



Hitherto unreported species of Ascomycetous Macrofungi of Kashmir Himalaya

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ABSTRACT

The Kashmir valley located in the north extreme of the India lies between 33°20' and 34°54' N latitude and 73° 55' and 75°35' E longitude, constitutes more than 20% of forests of its geographical area that harbors diverse macro fungal species due to their wide variability in climate altitude and nature of species constituting them. The base line of mushroom flora is still in its infancy and has not been generated until now. In this backdrop, a systematic survey for exploration and documentation of macro fungal species of unexplored forests of Kupwara District of Northern Kashmir Himalaya was undertaken between September 2015 and August 2016. Five hitherto unreported species, viz. *Disciotis vinosa*, *Gyrometra gigas*, *Gyrometra perlata*, *Helvella leucopus*, and *Geopyxis carbonaria* of mushrooms belonging to Ascomycetes were recorded from the Kashmir Himalaya of the Jammu and Kashmir state. These species were identified on the basis of macro and microscopic characteristics and on the basis of field guides, mushroom herbaria and expert mushroom taxonomists.

Key Words: *Ascomycetous Mushrooms, Exploration, Kupwara District, Kashmir Himalaya.*

1. INTRODUCTION

Mushrooms belong to Kingdom fungi which constitute the most diverse group of organisms after insects on this biosphere. Several studies have focused on enumerating the world's fungal diversity and the exact number of fungi on the earth has always been a point of discussion (Crous, 2006). Current studies estimate that out of 1.5 million species of fungi existing on this biosphere, 140,000 are considered as mushrooms, and only 10% (approximately 14000 named species) are known to scientific community (Hawksworth,2004; Chang and Miles, 2004; Mueller and Schmit, 2007 and Kirk *et al.*, 2008). One third of this fungal diversity of globe exists in India of which only 50% has been characterized till now (Manoharachary *et al.*, 2005).

Jammu and Kashmir State, harbors a rich repository and diversity of flora of which mushrooms are least explored and is still in a pioneer stage (Watling and Abraham, 1992). From time to time about 265 species of mushrooms have been reported from Kashmir Himalaya (Dar *et al.*, 2009, 2010; Wani *et al.*, 2010 and Pala *et al.*, 2011). The Kashmir Himalayas still need exploration of mushroom flora as a vast area is unexplored for mushroom diversity. Northern part of Kashmir Himalaya is yet unexplored due to restricted access being a high security zone of the J&K and due to its farflungness; and is considered to possess a rich diversity of edible and inedible macro fungi in its lush green forests, majestic mountains and large meadows. With this objective a study was carried out in the forests of Kupwara district of Kashmir Himalaya to describe and identify status of ascomycetous mushroom flora. The study revealed the collection and identification of five species of macrofungi which is a new record from the Kashmir Himalaya.

2. MATERIALS AND METHODS

Field trips were carried to different sampling sites of North Kashmir Himalaya like lolab, Qaziaabad, Bungus Valley, Karnah and Keran sectors, and Ramhal coniferous forests of Kupwara district (Fig. 1), at regular intervals to explore the mushroom flora belonging to Ascomycetes. The method given by Hailling, (1996) was followed for the field trips. Standard methods (Kumar *et al.*, 1990; Atri *et al.*, 2003) were followed for collection, preservation and for identification of mushrooms based on morphological, reproductive and other characters. Field notes were prepared with regard to habit and habitat, shape, size and colour of fresh specimen before preservation. Spore morphology (shape and size) was recorded and photographed with the aid of trinalocular microscope. Spore slides were prepared in 3% KOH, cotton blue, lactophenol and Melzer's reagents. Photographs of the specimens in the natural habitat and under lab conditions were taken using Sony SLR Digital field camera and Sony cyber shot 12.1 megapixel Camera. The fungal specimen were also preserved in FAA (Formaldehyde acetic acid), and formalin and preserved in the mycological section of KASH herbarium, Centre of Plant Taxonomy, Division of Botany, University of Kashmir Hazratbal Srinagar, J&K, India.

3. RESULTS

During survey of the different areas of Kupwara District of Northern Kashmir, five mushroom species belonging to Ascomycetes were collected from Kashmir Himalayan region and identified on the basis of morphological and reproductive and other characteristics. A brief description of these five species of mushrooms first time reported from the Kashmir Himalayan region is as under:

3.1 *Disciotis vinosa* (Pers.) Arnould

Synonyms: *Helvella cochleata* Wulfen, *Peziza cochleata* (Wulfen) Bull., *Peziza venosa* Pers., *Discina venosa* (Pers.) Fr., *Peziza reticulata* Grev.

English name: Bleach cup, veiny cup fungus, or the cup morel

Local name: Sura shaja kan

3.1.1 Classification:

Kingdom: Fungi

Division: Mycota

Class: Ascomycetes

Order: Pezizales

Family: Morchellaceae

Genus: *Disciotis*

Species: *D. vinosa*

3.1.2 Description

Fruiting Body: 4-10 cm across, more or less cup shaped when young becomes saucer shaped with age. Upper surface is brown, bald, and smooth at first but soon gets wrinkled in the centre. Undersurface is cream white rough or finely hairy, with a short pseudo- stem (1-2.5cm) buried in the soil. Flesh is brittle and brown in colour. Spores: Elliptical in shape, $22-24\mu \times 12\mu$ in size, smooth with oil droplets. Asci 8- spored. No reaction with Meltzer's reagent and KI. Habit and Habitat: Ecto-mycorrhizal, gregarious or scattered in coniferous forests.

Season: Late spring

Edibility: Edible

Site of collection: Rajwar, Bungas valley

Accession number: KASH-2462 M

4 *Gyromitra gigas* (Krombh.) Quél

Synonyms: *Gyromitra Montana* Harmaja Karsteina; *Helvella gigas* Krombholz; *Gyromitra korfii*.

Common name: Snow mushroom

Local name: Kanna guech

4.1 Classification

Kingdom: Fungi

Division: Ascomycota

Class: Ascomycetes

Order: Pezizales

Family: Discinaceae

Genus: *Gyromitra*

Species: *G. gigas*

4.2 Description

Cap: 2-8 cm high; 2-4 cm wide; loosely wrinkled, bald; somewhat convoluted or slightly lobed, sometimes resembles dogs mouth; yellowish brown, or tan coloured; undersurface whitish, bald .Flesh, Whitish; brittle; Stem: 2-4 cm high; 2-3 cm wide; pale tan to white; sometimes developing broad ribs, attached centrally to the cap. Spores: 20-24 μ x 11.5-12 μ ; ellipsoid; with short, blunt apiculi Asci 8-spored with two oil droplets. Clavate (club shaped) paraphysis.

Habit and Habitat: Saprophytic found under conifers preferably under shade.

Season: Early spring soon after melting of snow.

Edibility: Edible

Site of collection: Bungas valley

Accession number: KASH-2463 M

5 *Gyrometra perlata* (Fr.) Harmaja

Synonyms: *Discina perlata*

Common name: Pigs ear,

Local name: Kanna muend/Pappad

5.1 Classification

Kingdom: Fungi

Division: Mycota

Class: Ascomycetes

Order: Pezizales

Family: Discinaceae

Genus: *Gyrometra*

Species: *G. perlata*

5.2 Description

Fruiting Body: 3-10 cm across, disc -shaped at first and then irregularly flattened at maturity with a rudimentary stem, 1.5-2cms wide, buried under soil, Upper surface wavy to wrinkled, brown to dark brown. Undersurface grayish brown or yellowish; bald or minutely hairy.

Spores: Elleptical, 16-20x 10-12 μ ; with 1-2 prominent oil droplets and pointed apiculi. Asci 8-spored .

Habit and Habitat: On littered floor of coniferous forests with sufficient growth of moss plants.

Season: Spring to early summer

Edibility: Edible but less preffered.

Site of collection: Darbal Handwara.

Accession number: KASH-2464 M

6 *Geopyxis carbonaria* Alb. & Schwein

Synonyms: *Peziza carbonaria* Alb. & Schwein. (1805), *Pustularia carbonaria* (Alb. & Schwein.) Rehm (1884),
Geopyxis carbonaria var. *sessilis* Grélet (1937)

Common name: Charcoal loving elf-cup, dwarf acorn cup, pixie cup, stalked bonfire cup

Local name: Chine shaja kan

6.1 Classification

Kingdom: Fungi
Division: Mycota
Class: Ascomycetes
Order: Pezzizales
Family: Discinaceae
Genus: *Geopyxis*
Species: *G. carbonaria*

6.2 Description

Fruting body: Urn shaped, crenate margins and growing under burn soil with mycorrhizal association with spruce trees. Carpophore 1.0-2.5 cm broad, urn shaped, orange brown at both sides, deeply cupulate slightly expanded, margin pallid stipitate, fertile surface orange brown glabrous; stipe 1.5 cm long and 1-3.0mm wide, straight to slightly curved, the surface dull-brown covered with a white tomentum.

Spores: $14\ \mu - 16\ \mu \times 6-8\ \mu$, ellipsoid, smooth, thin walled, eguttulate, contents granular.

Habitate: Gregarious to clustered on humus rich littered soil after forest fires under spruce trees in the spring just after snow melting.

Habit and Habitat: On coniferous forest floor with burn soil.

Season: spring to early summer

Edibility: Inedible

Site of collection: Patni, Bungus valley

Accession number: 2465 M

7 *Helvella Leucopus* Pers.

Synonyms: *Helvella leucopus* var. *leucopus*

Helvella leucopus var. *populina* I. Arroyo & Calonge

Common name: Elfin Saddle, Darkies

Local name: Kanna guech.

7.1 Classification

Kingdom: Fungi
Division: Mycota
Class: Ascomycetes
Order: Pezizales
Family: Helvellaceae
Genus: *Helvella*
Species: *H. leucopus*

7.2 Description

Fruiting body: Sporophore brown-black or chocolate brown, Cap 25-35 mm diam. and 17-40 mm high, saddle-shaped, folded, with two to three distinct irregular lobes, the fertile area in between the folds. Stipe is dirty white, hollow, broader at the base. Cap and stipe are centrally connected. Ascus 8 spored. Ascospores 20-24 × 13-15 μ, ellipsoidal, thin-walled, hyaline, smooth, containing a large central lipid droplet surrounded by smaller ones, gelatinous sheath or appendages absent.

Habit and Habitat: On ground, mycorrhizal association with poplar trees, edge of streams.
Season: March-April
Edibility: Edible prized for its texture and aroma. Eaten with eggs and onion
Site of collection: Mawar Handwara
Accession number: KASH-2466 M

8. Figures



Fig. (1)

Fig.1: Map of the surveyed area of J&K-India

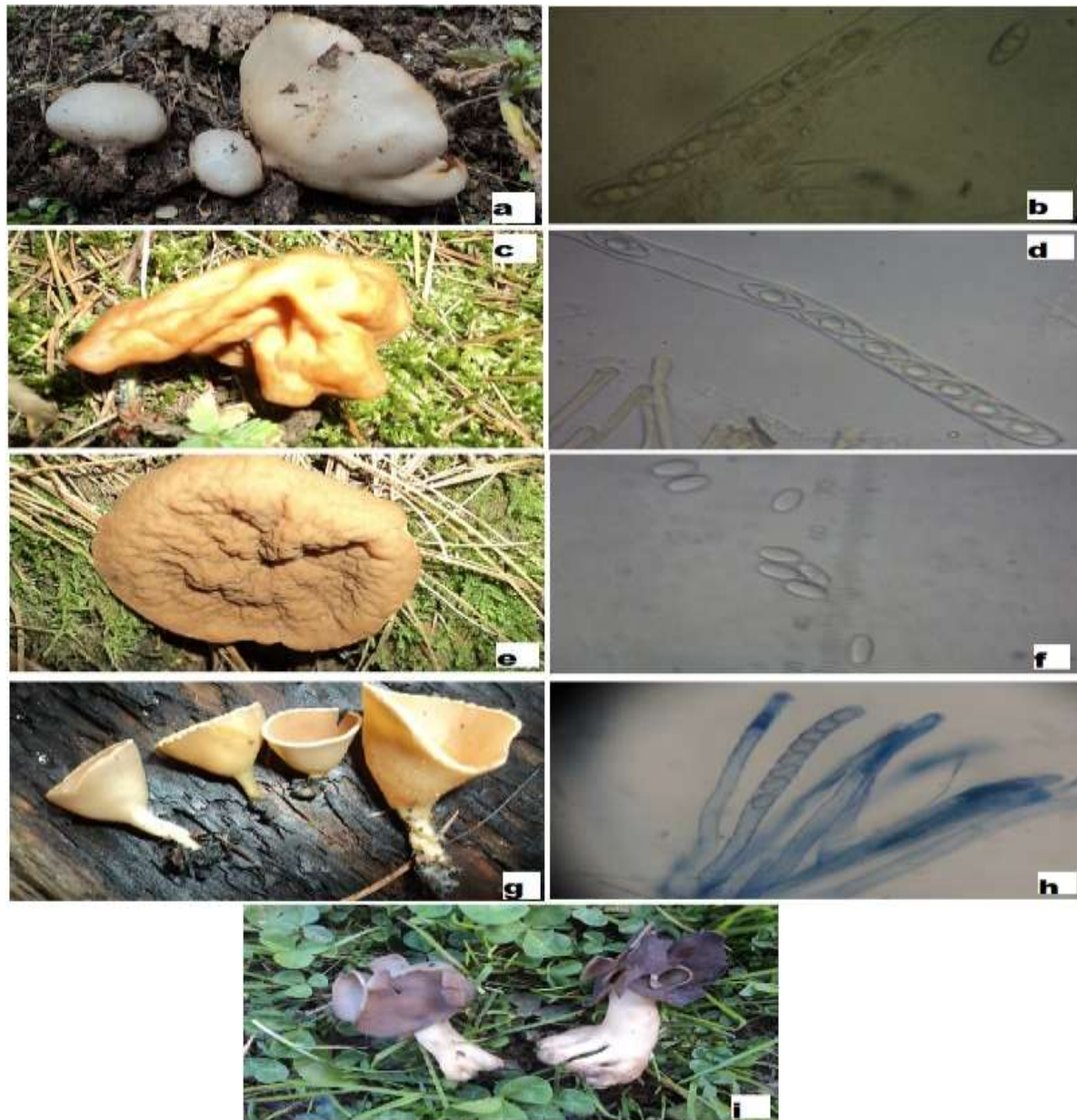


Fig. (2)

Fig. 2: Newly reported species of Ascomycetous fungi along with Asci and Ascospores.

- (a) *Disciotis vinosa*, (b) *D. vinosa*: Ascus with 8 ascospores (c) *Gyromitra gigas* sporocarp (d) Ascus with ascospores and sterile hyphae, (e) *Gyromitra perlata* sporocarp. (f) Ascospores of *G. perlata*, (g) *Geopyxis carbonaria* sporocarp, (h) Asci with ascospores, (i) *Helvella leucopus* sporocarp.

9 CONCLUSION

It was revealed from the results that five new species of Ascomycetous mushrooms, *Geopyxis carbonaria*, *Gyromitra gigas*, *Gyromitra perlata*, *Helvella leucopus* and *Diciotis venosa* were reported for the first time from the surveyed areas of Kashmir Himalaya. Similar species have been reported earlier by different workers from India and other parts of the world (Dennis, 1981, Breitenbach and Kranzlin, 1984; Arora 1986; Greene *et al.*, 2010; Asef, 2017). Noticeable work has been done by several workers across the globe for the exploration of Ascomycetes (Kirk *et al.*, 2008; Hawker, 1968; Hawksworth, 1989; Barseghyan and Wasser, 2008, 2011; Abdel-Azeem and EL-Fallal, 2012). Several workers have reported the genus *Helvella* of the family Helvellaceae of Pezizales from Europe, North-America, China, Russia and Turkey (Anderson and Ickis, 1921; Dissing and Lange, 1967; Kempton and Wells 1970; Cao and Liu 1990). In 2010, four taxa of family pyronemataceae were described from China (Zhuang, 2010) as has been reported from the present study in Kashmir Himalaya. Similarly 11 species of *Scutellinia* were reported from Korea and 2 from Switzerland (Choi *et al.*, 2012). In India the work on Ascomycetes with special reference to Pezizales has been undertaken by a number of workers from different regions including Western Himalaya (Kaul, 1971, 1981, Abraham, 1991, Kumar and Sharma, 2010 and Wani *et al.*, 2010). In the present study a new species *Helvella leucopus* was reported, however, Kaul and Kachroo (1974) reported two Ascomycetous genera *Morchella* and *Helvella* which included *H. crispa*. *Gyrometra gigas* and *Geopyxis carbonaria* as reported in the present study area new records from Kashmir Himalaya, however Pala *et al.* (2011) has reported *G. sphaerospora* and *Mutinus caninus* from southern Kashmir Himalaya. While reporting the mushroom species of Kashmir, Kaul (1981, 1997) included some ascomycetous macrofungi in his report like *Morchella esculenta*, *M. deliciosa*, *M. hybrid*, *M. angusticeps*, *M. conic*, *M. crassipes*, *Phallus hadrianii* and *Helvella crispa*. Similarly Dar *et al.* (2009) reported some species of pezizales (*Sepultaria sumneriana*, *Paxina barlae*, *Peziza exogelatinosa* and *Tarzeta catinus*) from Kashmir Himalaya and is a first report with regard to these species. Wani *et al.* (2010) has reported two species of Ascomycetous mushrooms (*Sarcoscypha coccinea* and *Scutellinia scutellata*) besides reporting some moral species from Kashmir Himalaya Wani *et al.* (2015). Sheikh *et al.* (2014) explored two new species of Ascomycetous macrofungi *Peziza retrocurvata* K. Hansen & Sandal and *Xylaria polymorpha* (Pers.) Grev from Jammu And Kashmir State. Exploration of many more species is required from the area owing to its virgin nature of biodiversity studies. The species reported in this study have ethno-medicinal use among the tribal people in the surveyed areas and are being evaluated for the presence of bioactive compounds and therapeutic potential.

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