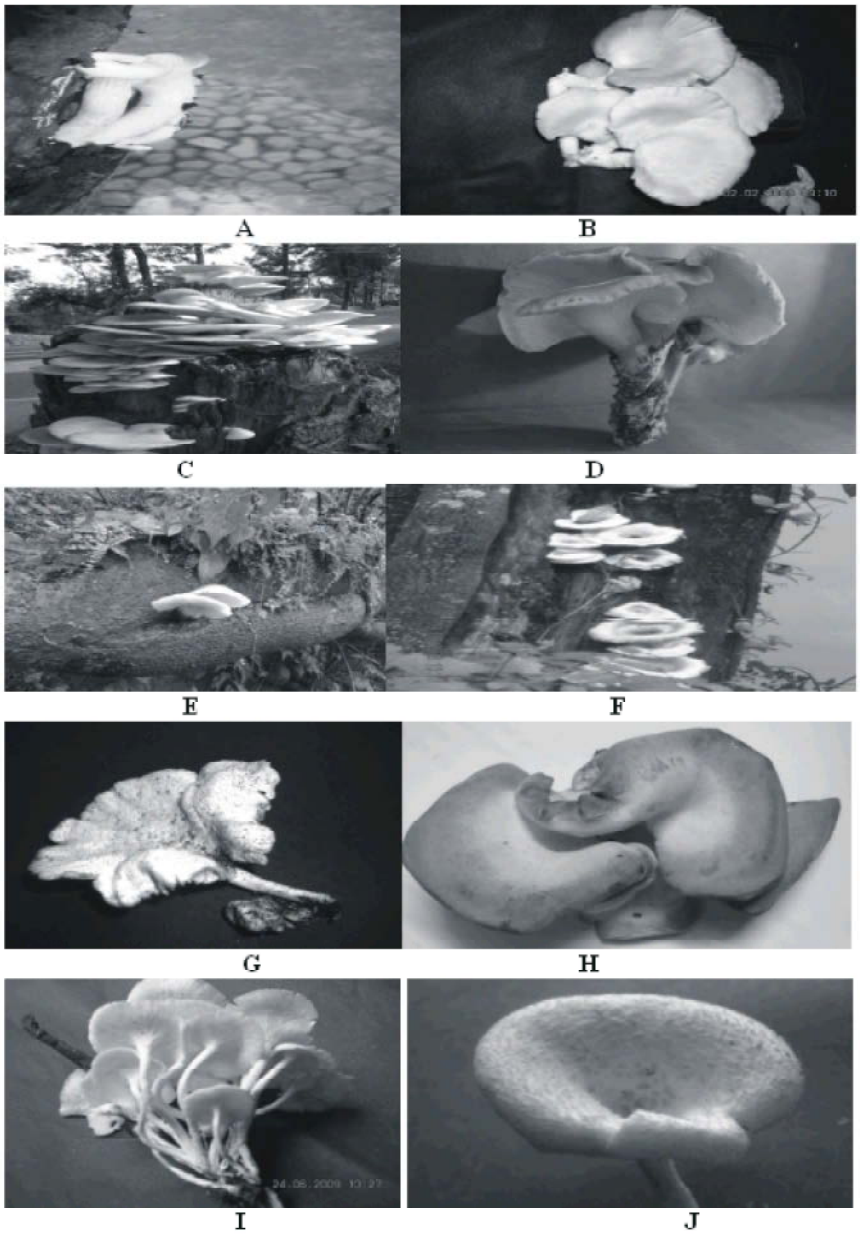

Fig. 1: Wild Basidiocarps A. Pleurotus floridanus B. Pleurotus pulmonarius C. Pleurotus sapidus D. Pleurotus cystidiosus E. Pleurotus sajor - caju F. Lentinus sajor - caju G. Lentinus connatus H. Lentinus torulosus I. Lentinus cladopus J. Lentinus squarrosulus.

from 200 - 1200 m of North West India (Table 1 and Figure 1). All the species are collected from different hosts, altitudes and different type of forests.

Alkaloids Estimation: The alkaloids were extracted from 20 g of each of the dried powdered mushroom samples using 100 ml of 10% acetic acid which was left to stand for 4 hours. The extracts were filtered to remove cellular debris and these concentrated to a quarter of the original volume. To this concentrate, 1% ammonium solution was added drop-wise until precipitate was formed. The alkaloids thus obtained were dried to a constant weight at 65°C in an oven. The weights were used to calculate the percentage alkaloids using formula given below:-

$$\text{Alkaloid (\%)} = \frac{\text{Weight of residue X 100q}}{\text{Weight of sample}}$$

RESULTS AND DISCUSSION

Like other reported mushrooms to contain alkaloids species of both these genera are documented with considerable amount of alkaloids. All the studied species contained alkaloids in varying amounts i.e. ranges from 0.52 - 0.89 %. The percentage of alkaloids documented in these species are higher than reported earlier in *Schizophyllum commune* (0.015 %) and *Polyporus* spp. (0.013 %) [25]. Presence of such alkaloids makes them equally important as some medicinal plants like *Euphorbia* species used as puragative [26]. Similarly alkaloids in *Momordica charanta* and *Azadirachta indica* used in cure of malaria [27-29]. All the studied species are edible and hence the use of such mushrooms in pharmaceutical industries because of presence of such useful compounds provide the alternative option as other medicinal plants. There are several reports which showed that mushrooms are the rich source of alkaloids and other nutritional components [30-31]. Among the ten species of *Lentinus* and *Pleurotus* genera *Lentinus cladopus* (0.89 ± 0.11) contained maximum percentage of alkaloids, which is followed by *Lentinus torulosus* (0.86 ± 0.7), *Lentinus sajor-caju* (0.80 ± 0.2), *Pleurotus sapidus* (0.74 ± 0.11), *Pleurotus cystidiosus* (0.70 ± 0.2), *Pleurotus pulmonarius* (0.66 ± 0.4), *Lentinus squarrosulus* (0.65 ± 0.3), *Pleurotus floridanus* (0.63 ± 0.21), *Pleurotus sajor - caju* (0.62 ± 0.2) whereas, minimum amount of the alkaloid percentage was documented in *Lentinus connatus* (0.52 ± 0.03). Although the *Lentinus* species contained higher amount of alkaloids as compared to most of the *Pleurotus* species except *Pleurotus sapidus* and *Pleurotus cystidiosus*. *Lentinus connatus* was found to contain minimum amount of alkaloids. These components further aids to the use of these species as the food items and their medicinal use. The amount of these alkaloids also vary according to the part of mushrooms which are reported to vary from 0.17 - 0.78% [32]. Hallucinogenic alkaloids (psilocin and psilocybin) have a tendency to be contained in the cap more than the stem [32]. Results of the comparative estimation on alkaloids is given in Table 2 and Figure 2.

Table 2: Alkaloids composition of ten wild fungal species

Species	Alkaloids (%)
Lentinus sajor-caju	0.80 ± 0.2
Lentinus connatus	0.52 ± 0.03
Lentinus torulosus	0.86 ± 0.7
Lentinus cladopus	0.89 ± 0.11
Lentinus squarrosulus	0.65 ± 0.3
Pleurotus cystidiosus	0.70 ± 0.2
Pleurotus floridanus	0.63 ± 0.21
Pleurotus sapidus	0.74 ± 0.11
Pleurotus pulmonarius	0.66 ± 0.4
Pleurotus sajor - caju	0.62 ± 0.2

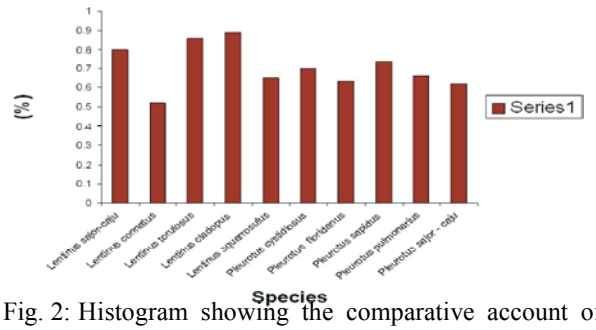

Fig. 2: Histogram showing the comparative account of alkaloid composition in ten fungal species

CONCLUSION

It is evident from the observations that all the species are rich in alkaloid percentage as compared to many other mushrooms like *Schizophyllum* commune and *Polyporus* sp. Although on the comparative account it is quite clear that *Lentinus cladopus* contained maximum percentage of alkaloids whereas *Lentinus connatus* contained the minimum percentage of alkaloids.

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