BIODIVERSITY AND MORPHOLOGICAL CHARACTERIZATION OF MUSHROOMS AT THE TROPICAL MOIST DECIDUOUS FOREST REGION OF BANGLADESH

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By

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CERTIFICATE

This is to certify that the thesis entitled, **"BIODIVERSITY AND MORPHOLOGICAL CHARACTERIZATION OF MUSHROOMS AT THE TROPICAL MOIST DECIDUOUS FOREST REGION OF BANGLADESH"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (M.S.) IN PLANT PATHOLOGY**, embodies the results of a piece of bona fide research work carried out by **MD. RUMAINUL ISLAM**, **Registration No. 08-02753**, under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma in any other institution.

I further certify that any help or sources of information received during the course of this investigation has been duly acknowledged.

Dated: 15 July 2014
Place: Dhaka, Bangladesh

……

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Dedicated

To

Almighty to bless me ever with the best of all the choices

&

My Loving Parents
and Teachers
Who laid the foundation of my success

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ABSTRACT

Mushrooms have long been regarded all over the world as the most delectable and succulent of foods. The floristic composition of Bangladesh has been studied earlier by several investigators but the biodiversity of mushroom flora which forms an important component of the ecosystem has been largely neglected in tropical moist deciduous forest regions of Bangladesh. There are basically four types of forest present in Bangladesh. This investigation was conducted in seven different regions of tropical moist deciduous forest of Bangladesh namely Dhaka, Gazipur, Bogra, Rajshahi, Pabna, Jaipurhat and Dinajpur. Mushroom flora associated with these forest region were collected, photographed and preserved in laboratory for the first time in Bangladesh. A total of fifty samples were collected and identified to twenty one genus and thirty three species. The predominant genera were *Ganoderma* sp., *Daedaleopsis* sp., *Lepiota* sp., *Marasmius* sp. and *Collybia* sp. All the mushroom flora and its morphological characteristics have been described and illustrated.

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LIST OF ABBREVIATED TERMS

ABBREVIATION	FULL WORD
et al.	And others
cm	Centimeter
°C	Degree centigrade
µm	Micrometer
etc.	Etcetera
ed.	Edition
J.	Journal
%	Percent
pp./p.	Page number
Var.	Variety

INTRODUCTION

The term “Mushroom” is used mainly for the fruiting body produce by the macrofungi and these are Ascomycota and Basidiomycota, some are edible and many are poisonous and non-edible. More than 10,000 species of mushrooms are present in and around the world and about 2000 of them are considered as edible (Borah *et al.*, 2010). Along with the cultivated mushrooms, wild mushrooms also have a profound biological as well as economical features and have a great impact along with the beneficiaries of human-kind. Mushroom have high nutritional value along with high proteins, vitamins, minerals, fibers, trace elements content and even low more or less no calories and cholesterol contents. Now-a-days, they are considered as an ideal food item. Besides these, mushrooms are the sources of various bioactive substances like, antibacterial, antifungal, antiviral, anti-parasitic, antioxidant, anti-inflammatory, anti-proliferative, anticancer, anti-tumor, cytotoxic, DNA damaging, anti-HIV, hypo-cholesterolemic, anti-diabetic, anti-coagulant, hepato-protective, insecticidal propertiesand an efficient tool for recycling of organic wastes (Das, 2010). Along with the beneficial impacts to mankind, large number of mushroom species are the wood-rotter’s, which are causing serious damage to the forest trees (Das, 2010). That is why it is causing considerable economic loss to timber industry every year. Besides, some are toxic, even deadly when eaten (Das, 2009). Bangladesh is a sub-tropical country. Depending on their location, nature and type of management, forests of Bangladesh can be grouped into three broad categories. These are as follows: (a) Mangrove forest, (b) Tropical evergreen and semi evergreen forest, (c) Tropical moist deciduous forests and (d) Village forest.

A number of species of mushrooms are grown mainly during the rainy season, on almost all types of soils, on decaying organic matter, wooden stumps, etc. naturally. The climate and the forest vegetation of the tropical moist deciduous forest region of Bangladesh, supports the growth and multiplication of various mushroom flora. According to Bangladesh Forest Department, the central and northern districts covering an area of 1,20,000 hector about 0.81% of total land mass of the country and 7.8% of the countries forest land are bestowed with tropical moist deciduous forests. About 80% rainfalls in tropical moist deciduous forest region of Bangladesh during the monsoon season extending from June to September and the mean annual rain fall for these region of Bangladesh is about ranged between 3,280 and 4,780mm (129.1 and 188.2 inch) per

year. The mean daily temperature range between 38°C and 41°C (100.4°F and 105.8°F) with relative humidity ranged between 55% and 81% during March and between 94% and 100% during July. Winds are mostly from the north and northwest in the monsoon, blowing gently at 1 to 3 kilometers per hour (0.6 to 1.9 mph) in northern area of Bangladesh. So, these forest region of Bangladesh is known for diverse macro fungal population.

The demand and consumers preference for different varieties of mushrooms among the people and farmers that are urged to exploit the diversity analysis of mushrooms for utilization. In an around the world, scientists are now more focusing on the exploitation of biomolecules from mushrooms for pest and disease management, which is a challenging field of study. For this reason, surveys were conducted in the tropical moist deciduous forest region so as to exploit the mushrooms for utilization and also to identify their characteristics. The purpose of the present survey was to benchmark diversity of these macro-fungal collection, preservation and morphological characterization of these fungal species in the tropical moist deciduous forest region of Bangladesh with the following objective:

- To collect, characterize and preserve mushroom flora from tropical moist deciduous forest region of Bangladesh.

REVIEW OF LITERATURE

Petersen and Hughes (2003) reported the morphology, sexual recognition systems, DNA sequencing and RFLP patterns, geographic patterns and directions of geographic migration of fungal groups such as *Artomyces (Clavicorona), Flammulina, Lentinus*, *Panellus* and *Pleurotus*. Four principles was elucidated. Sexual recognition among intercontinental populations appears to be a more reliable measure of relatedness than morphological characters and DNA sequence mutations.

Antonín and Buyck (2006) recorded twenty six collections representing 19 taxa of the genus *Marasmius* from Madagascar, Mauritius and Réunion. The following new taxa are described: *Marasmius andasibensis, Marasmius andasibensis* var. *obscurostipitatus, M. brunneoaurantiacus* and *M. curreyi* var. *bicystidiatus*.

Niazi *et al.* (2006) investigated the biodiversity of mushrooms and ectomycorrhizas from Himalayan Moist Temperate Forests of Pakistan. *Russula brevipes* was found associated with *Pinus wallichiana*. *Russula brevipes* and its morphotypes or ectomycorrhiza have been described and illustrated. The fungus and its mycorrhiza were new records for Pakistan.

Ahmed (2010) reviewed the Egyptian fungi, including lichenized fungi, these were scattered through a wide array of journals, books, and dissertations. This review documents are the known available sources and compiles data for more than 197 years of Egyptian mycology. Species richness is analyzed numerically with respect to the systematic position and ecology. Values of relative species richness of different systematic and ecological groups in Egypt compared to values of the same groups worldwide, showed that knowledge of Egyptian fungi was fragmentary, especially for certain systematic and ecological groups such as *Agaricales, Glomeromycota,* and *lichenized*, nematode-trapping, entomopathogenic, marine, aquatic and coprophilous fungi, and also yeasts.

Das (2010) collected 126 wild mushrooms from Barsey Rhododendron Sanctuary of the state Sikkim. Those are enlisted with their scientific names, common names, distribution, growing period and status of edibility. Medicinally important 46

mushrooms were also highlighted with their medicinal properties. Factors causing their continuous declination were mentioned along with the possible in-situ and ex-situ conservation measures.

Junior *et al.* (2010) studied two substrates prepared from ground corn cobs supplemented with rice bran and charcoal for mycelium growth kinetics in test tubes and for the cultivation of four *Pleurotus* commercial isolates in polypropylene bags. The identification of the isolates was based on the morphology of the *basidiomata* obtained and on sequencing of the LSU rDNA gene. Three isolates were identified as *P. ostreatus*, and one was identified as *P. djamor*.

Karwa and Rai (2010) surveyed Melghat forest in Central India for occurrence of wild edible fungi and their prevalent favorable ecological factors. A total of 153 species of mushrooms were recorded, collected, photographed and preserved. The enormous biomass in the forest favors variety of edible and medicinal mushrooms. Dominating species belong to genera *Agaricus, Pleurotus, Termitomyces, Cantharellus, Ganoderma, Auricularia, Schizophyllum, Morchella,* etc. These studies will open new avenues in improvement of breeding programs of commercially cultivated mushroom species.

Ram *et al.* (2010) collected various edible fleshy fungi from different localities of the eastern Uttar Pradesh forest. The collected edible fleshy fungi were studied for their macroscopic detail partening the habit, habitat, morphology and other phenotypic parameter noted in fresh form.

Cooper *et al.* (2011) found *Ganoderma boninense* as a causal agent of basal stem rot (BSR), upper stem rot (USR) and as a continuing limiting factor in palm oil production. Spread and infection can occur through roots, yet genetic evidence showed considerable isolate diversity and revealed the major input of airborne basidiospores to spread and infection.

Hosen and Ge (2011) recorded an interesting agaric, *Clarkeinda trachodes* for the first time from Bangladesh. A full description, discussion, and illustrations are provided. The enigmatic agaric genus, currently known only from south and Southeast Asia, is

characterized by the presence of a fawn colored pellicle on the central pileus surface, a stipe with a superior annulus and basal volva, and thick-walled pigmented spores with a slightly depressed truncated apex.

Khan *et al.* (2011) determined the genetic diversity among *Pleurotus* species of mushroom using morphological and random amplified polymorphic DNA (RAPD) markers. About seven different species were collected. Five species, naming *Pleurotus platypus* (P-6), *Pleurotus flabelatus* (P-7), *Pleurotus florida* (P-17), *Pleurotus ostreatus* (P-19) and *Pleurotus sajor-caju* (P-56) were from Canada and two *Pleurotus warm-stram* (P-9) and *Pleurotus eryngii* (P-16) from Philpines. Seven different morphological traits that viz. mycelial growth (mm), cap diameter (cm), total yield (kg), moisture contents (%), ash contents (%), nitrogen contents (%) and protein content (%) were recorded.

Srivastava *et al.* (2011) recorded four species of *Termitomyces* in the Gorakhpur forest division. In order to determine the genetic diversity among these four species morphological characterization, phenotypical appearance were studied. Four species naming *Termitomyces heimii, Termitomyces clypeatus, Termitomyces mammiformis* and *Termitomyces microcarpus* characterized by different morphological traits i.e., shape of perforatorium, stipe length(cm), pileus length, margin of fruit body, colour of fruit body, gills, flesh, annulus, pseudorrhiza and spore print were recorded.

Thiribhuvanamala *et al.* (2011) surveyed in the Anaikatti, Attapadi, Palghat, Siruvani, Nilgiris and Kallar regions of the Western Ghats of India during 2008-10 and about 68 mushroom flora belonging to 19 genera were recorded. Among the mushroom flora a wild strain of *Pleurotus djamor roseus* was found suitable for commercial cultivation with bioefficiency of 132 percent and cost benefit ratio of 1:2.9. The diethyl ether fraction (10 percent concentration) of *G.lucidum* and *L. edodes* showed the inhibition of mycelial growth by up to 70% and 68.2%, respectively against *Collectotrichum gloeosporioides*, the fruit rot pathogen of mango.

Bankole and Adekunle (2012) collected sixteen mushrooms in Lagos State for 12 months. The mushrooms collected include: *Agaricus campestris, Coprinus comatus, Daldinia concetrica, Ganoderma adspersum, Ganoderma applanatum, Ganoderma*

lucidum, Mycena haematopus, Mycena sp., *Pleurotus ostreatus, Pleurotus tuberregium, Polyporus* sp., *Polyporus squamosus, Polyporus sulphureus, Trametes versicolor, Xylaria polymorpha,* and *Xylaria* sp. Subsequently, eight different pure mushroom mycelia were isolated using potato dextrose agar medium (PDA) from sterile tissues of *A. campestris, C. comatus, G. lucidum, P. ostreatus, P. tuber-regium, P. sulphureus, X. polymorpha,* and *Xylaria* sp. The DNA sequence analyses of each of the eight mushroom mycelia pure isolates were carried out. Comprehensive description given by the GenBank provides a detailed, reliable and accurate identification than visual characteristics and phenotypic properties of the mushrooms.

Dung *et al.* (2012) isolated 18 strains from 6 different samples of fresh oyster mushrooms. Of these pure isolates, three groups performing significantly different ability of starch degradation at the 95% confidence level could be distinguished. The morphological and molecular identification methods gave the similar results, in which two strains of white oyster mushrooms were *Pleurotus floridanus* and one strain of Japanese oyster mushroom was *Pleurotus cystidiosus*.

Dwivedi *et al.* (2012) studied biodiversity of macro fungi in semi evergreen and moist deciduous forest of Amarkantak, where more than 50 samples were collected which is situated in Madhya Pradesh in India. Where collection, characterization, preservation and photo of macro fungi were *Agaricus, Amanita, Nyctalis, Russula, Boletus, Macrolapiota, Ganoderma, Termitomyces* were identified. Out of 50 samples only 16 samples were identified up to species level.

Pushpa and Purushothama (2012) investigated the biodiversity of mushrooms of Bangalore belonging to the class Basidiomycetes. A total number of 90 species in 48 genera belonging to 19 families in 05 orders were recorded, 28 species were found to be recorded for the first time in India. Among the collected species *Coprinus disseminates* followed by *Coprinus fibrillosis* and *Schizophyllum communae* was found to be abundant.

Wang *et al.* (2012) recorded the specimens of Lingzhi from China (field collections and cultivated basidiomata of the Chinese *'G. lucidum'*), *G. lucidum* from UK and other related *Ganoderma* species, were examined both morphologically and molecular basis.

Based on both morphological and molecular data, the identity of the Chinese '*G. lucidum*' (Ling-zhi) was considered conspecific with *G. sichuanense*.

Chandulal *et al.* (2013) identified 17 species belonging to two different classes namely, Gastromycetes - *Daldinia concentrica* [(Xylariaceae) (cramp ball)], *Lycoperedon pyriforme* [(Lycoperdaceae, edible) (wood or stump puff ball)], *Scleroderma citrinum* (Sclerodermataceae, edible); Hymenomycetes - *Cantharellus umbonatus*, *Coriolus versicolor* (Polyporaceae, inedible), *Schizophyllum commune* (Schizophyllaceae, inedible) (the split gill), *Ganoderma lucidum* (Ganodermataceae), *Ganoderma applanatum* (ganodermataceae), *Laetiporus sulphureus* (Polyporaceae, edible), *Lepiota organensis, Collybia butyracea*, *Lentineullus cochleatus* (Aurisclpinaceae, edible), *Galerina unicolor* (Hymenogatraceae), *Citocybe flaccida* (Trichomataceae, edible), *Oudemansiella redicata* (Physalacriaceae, edible), *Hygrophorus eburnes* (Hygrophoraceae, edible) and *Agaricus campestris* (Agaricaceae, edible). The investigation proved that there a distinct biodiversity existed in mushroom population.

Hosen *et al.* (2013) described a new monotypic genus in the Boletaceae, *Borofutus*, typified by *B. dhakanus*, is described using morphological and molecular evidence. This is a putatively ectomycorrhizal fungus associated with *Shorea robusta*. *Borofutus* was sister to *Spongiforma* in molecular phylogenetic analyses using DNA nucleotide sequences of single or multiple loci. A description, line drawings, phylogenetic placement and comparison with allied taxa were presented.

MATERIALS AND METHODS

In the present investigation, biodiversity and morphological characterization of mushrooms at the tropical moist deciduous forest region in Bangladesh were studied. The experiment was carried out during the period from July 2013 to June 2014.

3.1 Survey Area

The detailed survey was conducted in Dhaka, Gazipur, Bogra, Rajshahi, Pabna, Jaipurhat, and Dinajpur biosphere reserved area, which is situated in tropical moist deciduous forest region of Bangladesh from July 2013 to June 2014 to understand the morphological variability in the mushrooms population. According to the National Mapping Organization of Bangladesh, Dhaka is located at 23°42′37″ N (Latitude), 90°24′26″ E (Longitude) and it has an average elevation of 4 meters (13.12 ft.). Gazipur is located at 24.00°N (Latitude), 90.43°E (Longitude) and it has an average elevation of 10 meters (32.8 ft.). Bogra is located at 24°51′00″ N (Latitude), 89°22′00″ E (Longitude) and it has an average elevation of 24 meters (78 ft.). Rajshahi is located at 24°22′00″ N (Latitude), 88°36′00″ E (Longitude) and it has an average elevation of 31 meters (101 ft.). Pabna is located at 24°00′00″ N (Latitude), 89°15′00″ E (Longitude) and it has an average elevation of 8 meters (26 ft.). Jaipurhat is located at 25.1° N (Latitude), 89.02° E (Longitude) and it has an average elevation of 29 meters (94.25 ft.). Dinajpur is located at 25°37′37″ N (Latitude), 88°38′19″ E (Longitude) and it has an average elevation of 34 meters (111 ft.). The fungal surveys depend on timing and location of observations. The collection sites are university campus, residential area, botanical garden, parks, forest and nearby villages of those above mentioned areas of tropical moist deciduous forest region (Figure 1).

3.2 Collection of Mushroom Samples

The collection was made following the method of Hailing (1996). Systematic and periodical survey of different locations and other habitats were done in the tropical moist deciduous forest region of the country. Necessary materials and equipment such as isolation kit, slants, isolation chamber, data recording sheet, digital camera for photography, digging equipment, heat convector card board were arranged and collection of samples were usually made during day time and field characteristics of mushrooms were recorded in the data sheet which was prepared following Molina *et*

al., (1995). Then the specimens were dried in hot air over at 40-50°C and stored in air tight containers with some silica gel for further microscopic studies. Spotted mushrooms were minutely inspected in their natural habitats and brought to laboratory for detailed study. Photographs were taken by means of a Sony Cyber-shot Digital Camera with power of 14.2 megapixels.

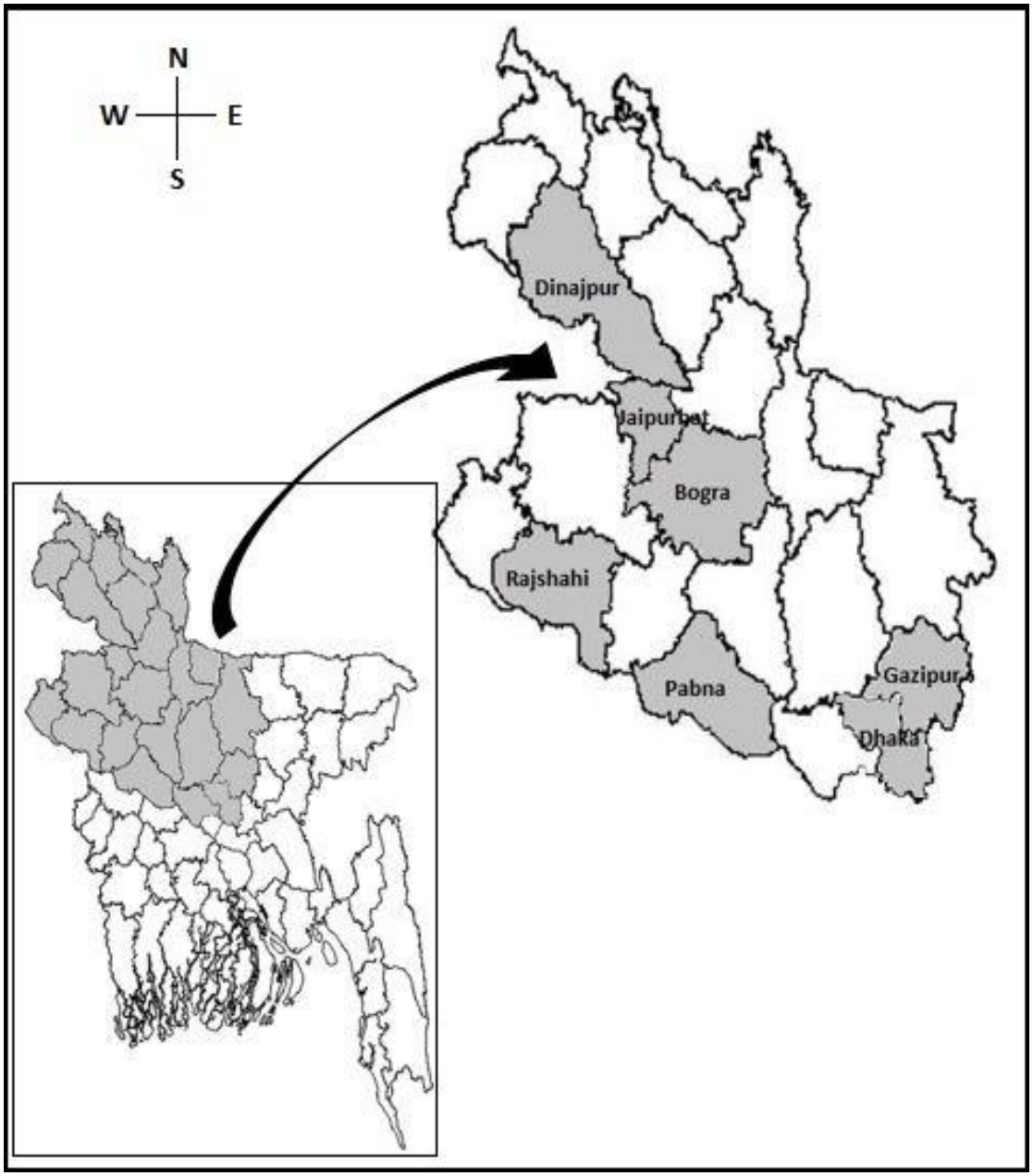

Figure 1. Survey Area: Tropical moist deciduous forest region

3.3 Identification of wild mushrooms

The collected mushroom samples were identified on their morphological, macroscopic, physiological and ecological features according to the previously published documents by Arora (1986) and Singer (1986). The morphological parameters used for identification of mushrooms specimens were cap color, cap surface, cap margin, cap diameter, stipe length, gill attachment, gill spacing, spore diameter, etc. (Chandulal *et al.*, 2013). The spore diameter and the photograph of spore were calculated through using the Motic microscope (Motic Images Plus 2.0) with the magnification of 40x. Most of the cases, one mature and one immature (growing) mushrooms were sampled for each collection to collect accurate information. Through comparing recorded characteristics the mushrooms were identified following Dickinson and John (1982), Jorden (2000), Pegler and Spooner (1997).

The detailed about the mushrooms under the subphylum *Agaricomycotina,* which were found in the investigation on that particular time in the tropical moist deciduous forest region of Bangladesh described here.

RESULTS

Through the investigation, 21 genera and 33 mushroom species were identified (Figures 2 to 34). The identified genera were *Ganoderma* sp., *Trametes* sp., *Daedaleopsis* sp., *Pycnoporus* sp., *Hebeloma* sp., *Craterellus* sp., *Lepiota* sp., *Boletus* sp., *Ramariopsis* sp., *Ampulloclitocybe* sp., *Tuber* sp., *Lycoperdon* sp., *Volvariella* sp., *Russula* sp., *Termitomyces* sp., *Amanita* sp., *Marasmius* sp., *Collybia* sp., *Panaeolus* sp., *Mycena* sp. and *Armillaria* sp. These genera were described below:

4.1 Genus: *Ganoderma* sp.

4.1.1 *Ganoderma lucidum*

Family: Ganodermataceae

Common name: Lingzhi or Reishi mushroom

Color: Young: Red; Mature: Red

Length (Mature): 13.5cm

Width (Mature): 9.6cm

Spore bearing surface under cap : Pores on hymenium

Spore diameter (Average): Length: 9.57µm; Width: 6.77µm

Spore shape: Single walled, smooth and ellipsoidal

Cap of the carpophore: Size: 9.6cm; Shape: Offset

Pileus: Color: Pinkish; Surface character and Zonation: Smooth, Silky, some kind of leathery, having cracking property and dry in nature; Margin: Incurved in shape

Texture of the fruiting body: Brittle, tough, leathery and woody

Flesh odor: Pleasant

Lamellae: Pores present; Pores attachment: Free in nature; Pores color: Yellowish to white in color; Pores shape: Broad; Pores spacing: Crowded

Stipe: Present; Size: 11.8cm; Shape: Unequal; Position: Lateral; Surface characteristics: Dry and Polished in nature; Color and color changes: Pink to chocolaty in color; Firmness: Solid or sometime in fleshy

Figure 2. *Ganoderma lucidum*; (1 & 2). Mature fruiting body, (3). In the habitat, (4). Longitudinal section of stipe, (5). Pores, (6). Spores (40x)

Ecological features: Locality found: Gazipur, Dhaka, Tropical Moist Deciduous Forest region, Bangladesh; Habitat: On soil, in an association near the Ipil-Ipil (*Leucaena leucocephala)* and Golden shower (*Acacia auriculiformis*) trees; Habit: Scattered; Type of association: Root associated; Forest type: Leveled; Constancy of occurrence in specific habitat: Abundant; Type of soil: Sandy soil in nature; Factors affecting their distribution: Literally dry weather around the habitat

4.1.2 *Ganoderma boninense*

Family: Ganodermataceae

Common name: Young resinous polypore mushroom

Color: Young: Center is orange in color with white boarder

Length: 07cm

Width: 0.9cm

Spore diameter (Average): Length: 4.9µm; Width: 4.12µm

Spore shape: Single walled, smooth and more or less circular

Cap of the carpophore: Size: 7cm x 5.3cm; Shape: Flat

Pileus: Color: Center is orange in color with white boarder; Margin: Regular in shape

Texture of the fruiting body: Soft and spongy

Flesh odor: Unpleasant

Ecological features: Locality found: Rajshahi University, Rajshahi, Tropical Moist Deciduous Forest region, Bangladesh; Habitat: On root of the Bamboo (*Bambuseae*) tree; Habit: Caespitose cluster and closely merged with the root; Type of association: Root associated; Forest type: Leveled; Constancy of occurrence in specific habitat: Not in abundant; Type of soil: Loamy soil in nature; Factors affecting their distribution: Less moist weather around the habitat

4.1.3 *Ganoderma tsugae*

Family: Ganodermataceae

Common name: Reishi mushroom

Color: Mature: Red in center with white boarder; Young: Yellow at the top with red in the bottom

Length (Mature): 8.5cm

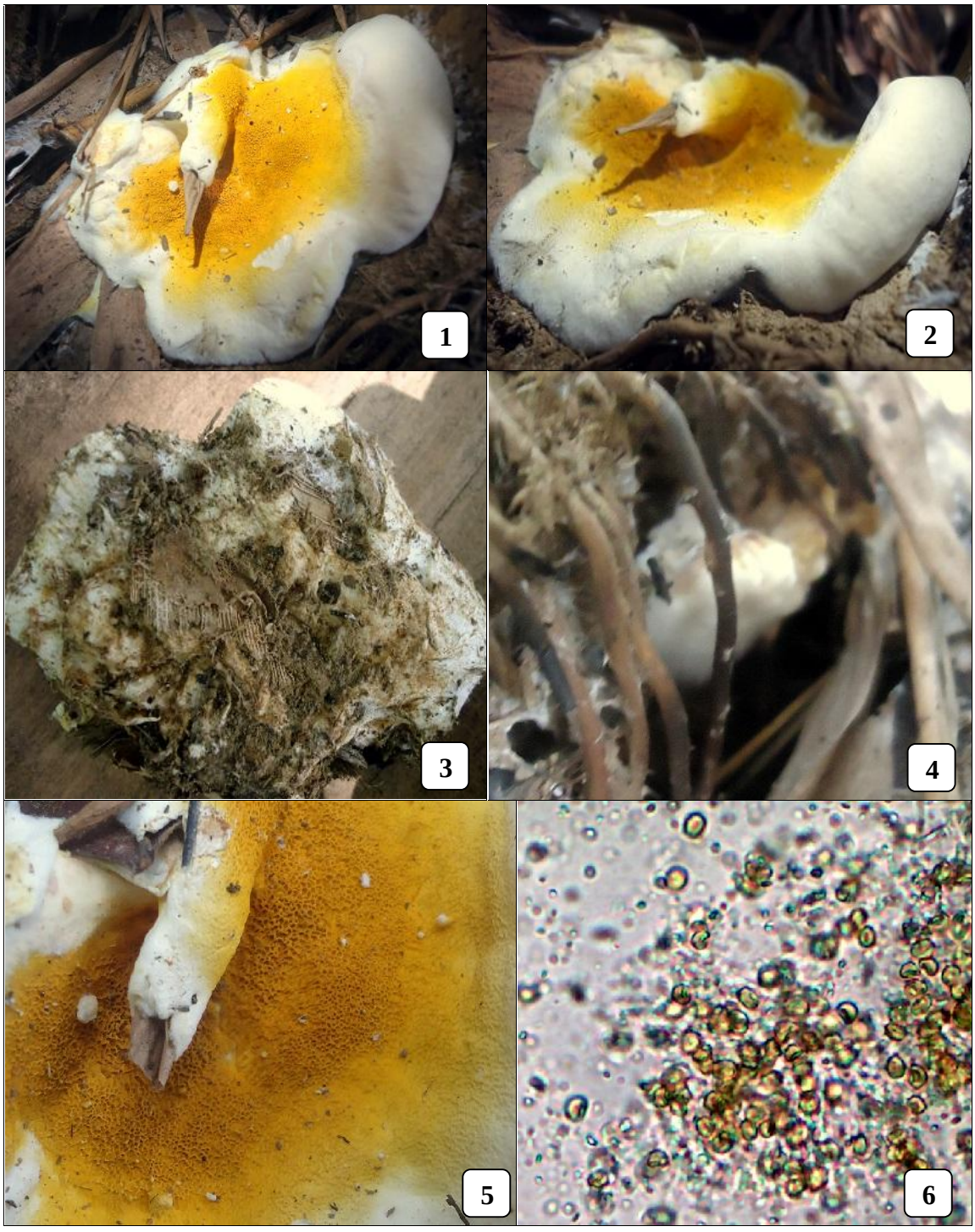

Figure 3. *Ganoderma boninense* (Growing stage); (1 & 2). Fruiting body, (3). Backside of the fruiting body, (4). Growing in the habitat, (5). Spore bearing region on the fruiting body, (6). Spores (40x)

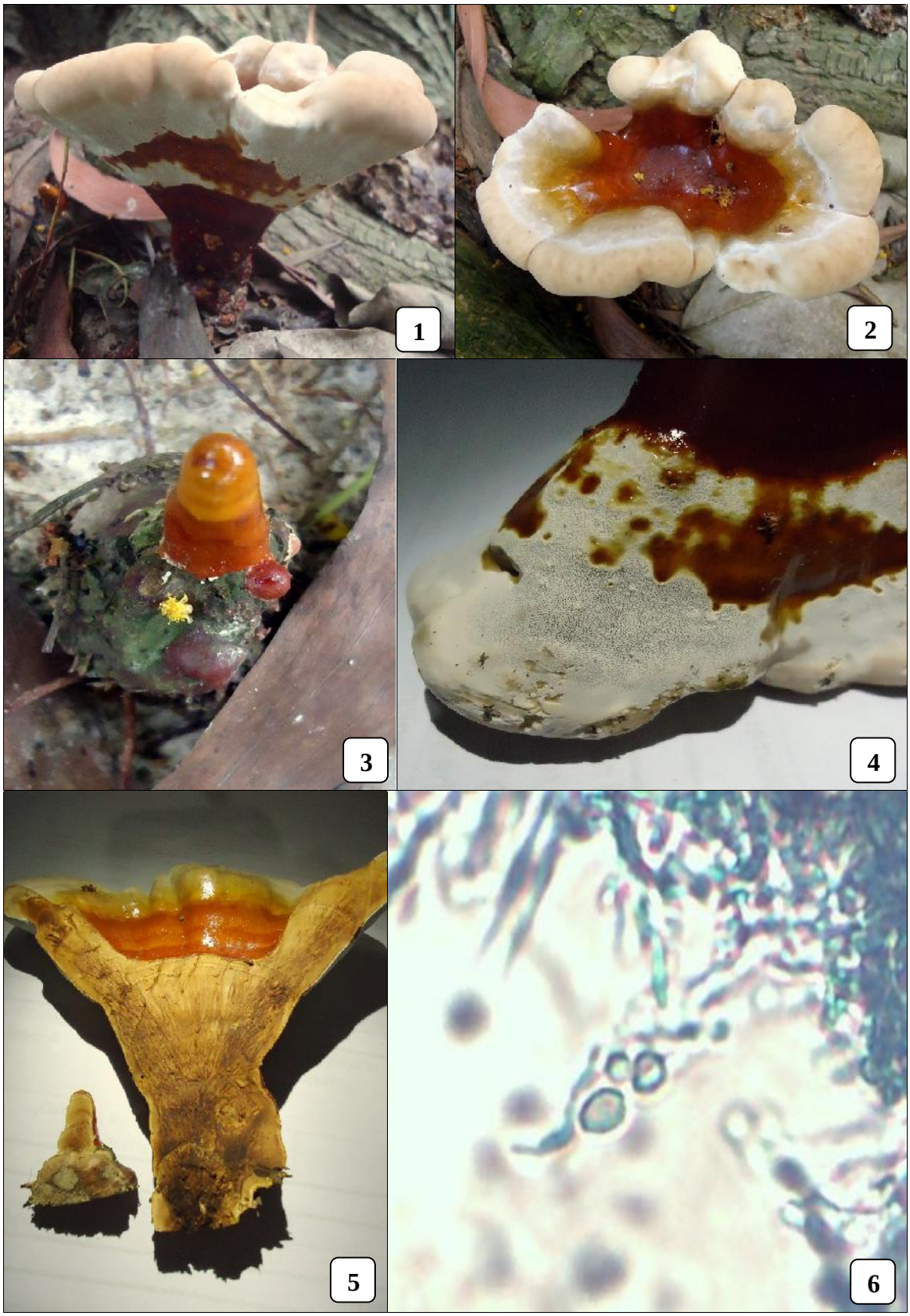

Figure 4. *Ganoderma tsugae*; (1 & 2). Mature fruiting body, (3). Growing fruiting body, (4). Pores, (5). Longitudinal section of fruiting body, (6). Spores (40x)

Width (Mature): 9.3cm

Spore bearing surface under cap: Pores on hymenium

Spore diameter (Average): Length: 5.8µm; Width: 4.7µm

Spore shape: Single walled, smooth and oval

Cap of the carpophore: Size: 9.6cm x 5.3cm; Shape: Flat in the top around

Pileus: Color: Creamy; Surface character and Zonation: Leathery; Margin: Irregular in shape

Texture of the fruiting body: Brittle, leathery and woody

Flesh odor: Pleasant (chocolaty)

Stipe: Present; Size: 3cm; Shape: Unequal; Position: Central; Surface characteristics: Dry and Polished in nature; Color and color changes: Pink to chocolaty in color; Firmness: Solid or sometime in erect

Ecological features: Locality found: Sujanagar, Pabna; Nature: Saprotrophic or parasitic; Habitat: On soil, in the bark of Golden shower (*Acacia auriculiformis*) tree; Habit: Scattered; Type of association: Closely root associated; Forest type: Leveled; Constancy of occurrence in specific habitat: Abundant; Type of soil: loamy soil in nature; Factors affecting their distribution: Literally dry weather around the habitat

Edibility: Inedible

4.1.4 *Ganoderma zonatum*

Family: Ganodermataceae

Common name: Lingzhi or Reishi mushroom

Color: Young: White

Length (Young): 3.4cm to 1.7cm

Width (Young): 3.3cm to 2.1cm

Spore bearing surface under cap: Pores present

Spore diameter (Average): Length: 6.63µm; Width: 4.47µm

Spore shape: Single walled, smooth and ellipsoidal

Pileus: Color: Milky white to Creamy; Surface character and Zonation: Dry in nature

Texture of the fruiting body: Woody

Flesh odor: pleasant

Lamellae: Absent; Pores color: Milky white in color; Pores shape: Broad; Pores spacing: Crowded; Firmness: Solid or somewhat in fleshy

Figure 5. *Ganoderma zonatum* (Beginning stage); (1). Growing fruiting body on the bark wood of the tree, (2). Pores, (3). Longitudinal section of the fruiting body, (4). Spore (40x)

Ecological features: Locality found: Kalai, Jaipurhat; Nature: Parasitic; Habitat: On bark of the tree, in an association with the Mahagany (*Swietenia mahogani*) trees; Habit: Closely associated on the bark of the tree; Type of association: Scattered and somewhat caespitose cluster; Forest type: Leveled; Constancy of occurrence in specific habitat: Not in abundant; Type of soil: Clay loam soil in nature; Factors affecting their distribution: Moderate moist weather around the habitat

4.1.5 *Ganoderma applanatum*

Family: Ganodermataceae

Common name: Lingzhi or Reishi mushroom

Color: Mature: Red with white color pores

Length (Mature): 6.4cm

Width (Mature): 3.5cm

Spore bearing surface under cap: Pores on hymenium

Spore diameter (Average): Length: 7.46µm; Width: 6.0µm

Spore shape: Single walled, smooth and oblong or spherical

Pileus: Surface character and Zonation: Dry in nature; Margin: Incurved in shape

Texture of the fruiting body: Woody

Flesh odor: Disagreeable

Pores color: White

Ecological features: Locality found: Kalai, Jaipurhat; Nature: Parasitic; Habitat: On bark wood of the tree, in an association with the Golden shower (*Acacia auriculiformis*) tree; Habit: Scattered; Type of association: Closely associated; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loamy soil in nature; Factors affecting their distribution: Literally moist weather around the habitat

4.1.6 *Ganoderma resinaceum*

Family: Ganodermataceae

Common name: Bracket fungi or Reishi mushroom

Color: Mature: Blackish with grayish color boarder

Length: Mature: 06cm; Young: 05cm

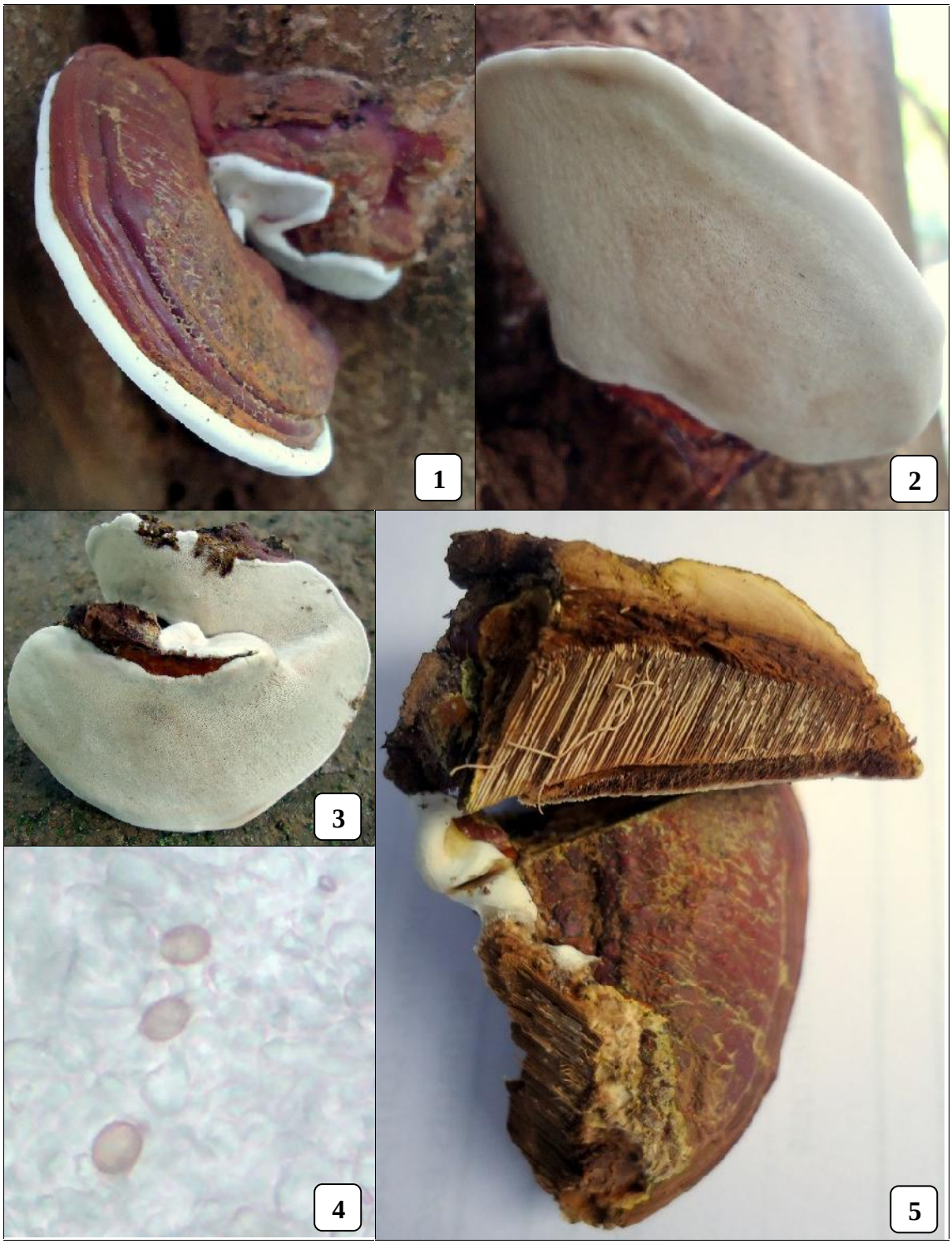

Figure 6. *Ganoderma applanatum*; (1 & 2). Fruiting body, (3). Pores, (4). Spores (40x), (5). Cross-section of fruiting body

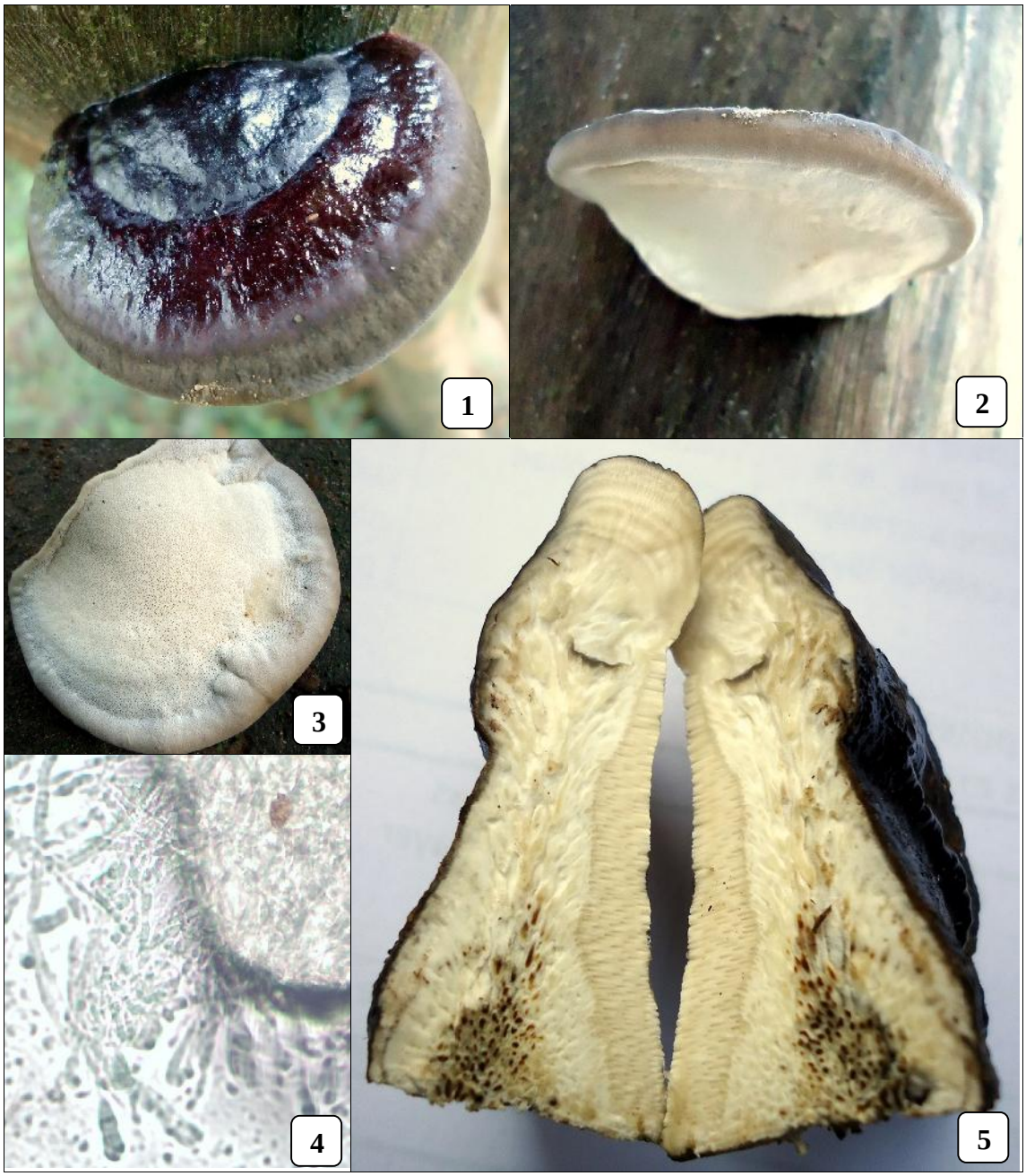

Figure 7. *Ganoderma resinaceum*; (1 & 2). Fruiting body, (3). Pores, (4). Spores (40x), (5). Cross-section of fruiting body

Width: Mature: 4.1cm; Young: 3.2cm

Spore bearing surface under cap: Pores on hymenium

Spore diameter (Average): Length: 14.9µm; Width: 10.0µm

Spore shape: Single walled, smooth and ellipsoidal

Pileus: Color: Whitish to Creamy; Surface character and Zonation: Smooth, some kind of leathery and moist in nature; Margin: Regular in shape

Texture of the fruiting body: Spongy, leathery and woody

Flesh odor: Unpleasent

Lamellae: Absent; Pores color: White in color; Pores spacing: Crowded

Ecological features: Locality found: Kalai, Jaipurhat; Habitat: On bark wood of the tree, in an close association with the Golden shower (*Acacia auriculiformis*) trees; Habit: Scattered; Type of association: Closely associated; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loamy soil in nature; Factors affecting their distribution: Moderately moist weather around the habitat

Edibility: Inedible

4.2 Genus: *Trametes* sp.

Trametes versicolor

Family: Polyporaceae

Common name: Polypore or Bracket mushroom

Color: Young: Dark violate along with white boarder; Mature: Dark violate along with white boarder

Length: Mature: 8.2cm; Young: 4.8cm

Width: Mature: 5.4cm; Young: 3.8cm

Spore bearing surface under cap: Pores on hymenium

Spore diameter (Average): Length: 8.62µm; Width: 5.6µm

Spore shape: Single walled, smooth and ellipsoidal

Pileus: Color: Creamy; Surface character and Zonation: Dry in nature; Margin: Regular in shape

Texture of the fruiting body: Brittle and woody

Flesh odor: Unpleasant

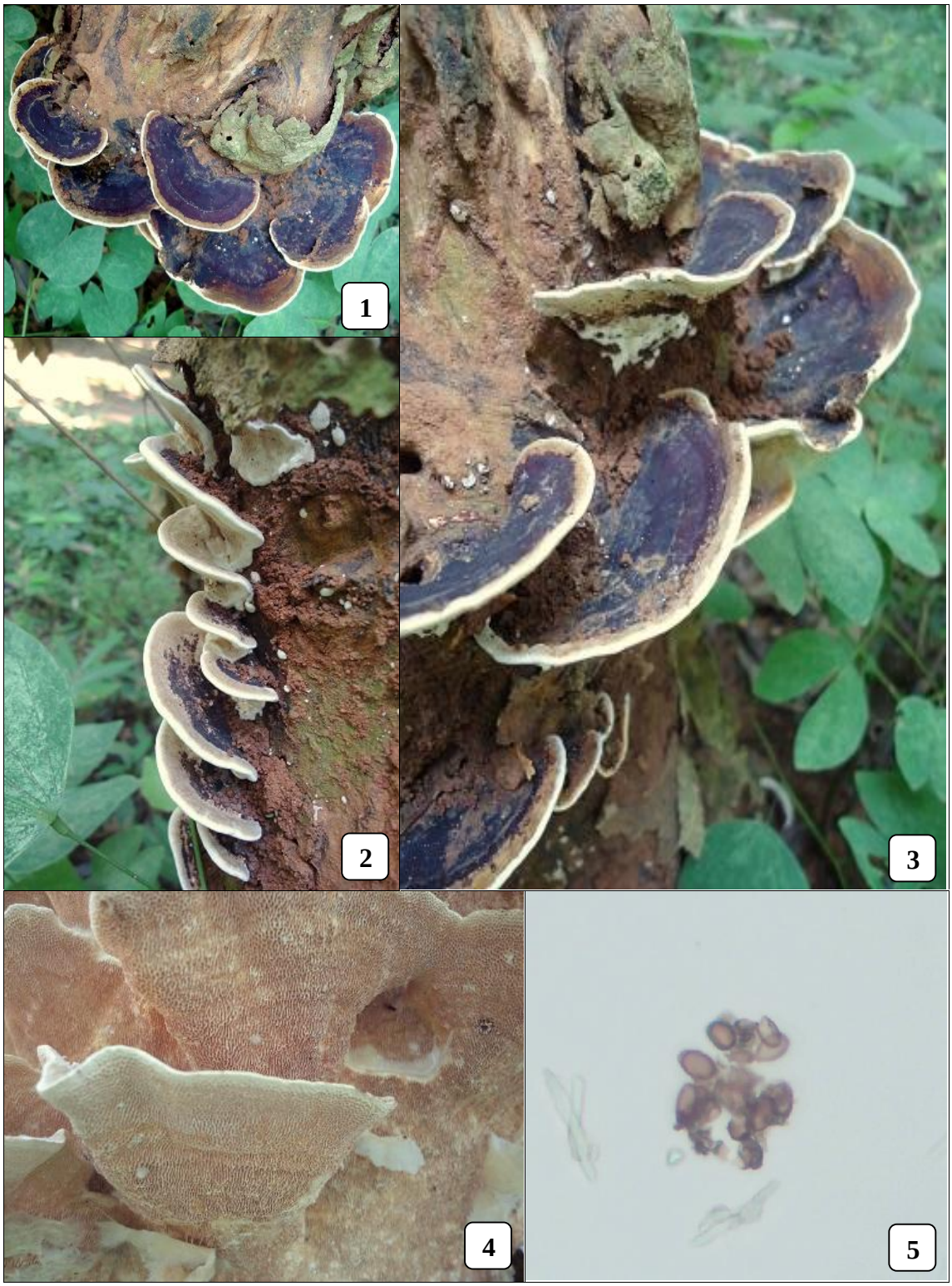

Figure 8. *Trametes versicolor;* (1, 2 & 3). Fruiting body on growing habitat, (4). Pores, (5). Spores (40x)

Pores color: White

Ecological features: Locality found: Dinajpur; Nature: Saprotrophic; Habitat: On the bark wood of the tree, in closely associated with Royal siris (*Albizzia procera*) tree; Habit: Solitary and somewhat are caespitose cluster; Type of association: Stem associated; Forest type: Leveled; Constancy of occurrence in specific habitat: Abundant; Type of soil: Loamy soil in nature; Factors affecting their distribution: Moist weather around the habitat

4.3 Genus: *Daedaleopsis* sp.

4.3.1 *Daedaleopsis confragosa*

Family: Polyporaceae

Common name: Blushing bracket

Color: Young: Whitish to creamy in circle; Mature: Whitish to creamy in circle and somewhat pinkish circle around the boarder

Length: Mature: 4.1cm to 5.4cm; Young: 1.4cm to 1.5cm;

Width: Mature: 6.4cm to 8cm; Young: 3cm to 3.8cm

Spore bearing surface under cap: Teeth in very young stage

Spore diameter (Average): Length: 6.88µm; Width: 6.44µm

Spore shape: Single walled, smooth and elongated

Pileus: Color: Pinkish; Surface character and Zonation: Leathery and dry in nature; Margin: Regular in shape

Texture of the fruiting body: Brittle, tough, leathery and woody

Flesh odor: Pleasant

Firmness: Very Hard

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On bark wood of the tree, in an association near the Ipil-Ipil (*Leucaena leucocephala*) tree; Habit: Solitary and somewhat are caespitose cluster; Type of association: Trunk associated; Forest type: Leveled; Constancy of occurrence in specific habitat: Abundant; Type of soil: Loamy soil in nature; Factors affecting their distribution: Literally more moist weather around the habitat

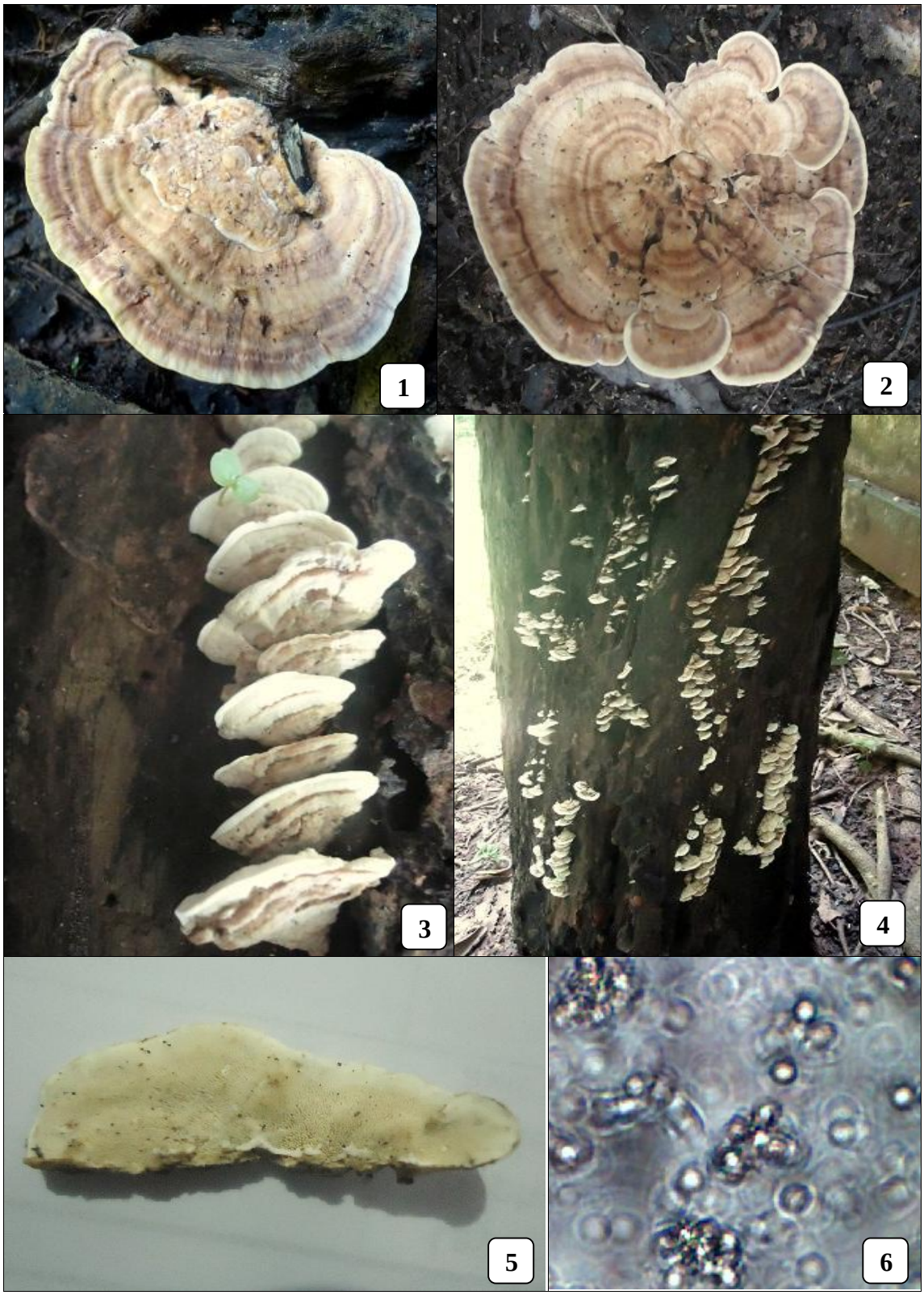

Figure 9. *Daedaleopsis confragosa*; (1 & 2). Fruiting body growing on the bark wood of the tree and on the soil accordingly, (3 & 4). Growing on the trunk of the tree in a chain form, (5). Pores, (6). Spores (40x)

4.3.2 *Daedaleopsis confragosa* var. *tricolor*

Family: Polyporaceae

Common name: Blushing Bracket

Color: Young: Dark red; Mature: Dark red

Length (Mature): 8.5cm

Width (Mature): 12.3cm

Spore bearing surface under cap: Teeth (beginning stage)

Spore diameter (Average): Length: 4.84µm; Width: 4.06µm

Spore shape: Single walled, smooth and oblong

Cap of the carpophore: Size: 8.5cm x 12.3cm; Shape: Umbilicate

Pileus: Color: Pinkish; Surface character and Zonation: Leathery and moist in nature; Margin: Regular in shape

Texture of the fruiting body: Brittle, tough, leathery and woody

Flesh odor: Fragrant

Firmness: Solid and very hard

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Nature: Saprotrophic; Habitat: On bark wood of the tree, in an association near the Ipil-Ipil (*Leucaena leucocephala*), Golden shower (*Acacia auriculiformis*) and medicinal plants; Habit: Caespitose cluster; Type of association: Root associated; Forest type: Mixed; Constancy of occurrence in specific habitat: Abundant; Type of soil: Loamy soil in nature; Factors affecting their distribution: More moist weather around the habitat

4.4 Genus: *Pycnoporus* sp.

Pycnoporous cinnibarinus

Family: Polyporaceae

Common name: Cinnibar Red Polypore

Color: Young: Orange-red; Mature: Orange-red

Length: Mature: 4.2cm; Young: 3.1cm

Breath: Mature: 2.5cm; Young: 1.8cm

Width: Mature: 0.8cm to 9cm

Figure 10. *Daedaleopsis confragosa var. tricolor;* (1 & 3). Mature fruiting body, (2). Pores, (4). Longitudinal section, (5). Spores (40x)

Figure 11. *Pycnoporous cinnibarinus;* (1 & 2). Mature fruiting body, (3 & 4). Pores, (5). Showing the measurement of mature fruiting body, (6). Spores (40x)

Spore bearing surface under cap: Pores

Spore diameter (Average): Length: 3.75µm; Width: 2.48µm

Spore shape: Single walled, smooth and ellipsoidal

Cap of the carpophore: Shape: Flat

Pileus: Color: Orange-red; Surface character and Zonation: Smooth, Silky, somewhat dry in nature; Margin: Incurved in shape

Texture of the fruiting body: Woody

Flesh odor: Pleasant

Firmness: Solid

Ecological features: Locality found: Bogra; Nature: Parasitic; Habitat: On humus, in an association with the stem of Bamboo (*Bambuseae*) tree; Habit: Scattered; Type of association: Closely associated; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Factors affecting their distribution: Less moist or moderately dry weather around the habitat

4.5 Genus: *Hebeloma* sp.

Hebeloma crustuliniforme

Family: Hymenogastraceae

Common name: Poison pie or fairy cakes

Color: Young: White; Mature: Creamy

Length: Mature: 6.2cm; Young: 3.7cm

Width: Mature: 3.3cm; Young: 1.2cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 5.85µm; Width: 3.7µm

Spore shape: Single walled, smooth and ellipsoidal

Cap of the carpophore: Size: Mature: 3.3cm; Young: 1.2cm; Shape: Umbonate and some are flatten

Pileus: Color: Creamy; Surface character and Zonation: Smooth and dry in nature; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Pleasant

Figure 12. *Hebeloma crustuliniforme;* (1). Mature fruiting body, (2). Immature fruiting body, (3). Growing on habitat, (4). Gills, (5). Spores (40x), (6). Longitudinal section of fruiting body

Lamellae: Present; Gill attachment: Adnate; Gill color: Yellowish white; Gill shape and width: Moderately broad; Gill spacing: Close; Lamellulae: Present; Forking pattern: Branched

Stipe: Present; Size: Mature: 3.9cm; Shape: Bare; Position: Central; Surface characteristics: Dry and polished; Color and color changes: Creamy; Firmness: Solid but fleshy

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On soil and root of the tree; in an association with the stem of Bamboo (*Bambuseae*) tree; Habit: Scattered; Type of association: Close; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Sandy; Factors affecting their distribution: Less moist weather

4.6 Genus: *Craterellus* sp.

Craterellus cornucopioides

Family: Cantharellaceae

Common name: Black trumpet mushroom

Color: Young: Violet; Mature: Black with whitish color boarder

Length (Mature): 7.4cm

Width (Mature): 3.8cm

Spore diameter (Average): Length: 4.46µm; Width: 3.96µm

Spore shape: Single walled, smooth and cylindrical

Cap of the carpophore: Size: 3.4cm × 2.6cm; Shape: Infundibular

Pileus: Color: Pinkish and somewhat mixed; Surface character and Zonation: Smooth, leathery, sticky and moist; Margin: Incurved

Texture of the fruiting body: Brittle but moist in nature

Flesh odor: Pleasant

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On soil and root of the tree; in an association with the stem of Bamboo (*Bambuseae*) tree; Habit: Scattered; Type of association: Close; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Sandy; Factors affecting their distribution: More moist weather

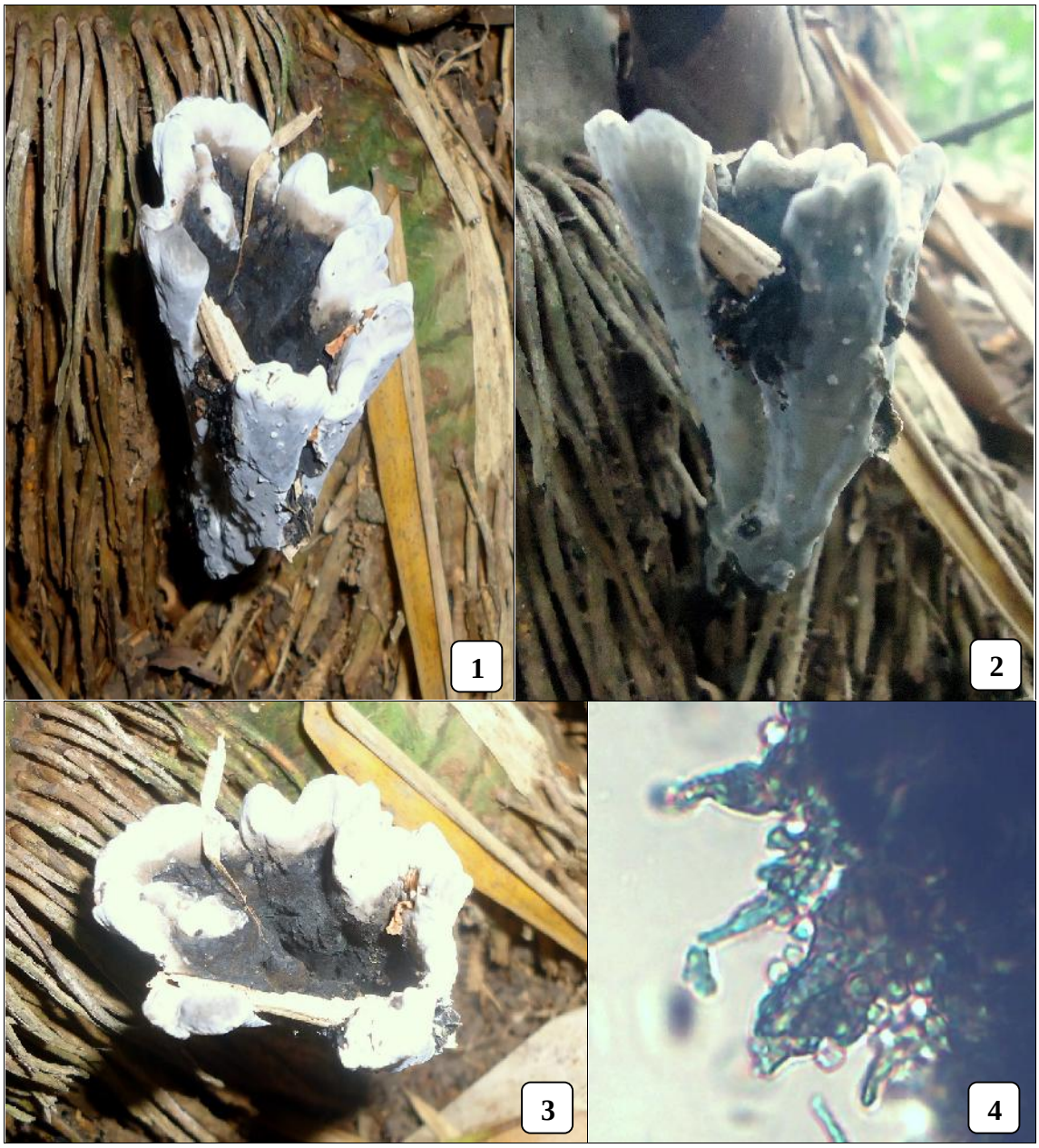

Figure 13. *Craterellus cornucopioides;* (1 & 2). Mature fruiting body, (3). Frontal view of fruiting body, (4). Spores (40x)

4.7 Genus: *Lepiota* sp.

4.7.1 *Lepiota americana*

Family: Agaricaceae

Common name: Rogers mushroom

Color: Young: Brown; Mature: Brown with dark brown as well as pinkish spots or scales; Color changed from dark brown to black in the border region after one hour of collection

Length: Mature: 3.0cm to 4.5cm; Young: 4.0cm

Width: Mature: 3.8cm to 5.1cm; Young: 1.8cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 6.28µm; Width: 4.32µm

Spore shape: Single walled, smooth and ellipsoid

Cap of the carpophore: Size (Mature): 3.8cm to 5.1cm; Shape: Convex

Pileus: Color: Pinkish, brownish or mixed; Surface character and Zonation: Smooth and dry in nature; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Pleasant

Lamellae: Present; Gill attachment: Emarginated; Gill color: Light brown; Gill shape: Broad; Gill spacing: Close; Lamellulae: Present; Forking pattern: Unbranched

Stipe: Present; Size: 2.4cm × 5.8cm; Shape: Equal; Position: Central; Surface characteristics: Dry, glabrous and polished; Color and color changes: Some are grey to light brown; Firmness: Tubular;

Annulus (position): Present and single

Scale: Present and brown in color

Umbo: Present and convex well shaped

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On soil; in an association with the mango (*Magifera indica*) tree; pH in soil: 5.6; Moisture: 7.0%; Temperature: 34°C; Habit: Scattered; Type of association: Distant; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: Dry weather

Figure 14. *Lepiota americana*; (1 & 3). Mature fruiting body, (4). Immature fruiting body, (2). Gills, (5). Longitudinal section, (6). Spores (40x)

4.7.2 *Lepiota helveola*

Family: Agaricaceae

Color: Young: White and creamy; Mature: White and creamy with dark brown spots on cap and stipe; color changed after four hours of collection

Length (Mature): 13cm to 15cm; Young: 8.0cm

Width (Mature): 6.0cm to 6.3cm; Young: 4.4cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 8.8µm; Width: 5.88µm

Spore shape: Single walled, smooth and ellipsoid

Cap of the carpophore: Size: 6.0cm to 6.3cm; Shape: Convex or flat

Pileus: Color: White, creamy and brownish with brown spot; Surface character and Zonation: Smooth, scaly and dry in nature; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Fragrant

Lamellae: Present; Gill attachment: Free; Gill color: White; Gill shape: Broad; Gill spacing: Close; Lamellulae: Present; Forking pattern: Unbranched

Stipe: Present; Size: 10.5cm; Shape: Clavate; Position: Central; Surface characteristics: Dry and glabrous; Color and color changes: Grey to light brown with dark brown spots; Firmness: Tubular;

Annulus (position): Present and single

Scale: Present and brown in color

Umbo: Present and oyster shaped

Ecological features: Locality found: Jahangirnagar University, Savar, Dhaka; Habitat: On humus; Habit: Solitary; Forest type: Mixed; Constancy of occurrence in specific habitat: Abundant; Factors affecting their distribution: Moist weather

4.7.3 *Lepiota aspera*

Family: Agaricaceae

Common name: Freckled dapperling

Color: Young: Brown; Mature: Brown

Length: 4.0cm

Width: 1.5cm

Spore bearing surface under cap: Gills

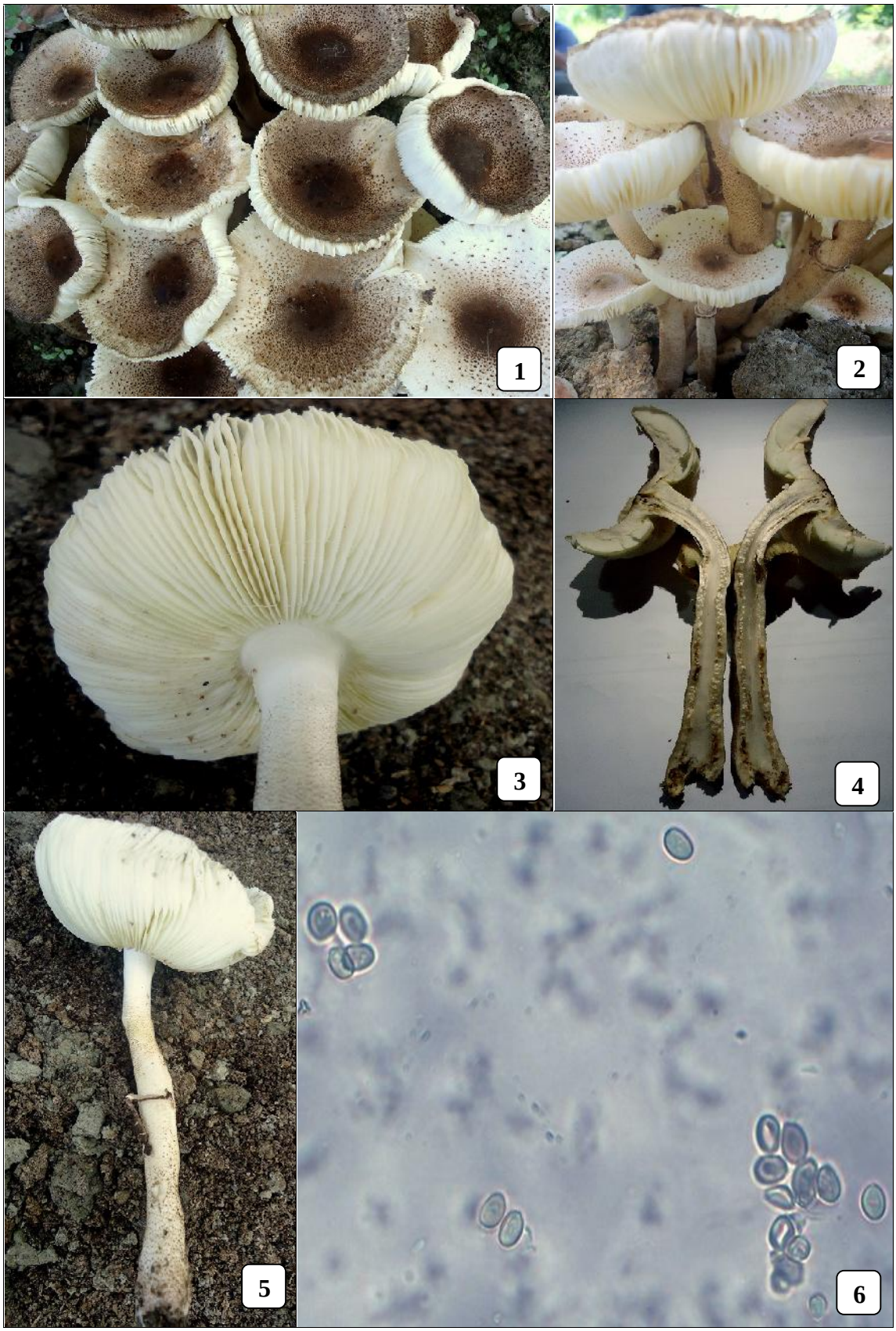

Figure 15. *Lepiota helveola;* (1 & 2). Mature fruiting body, (3). Gills, (4). Longitudinal section, (5). Annulus or Ring on stipe, (6). Spores (40x)

Figure 16. *Lepiota aspera;* (1 & 2). Mature fruiting body, (3). Longitudinal section, (4). Spore bearing hymenium, (5). Spores on basidium (40x)

Spore diameter (Average): Length: 3.77µm; Width: 3.6µm

Spore shape: Single walled, smooth and cylindrical

Cap of the carpophore: Size: 1.5cm; Shape: Campanulate

Pileus: Color: Brownish; Surface character and Zonation: Scaly and dry in nature; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Pleasant

Lamellae: Present; Gill attachment: Free; Gill color: Pale light brown; Gill shape: Moderately broad; Gill spacing: Crowed; Lamellulae: Present; Forking pattern: Branched

Stipe: Present; Size: 3.9cm; Shape: Equal; Position: Central; Surface characteristics: Dry but spiny scale present and pruinose; Color and color changes: Grey to light brown; Firmness: Solid

Ecological features: Locality found: Sher-e-Bangla Nagar, Dhaka; Habitat: On humus; Habit: Scattered; Forest type: Leveled; Constancy of occurrence in specific

Habitat: Un-abundant; Type of soil: Clay loam; Factors affecting their distribution: More moist weather

4.7.4 *Macrolepiota procera*

Family: Lepiotaceae

Color: Young: Creamy; Mature: Creamy with dark brown scale

Length: 13cm

Width: 7cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 8.82µm; Width: 5.82µm

Spore shape: Single walled, smooth and elongated as well as ellipsoid

Cap of the carpophore: Size: Length: 7.0cm; Width: 0.8cm; Shape: Umbonate

Pileus: Color: Creamy with spots; Surface character and Zonation: Smooth, scaly and dry in nature; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Pleasant

Lamellae: Present; Gill attachment: Free; Gill color: Pale white; Gill shape: Broad; Gill spacing: Close; Lamellulae: Present; Forking pattern: Unbranched

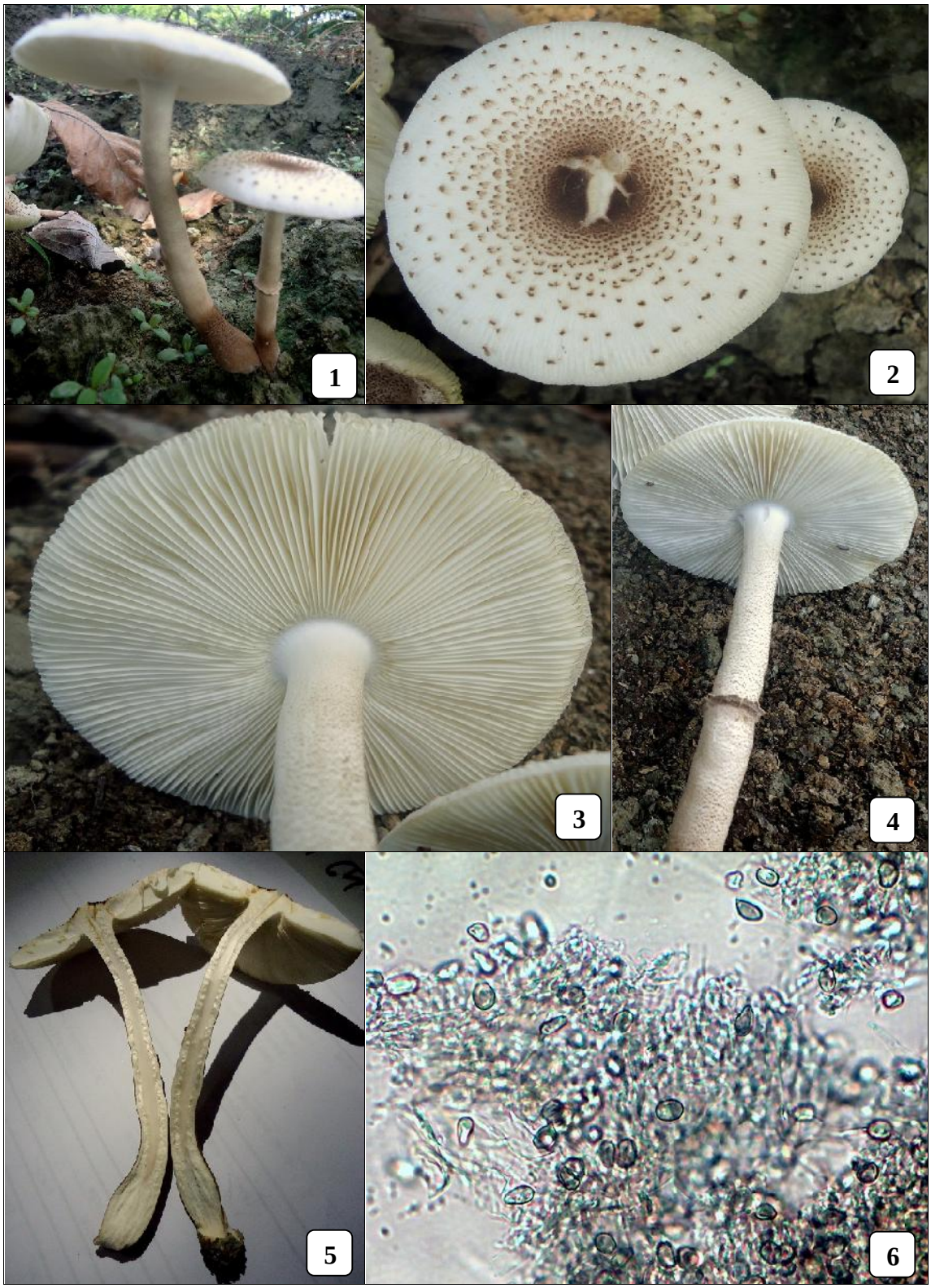

Figure 17. *Macrolepiota procera;* (1 & 2). Mature fruiting body, (3). Spore bearing hymenium, (4). Annulus or ring on the stipe in the immature stage, (5). Longitudinal section, (6). Spores (40x)

Stipe: Present; Size: 11.5cm; Shape: Bulboue; Position: Central; Surface characteristics: Dry and polished; Color and color changes: White to light brown with spots; Firmness: Tubular and fleshy

Annulus (position): Present and single

Scale: Present and brown in color

Umbo: Present and oyster shaped

Ecological features: Locality found: Jahangirnagar University, Savar, Dhaka; Habitat: On humus; Habit: Solitary; Forest type: Mixed; Constancy of occurrence in specific habitat: Un-abundant; Factors affecting their distribution: Moist weather

4.8 Genus: *Boletus* sp.

Boletus amygdalinus

Family: Boletaceae

Common name: Summer bolete

Color: Young: Yellowish with brown shades; Mature: Yellow

Length (Mature): 9.8cm

Width (Mature): 7.1cm

Spore bearing surface under cap: Pores

Cap of the carpophore: Size: 7.1cm × 2.5cm; Shape: Convex

Pileus: Color: Greyish and brownish; Surface character and Zonation: Smooth, silky, leathery and dry in nature; Margin: Regular

Texture of the fruiting body: Spongy and some extent woody

Flesh odor: Pleasant

Lamellae: Present; Pores attachment: Adnate; Pores color: Pale yellow; Gill shape: Broad; Pores spacing: Crowed; Lamellulae: Present; Forking pattern: Unbranched

Stipe: Present; Size: 7.3cm; Shape: Bare; Position: Central; Surface characteristics: Dry and polished; Color and color changes: Yellowish and some are greyish to light brown; Firmness: Solid

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On soil; in an association with the Ipil-Ipil (*Leucaena leucocephala*) tree; Habit:

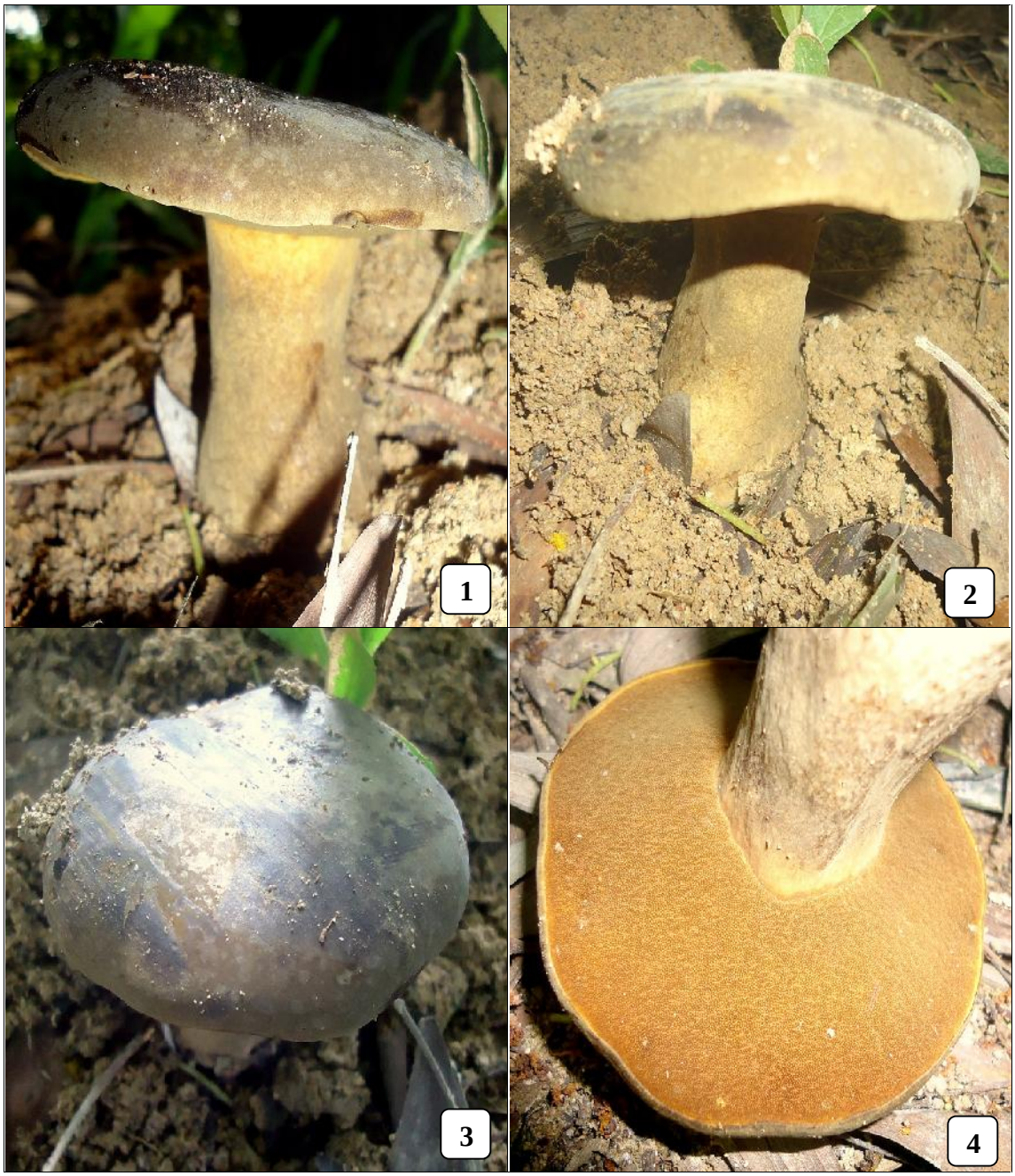

Figure 18. *Boletus amygdalinus;* (1 & 2). Mature fruiting body, (3). Cap of the carpophore, (4). Spore bearing pores on hymenium

Scattered; Type of association: Scattered; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; pH of soil: 6.1; Moisture: 6.8%, Temperature: 35°C; Factors affecting their distribution: Less moist weather

4.9 Genus: *Ramariopsis* sp.

Ramariopsis kunzei

Family: Clavariaceae

Common name: White coral

Color: Young: White; Mature: White

Length (Mature): 5.2cm

Width (Mature): 02cm to 0.5cm

Spore diameter (Average): Length: 4.0µm; Width: 3.6µm

Spore shape: Single walled, smooth and spherical

Texture of the fruiting body: Soft, spongy and brittle

Flesh odor: Unpleasant

Forking pattern: Branched

Surface characteristics: Dry

Color and color changes: White

Firmness: Fistulose and narrow

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On soil; in an association with the Ipil-Ipil (*Leucaena leucocephala*), Golden shower (*Acacia auriculiformis*) and some other medicinal plant roots; Habit: Solitary and some others are caespitose cluster; Type of association: Distant and some are closely crowded; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Sandy; Factors affecting their distribution: Moist weather

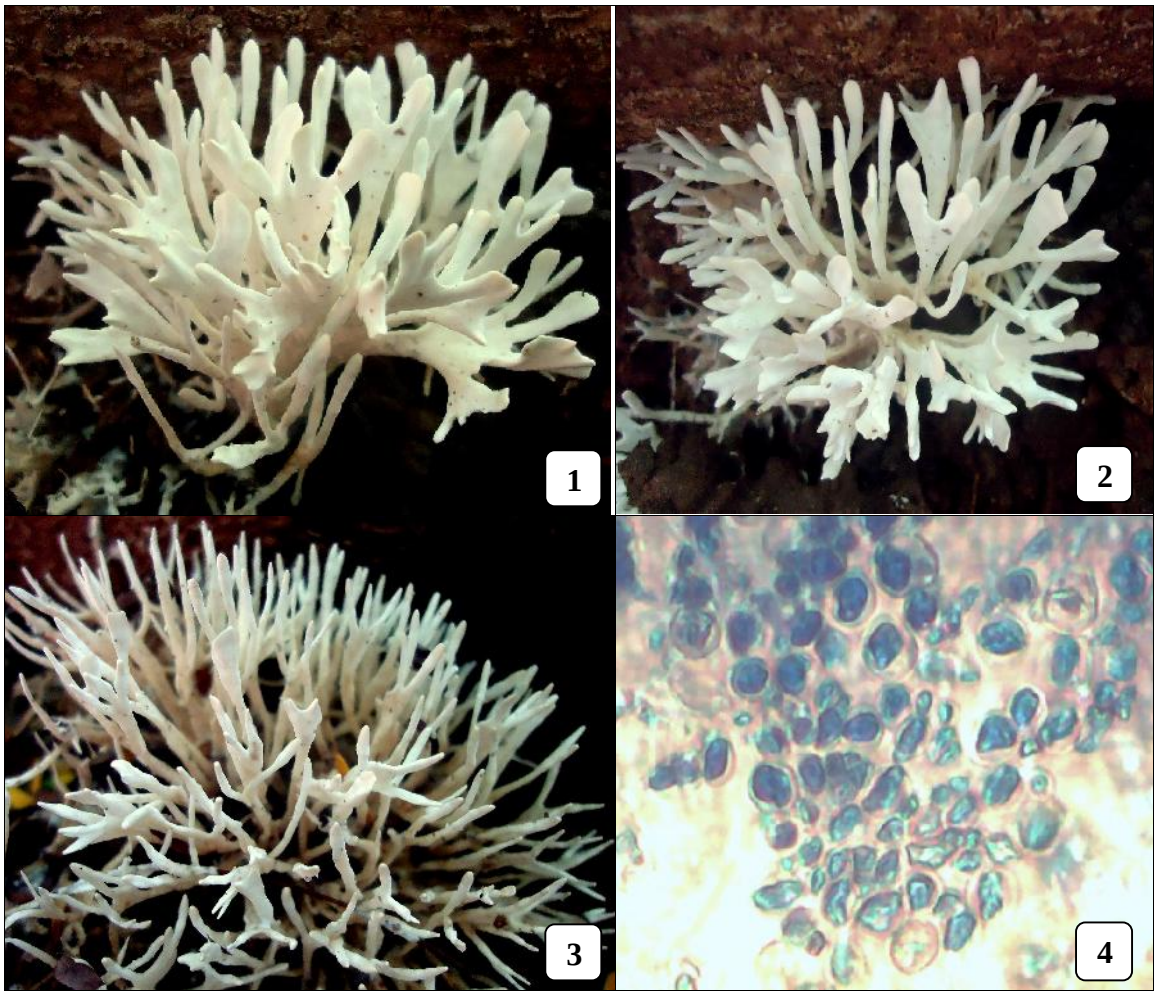

Figure 19. *Ramariopsis kunzei;* (1, 2 & 3). Mature fruiting body, (4). Spores (40x)

4.10 Genus: *Ampulloclitocybe* sp.

Ampulloclitocybe clavipes

Family: Hygrophoraceae

Common name: Club footed ditocybe

Color: Young: White; Mature: White

Length: Mature: 2.4cm; Young: 1.8cm

Width: Mature: 1.4cm; Young: 0.6cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 4.56µm; Width: 4.56µm

Spore shape: Single walled, smooth and spherical

Cap of the carpophore: Size: Mature: 1.4cm; Young: 0.6cm; Shape: Ovate

Pileus: Color: White; Surface character and Zonation: Smooth and dry in nature; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Pleasant

Lamellae: Present; Gill attachment: Free; Gill color: White; Gill shape: Moderately broad; Gill spacing: Close; Lamellulae: Present; Forking pattern: Unbranched

Stipe: Present; Size: 2.4cm; Shape: Bare; Position: Central; Surface characteristics: Dry and glabrous; Color and color changes: White and some became grey to light brown after one hour; Firmness: Solid and tubular

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On soil; in an association with the Golden shower (*Acacia auriculiformis*) and some other medicinal plants; Habit: Scattered; Type of association: Distant; Forest type: Mixed; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Clay loam; Factors affecting their distribution: Moderately moist weather

4.11 Genus: *Tuber* sp.

Tuber aestivum

Family: Tuberaceae

Figure 20. *Ampulloclitocybe clavipes;* (1 & 2). Mature fruiting body, (2). Gills attachment, (4). Longidutinal section, (5). Cap of the carpophore, (6). Spores (40x)

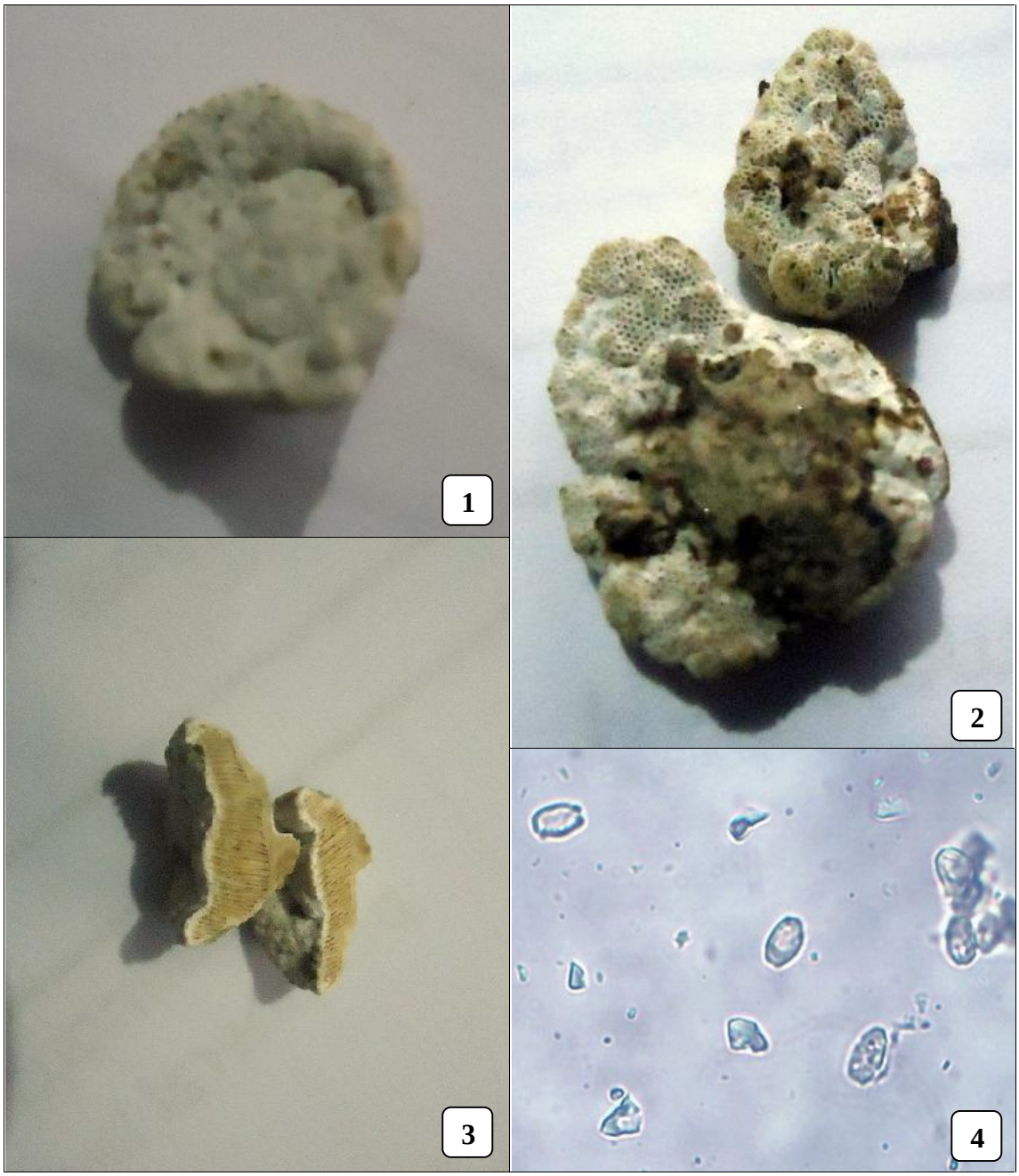

Figure 21. *Tuber aestivum;* (1). Fruiting body, (2). Spore bearing pores, (3). Longitudinal section of fruiting body, (4). Spores (40x)

Common name: Truffle

Color: Young: White; Mature: White

Length (Mature): 1.1cm to 1.5cm

Width (Mature): 1.1cm to 1.3cm

Spore bearing surface under cap: Glebal

Spore diameter (Average): Length: 12.9µm; Width: 7.94µm

Spore shape: Single walled, smooth and ellipsoidal

Cap of the carpophore: Size: 1.1cm to 1.3cm; Shape: Flat

Pileus: Color: White; Surface character and Zonation: Glabrous and dry in nature; Margin: Irregular

Texture of the fruiting body: Spongy

Flesh odor: Pleasant

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On bark wood of the plant; in an association with the Dahlia plant (*Dahlia* sp.); Habit: Scattered and some are caespitose cluster; Type of association: Close; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: Less moist weather

4.12 Genus: *Lycoperdon* sp.

Lycoperdon pyriforme

Family: Lycoperdaceae

Common name: Pear-shaped puffball or stump puffball

Color: Young: White; Mature: White

Length: 1cm to 1.3cm

Width: 1.3cm

Spore diameter (Average): Length: 5.27µm; Width: 4.07µm

Spore shape: Single walled, smooth and ellipsoid

Cap of the carpophore: Size: 1.3cm; Shape: Flat

Pileus: Color: White; Surface character and Zonation: Smooth

Texture of the fruiting body: Soft and spongy

Flesh odor: Pleasant

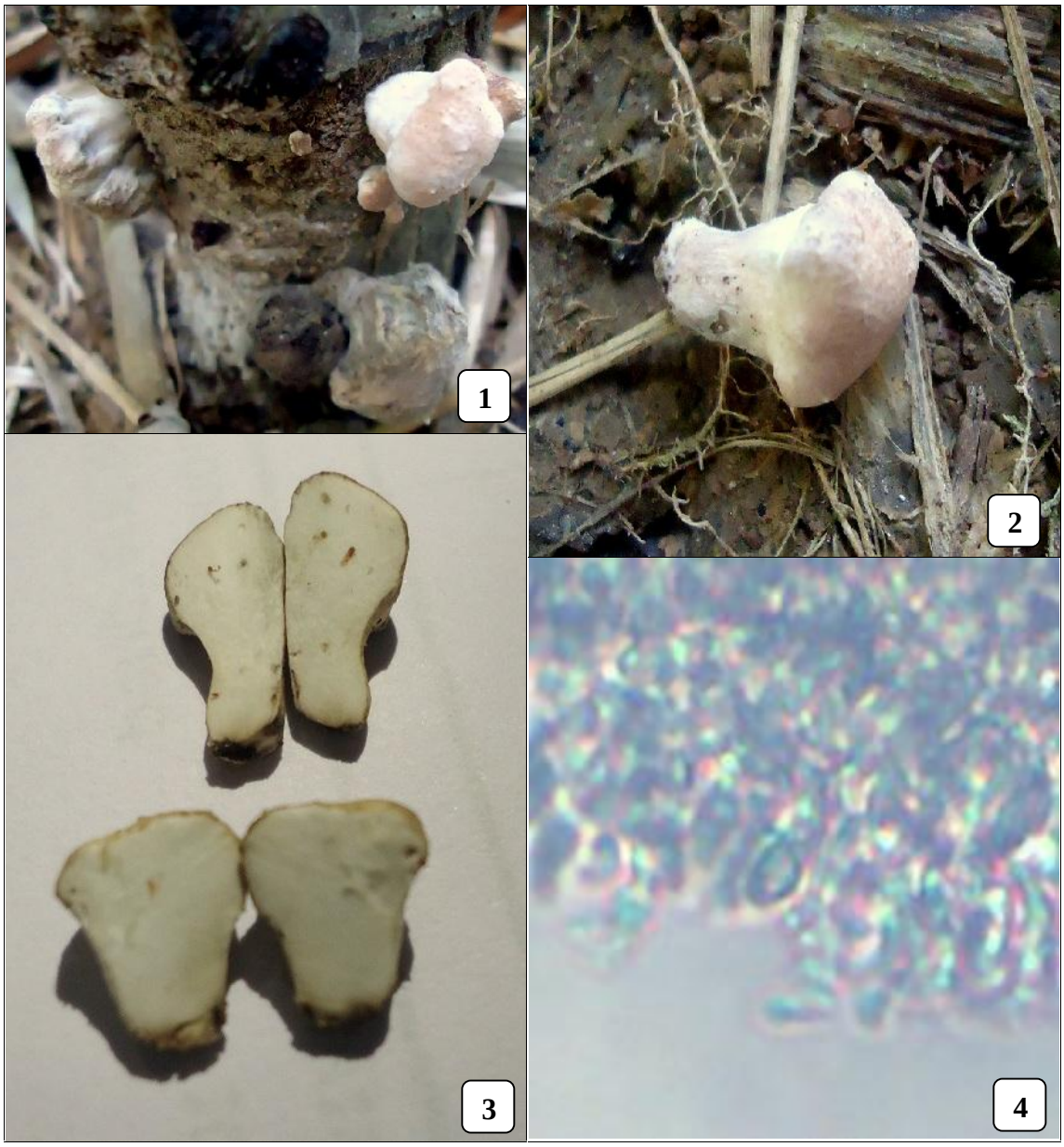

Figure 22. *Lycoperdon pyriforme;* (1). Mature along with immature fruiting body on the habitat, (2). Mature fruiting body, (3). Longitudinal section of the fruiting body, (4). Spores (40x)

Firmness: Solid but fleshy

Ecological features: Locality found: Gazipur, Dhaka; Habitat: On bark wood of the tree; in an association with the stem of Bamboo (*Bambuseae*) tree; Habit: Scattered; Type of association: Close; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: Moist weather

4.13 Genus: *Volvariella* sp.

Volvariella gloiocephala

Family: Pluteaceae

Common name: Big sheath mushroom, rose-gilled grisette, or stubble rosegill

Color: Young: White; Mature: White

Length: 10.5cm

Width: 6.8cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 10.5µm; Width: 10.1µm

Spore shape: Single walled, smooth and ellipsoidal

Cap of the carpophore: Size: 6.8cm; Shape: Ovate or flat

Pileus: Color: Creamy, brownish and some are mixed; Surface character and Zonation: Smooth and dry in nature; Margin: Incurved

Texture of the fruiting body: Soft and spongy

Flesh odor: Disagreeable after half an hour of collection

Lamellae: Present; Gill attachment: Free; Gill color: Pale white; Gill shape: Broad; Gill spacing: Close; Lamellulae: Present; Forking pattern: Branched

Stipe: Present; Size: 9.2cm; Shape: Clavate; Position: Central; Surface characteristics: Dry and glabrous; Color and color changes: White to creamy; Firmness: Tubular and narrow

Volva: Present

Ecological features: Locality found: Sujanagar thana, Pabna; Habitat: On soil; in an association with the Mahogany (*Swietenia mahogani*) tree; Habit: Scattered; Type of

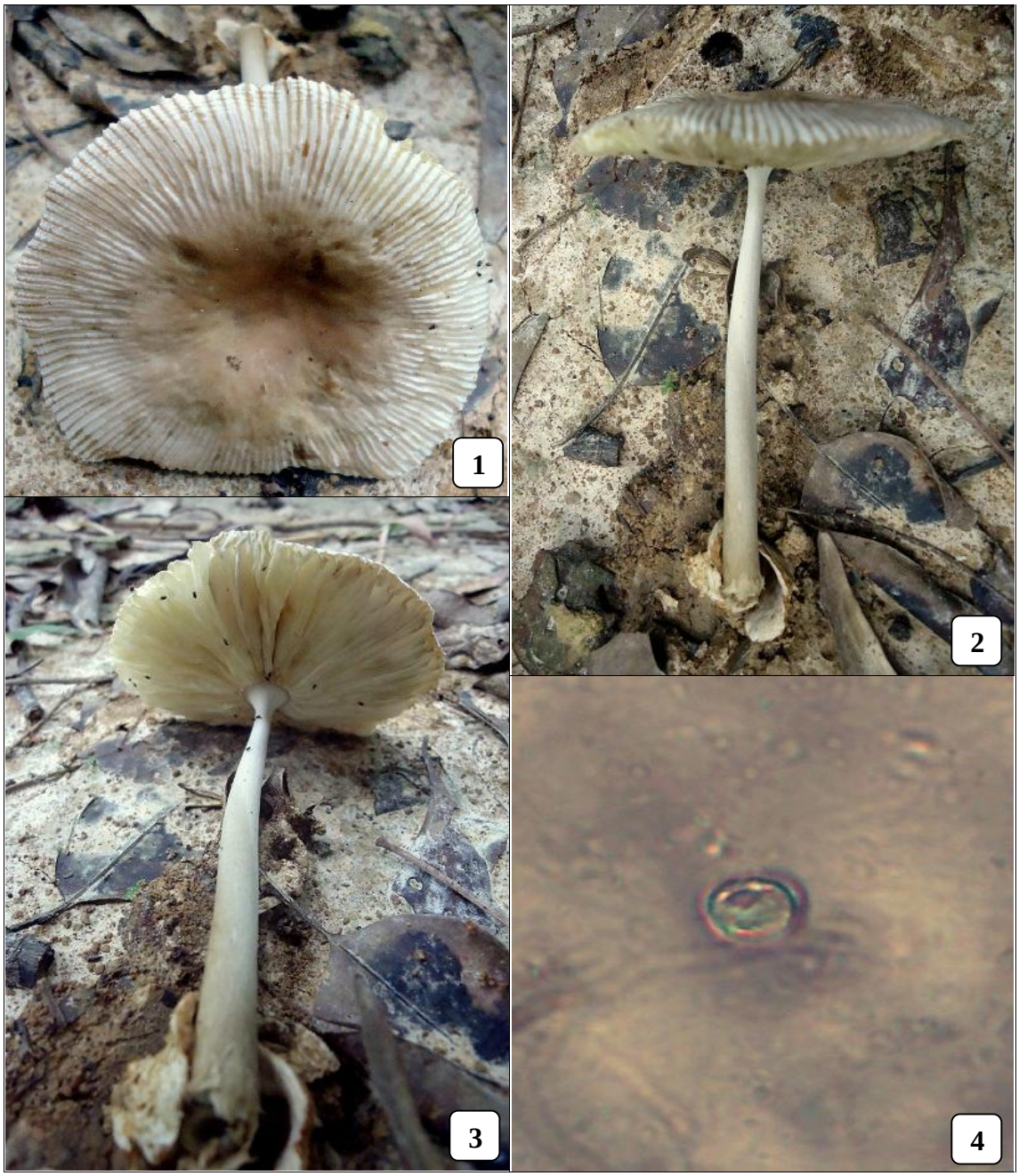

Figure 23. *Volvariella gloiocephala;* (1). Cap of the carpophore, (2). Mature fruiting body along with volva, (3). Gills attachment, (4). Spores (40x)

association: Close; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: Moist weather

Note: Started rotting after half an hour of collection

4.14 Genus: *Russula* sp.

Russula nobilis

Family: Russulaceae

Common name: Beechwood sickener

Color: Young: Red and white mixture; Mature: Red and white mixture

Length: 4.8cm

Width: 6.0cm × 5.3cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 8.78µm; Width: 7.6µm

Spore shape: Single walled, smooth and spherical

Cap of the carpophore: Size: 6.0cm × 5.3cm; Shape: Convex

Pileus: Color: Reddish; Surface character and Zonation: Dry and rough in nature; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Aromatic

Lamellae: Present; Gill attachment: Free and some are emarginated; Gill color: White; Gill shape: Broad; Gill spacing: Close; Lamellulae: Present; Forking pattern: Unbranched

Stipe: Present; Size: 3.8cm; Shape: Bare; Position: Central; Surface characteristics: Dry and polished; Color and color changes: Creamy; Firmness: Tubular and fleshy

Ecological features: Locality found: Sujanagar thana, Pabna; Habitat: On soil; in an association with the Golden shower (*Acacia auriculiformis*) tree; Habit: Scattered; Type of association: Close; Forest type: Leveled; Constancy of occurrence in specific Habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: Moderately moist weather

Figure 24. *Russula nobilis;* (1 & 2). Mature fruiting body, (3). Gills attachment, (4). Longitudinal section, (5). Spores (40x)

4.15 Genus: *Termitomyces* sp.

Termitomyces heimii

Family: Lyophyllaceae

Color: Young: White; Mature: White

Length: 21.1cm

Width: 12cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 14.0µm; Width: 10.8µm

Spore shape: Single walled, smooth and cylindrical as well as ellipsoid

Cap of the carpophore: Size: 12cm; Shape: Convex

Pileus: Color: Creamy; Surface character and Zonation: Smooth and dry in nature; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Fragrant

Lamellae: Present; Gill attachment: Adnexed; Gill color: White; Gill shape: Broad; Gill spacing: Crowed; Lamellulae: Present; Forking pattern: Unbranched

Stipe: Present; Size: 20.0cm; Shape: Bulboue; Position: Central; Surface characteristics: Dry and polished; Color and color changes: Creamy; Firmness: Solid; Scale: Present and white in color

Ecological features: Locality found: Sadar thana, Dinajpur, Habitat: On humus; near the mango (*Magifera indica*) tree; Habit: Scattered; Type of association: Distant; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Clay loam; Factors affecting their distribution: More moist weather

4.16 Genus: *Amanita* sp.

Amanita muscaria

Family: Amanitaceae

Common name: Fly agaric

Color: Young: Red; Mature: Red

Figure 25. *Termitomyces heimii;* (1 & 2). Mature fruiting body, (2). Longitudinal section, (4). Gills attachment, (5). Spores (40x)

Figure 26. *Amanita muscaria;* (1 & 2). Mature fruiting body, (3). Growing fruiting body, (4). Gills attachment, (5). Longitudinal section, (6). Spores (40x)

Length: 4.2cm

Width: 2.5cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 4.8µm; Width: 3.28µm

Spore shape: Single walled, smooth and ellipsoid

Cap of the carpophore: Size: 2.5cm; Shape: Convex

Pileus: Color: Pinkish; Surface character and Zonation: Smooth and dry in nature; Margin: Regular

Texture of the fruiting body: Spongy

Flesh odor: Pleasant

Lamellae: Present; Gill attachment: Free; Gill color: White; Gill shape: Moderately broad; Gill spacing: Crowed; Lamellulae: Present; Forking pattern: Branched

Stipe: Present; Size: 4.3cm; Shape: Equal; Position: Central; Surface characteristics: Dry and polished; Color and color changes: Pinkish; Firmness: Solid; Annulus (position): Present and single; Scale: Present and reddish to pinkish in color

Ecological features: Locality found: Sher-e-Bangla Nagar, Dhaka; Habitat: On humus; Habit: Scattered; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: Moderately moist weather

4.17 Genus: *Marasmius* sp.

4.17.1 *Marasmius confertus*

Family: Marasmiaceae

Color: Young: Pink and purple; Mature: Pink and purple

Length: 5.5cm

Width: 2.1cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 4.28µm; Width: 3.9µm

Spore shape: Single walled, smooth and oval

Cap of the carpophore: Size: 1.8cm to 2.1cm; Shape: Flat

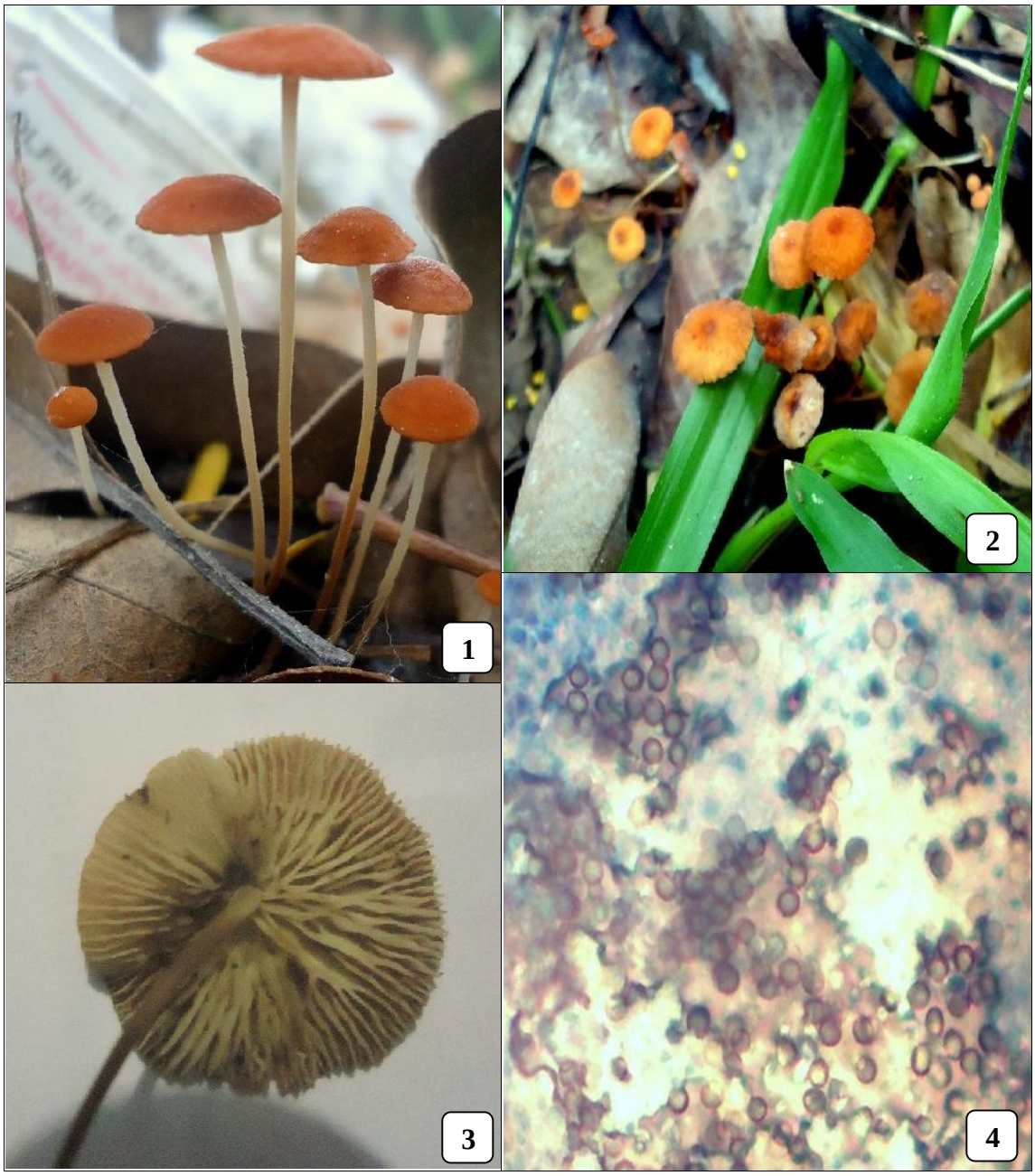

Figure 27. *Marasmius confertus;* (1). Mature fruiting body, (2). Growing on habitat, (3). Gills attachment, (4). Spores (40x)

Pileus: Color: Pinkish; Surface character and Zonation: Glabrous and dry in nature; Margin: Incurved

Texture of the fruiting body: Soft

Flesh odor: Pleasant

Lamellae: Present; Gill attachment: Adnexed; Gill color: White; Gill shape: Moderately broad; Gill spacing: Crowed; Lamellulae: Present; Forking pattern: Unbranched

Stipe: Present; Size: 5.0cm; Shape: Radicating; Position: Central; Surface characteristics: Dry and glabrous; Color and color changes: White to pinkish; Firmness: Narrow

Ecological features: Locality found: Sher-e-Bangla Nagar, Dhaka; Habitat: On humus; Habit: Solitary; Forest type: Leveled; Constancy of occurrence in specific habitat: Abundant; Type of soil: Loam; Factors affecting their distribution: Moist weather

4.17.2 *Marasmius elegans*

Family: Marasmiaceae

Common name: Velvet parachute

Color: Young: Pink and purple; Mature: Pink and purple

Length: 4.5cm

Width: 1.3cm

Spore bearing surface under cap: Gills

Cap of the carpophore: Size: 1.3cm; Shape: Convex

Pileus: Color: Brownish; Surface character and Zonation: Smooth; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Pleasant

Lamellae: Present; Gill attachment: Adnate; Gill color: Pale reddish; Gill shape: Narrow; Gill spacing: Close; Lamellulae: Present; Forking pattern: Branched

Stipe: Present; Size: 4.5cm to 4.8cm; Shape:Bare; Position: Central; Surface characteristics: Dry and glabrous; Color and color changes: White to light brown; Firmness: Solid

Ecological features: Locality found: Ramna park, Ramna, Dhaka; Habitat: On humus; Habit: Scattered; Forest type: Leveled; Constancy of occurrence in specific

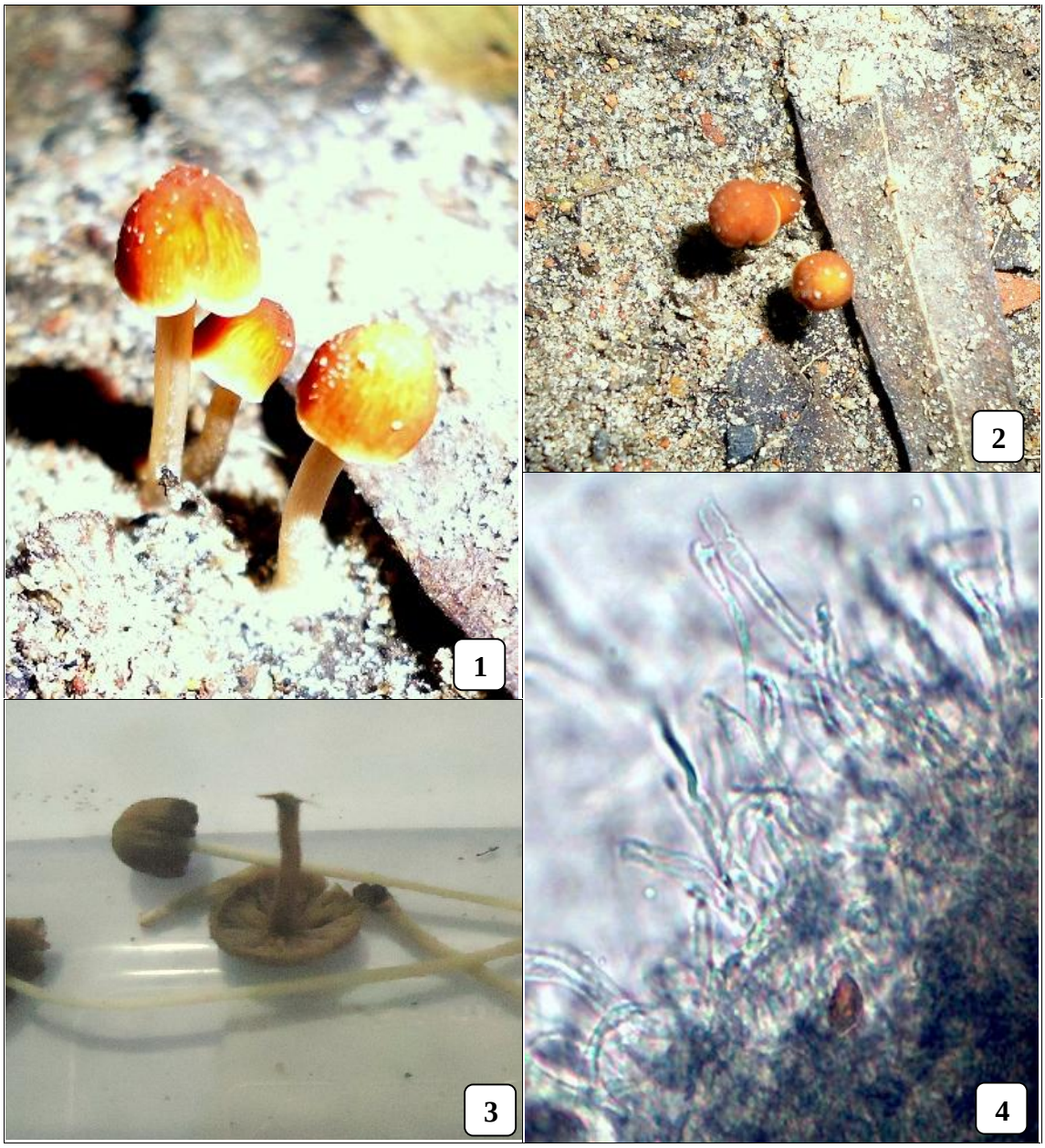

Figure 28. *Marasmius elegans;* (1 & 2). Mature fruiting body, (3). Gills attachment, (4). Spore in an association with the basidium (40x)

Habitat: Abundant; Type of soil: Loam; Factors affecting their distribution: Moist weather

4.17.3 *Marasmius oreades*

Family: Marasmiaceae

Common name: California fungi or Scotch bonnet

Color: Young: Brown; Mature: Brown

Length: 2.2cm to 2.5cm

Width: 1.3cm to 1.4cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 11.05µm; Width: 7.75µm

Spore shape: Single walled, smooth and ellipsoid

Cap of the carpophore: Size: 1.2cm to 1.5cm; Shape: Convex

Pileus: Color: Brownish; Surface character and Zonation: Glabrous and dry in nature; Margin: Regular

Texture of the fruiting body: Soft

Flesh odor: Pleasant

Lamellae: Present; Gill attachment: Adnate; Gill color: Pale brown; Gill shape: Narrow; Gill spacing: Close; Lamellulae: Present; Forking pattern: Branched **Stipe:** Present; Size: 2.2cm to 2.5cm; Shape: Bare; Position: Central; Surface characteristics: Dry and glabrous; Color and color changes: Grey to light brown; Firmness: Solid

Umbo: Present and oyster shaped

Ecological features: Locality found: Ramna park, Ramna, Dhaka; Habitat: On bark wood of the tree; Habit: Solitary; Type of association: Close; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: Moist weather

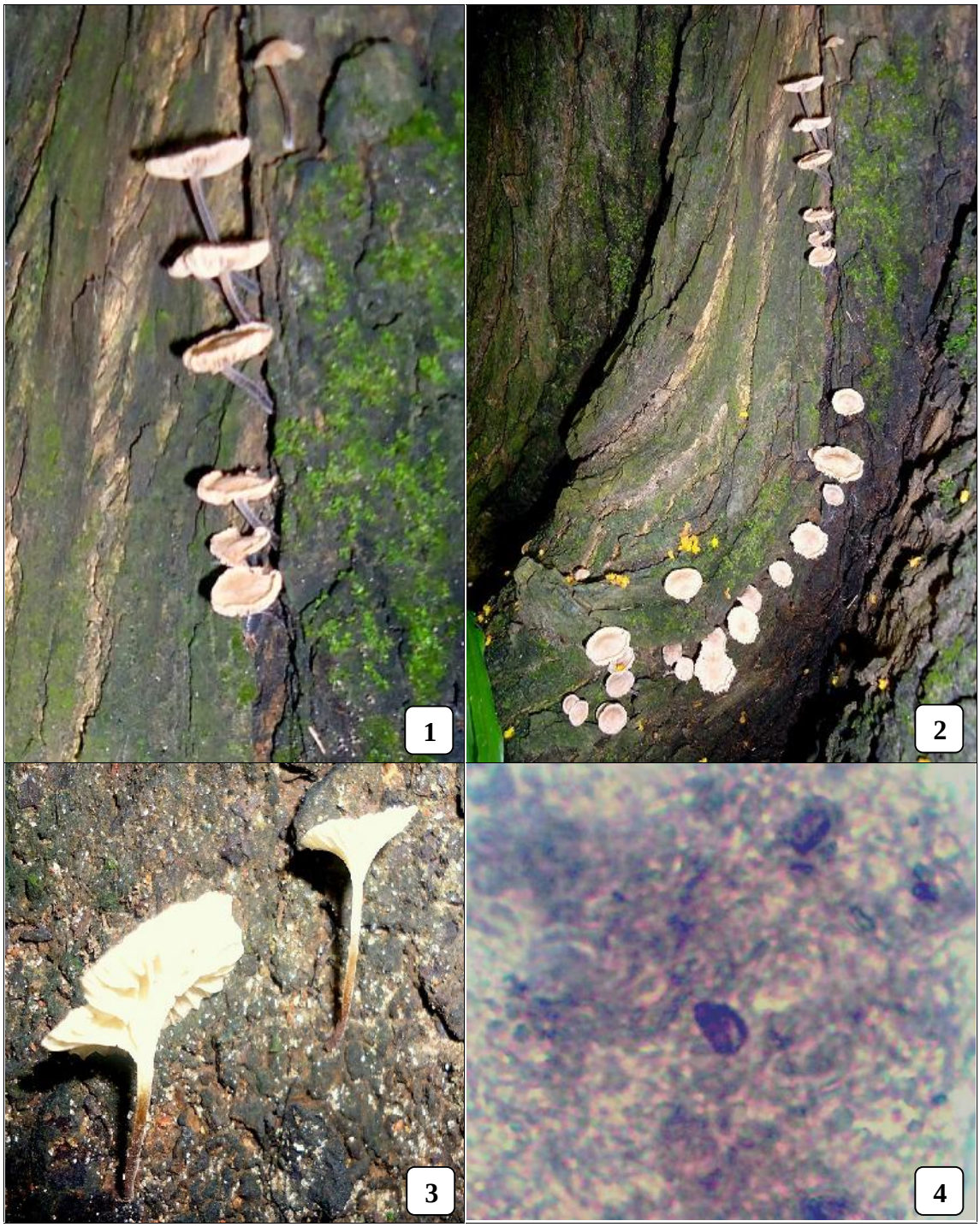

Figure 29. *Marasmius oreades;* (1). Mature fruiting body, (2). Circular shaped growing on habitat, (3). Gills attachment, (4). Spores (40x)

4.18 Genus: *Collybia* sp.

4.18.1 *Collybia cookei*

Family: Tricholomataceae

Color: Young: White; Mature: White

Length: 5.0cm

Width: 2.5cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 7.8µm; Width: 6.46µm

Spore shape: Single walled, smooth and elongated

Cap of the carpophore: Size: 1.5cm to 2.5cm; Shape: Convex

Pileus: Color: White; Surface character and Zonation: Smooth; Margin: Regular

Texture of the fruiting body: Spongy

Flesh odor: Fragrant

Lamellae: Present; Gill attachment: Adnate; Gill color: White; Gill shape: Moderately broad; Gill spacing: Crowded; Lamellulae: Present; Forking pattern: Unbranched

Stipe: Present; Size: 4.5cm to 5.0cm; Shape: Bare; Position: Central; Surface characteristics: Dry and glabrous; Color and color changes: White; Firmness: Solid

Ecological features: Locality found: Sher-e-Bangla Nagar, Dhaka; Habitat: On the bark wood of the tree; in an association with the Mahogany (*Swietenia mahogani*) and Eucalyptus (*Eucalyptus citriodora*) tree; Habit: Solitary; Type of association: Close; Forest type: Leveled; Constancy of occurrence in specific habitat: Abundant; Type of soil: Loam; Factors affecting their distribution: Moist weather

4.18.2 *Megacollybia platyphylla*

Family: Marasmiaceae

Common name: Broad gilled collybia

Color: Young: White; Mature: White

Length: 1.3cm

Width: 1.4cm

Figure 30. *Collybia cookie;* (1 & 2). Mature fruiting body, (3). Gills attachment, (4). Cap on the carpphore, (5). Longitudinal section, (6). Spores (40x)

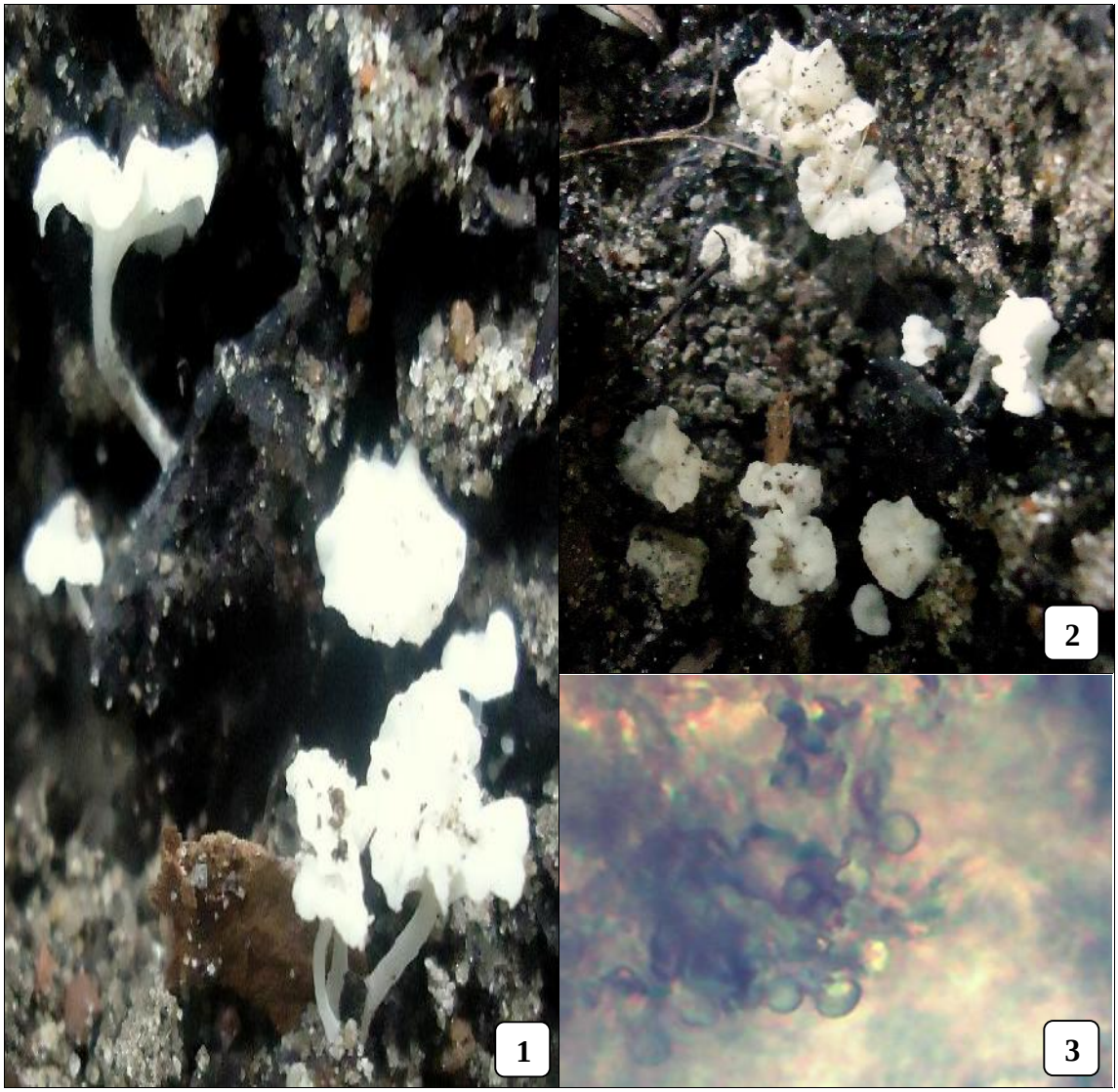

Figure 31. *Megacollybia platyphylla;* (1). Mature fruiting body, (2). Growing on habitat, (3). Spores on basidium (40x)

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 4.63µm; Width: 4.13µm

Spore shape: Single walled, smooth and elongated

Cap of the carpophore: Size: 1.4cm

Pileus: Color: Whitish; Surface character and Zonation: Smooth and dry in nature; Margin: Incurved

Texture of the fruiting body: Soft and spongy

Flesh odor: Fragrant

Lamellae: Present; Gill attachment: Subdecurrent; Gill color: White; Gill shape: Narrow; Gill spacing: Crowed; Lamellulae: Present; Forking pattern: Branched

Stipe: Present; Size: 0.5cm; Shape: Radicating; Position: Excentric; Surface characteristics: Dry and glabrous; Color and color changes: White to creamy; Firmness: Solid

Ecological features: Locality found: Ramna park, Ramna, Dhaka; Habitat: On the bark wood of the tree; in an association with the Mahogany (*Swietenia mahogani*) tree; Habit: Solitary; Type of association: Closed; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: More moist weather

4.19 Genus: *Panaeolus* sp.

Panaeolus foenisecii

Family: Bolbitiaceae

Common name: Brown hay cap

Color: Young: Pink and purple; Mature: Pink and purple

Length: 4.9cm

Width: 1.0cm

Spore bearing surface under cap: Gills

Cap of the carpophore: Size: 1.0cm; Shape: Convex

Pileus: Color: Brownish; Surface character and Zonation: Smooth; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Fragrant

Figure 32. *Panaeolus foenisecii;* (1). Mature fruiting body, (2). Stipe attachment with gills, (3). Growing on habitat

Lamellae: Present; Gill attachment: Adnaxed; Gill color: Pale reddish; Gill shape: Narrow; Gill spacing: Close; Lamellulae: Present; Forking pattern: Branched

Stipe: Present; Size: 4.5cm to 4.9cm; Shape: Bare; Position: Central; Surface characteristics: Dry and glabrous; Color and color changes: White to light brown; Firmness: Solid

Ecological features: Locality found: Ramna park, Ramna, Dhaka; Habitat: On humus; Habit: Scattered; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: Moist weather

4.20 Genus: *Mycena* sp.

Mycena alba

Family: Mycenaceae

Common name: Tropical white mushroom

Color: Young: White; Mature: White

Length: 1.0cm

Width: 2.1cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 5.32µm; Width: 4.43µm

Spore shape: Single walled, smooth and elongated

Cap of the carpophore: Size: 2.0cm to 2.1cm, Shape: Conical

Pileus: Color: Creamy, Surface character and Zonation: Smooth, Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Fragrant

Lamellae: Present; Gill attachment: Adnate; Gill color: White; Gill shape: Moderately broad; Gill spacing: Close; Lamellulae: Present; Forking pattern: Branched

Stipe: Present; Size: 1.0cm; Shape: Bare; Position: Lateral; Surface characteristics: Dry and polished; Color and color changes: White and creamy; Firmness: Solid

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On bark wood of the tree; in an association with the Mahogany (*Swietenia mahogani*) and

Figure 33. *Mycena alba;* (1 & 2). Mature fruiting body, (3). Cap, (4). Longitudinal section, (5). Gill attachment, (6). Spores on basidium (40x)

Eucalyptus (*Eucalyptus citriodora*) tree; Habit: Solitary; Type of association: Close; Forest type: Leveled; Constancy of occurrence in specific habitat: Un-abundant; Type of soil: Loam; Factors affecting their distribution: Moderately moist weather

4.21 Genus: *Armillaria* sp.

Armillaria mellea

Family: Physalacriaceae

Common name: Honey fungus

Color: Young: Brown; Mature: Brown with dark brown spots on cap

Length: 4.8cm

Width: 1.4cm

Spore bearing surface under cap: Gills

Spore diameter (Average): Length: 7.15µm; Width: 3.88µm

Spore shape: Single walled, smooth and ellipsoidal

Cap of the carpophore: Size: 1.2cm to 1.4cm; Shape: Convex or flat

Pileus: Color: Brownish; Surface character and Zonation: Smooth and silky; Margin: Regular

Texture of the fruiting body: Soft and spongy

Flesh odor: Pleasant

Lamellae: Present; Gill attachment: Adnate; Gill color: Pale brownish; Gill shape: Narrow; Gill spacing: Crowed; Lamellulae: Present; Forking pattern: Branched

Stipe: Present; Size: 4.8cm; Shape: Equal; Position: Central; Surface characteristics: Dry and polished; Color and color changes: Grey to light brown; Firmness: Tubular

Annulus (position): Present and single

Scale: Present and brown

Ecological features: Locality found: Botanical garden, Mirpur, Dhaka; Habitat: On soil, in an association with the Mahogany (*Swietenia mahogani*) and Ipil-Ipil (*Leucaena leucocephala*) tree; Habit: Solitary; Type of association: Close; Forest type: Leveled; Constancy of occurrence in specific habitat: Abundant; Type of soil: Sandy; Factors affecting their distribution: Moist weather

Edibility: Inedible

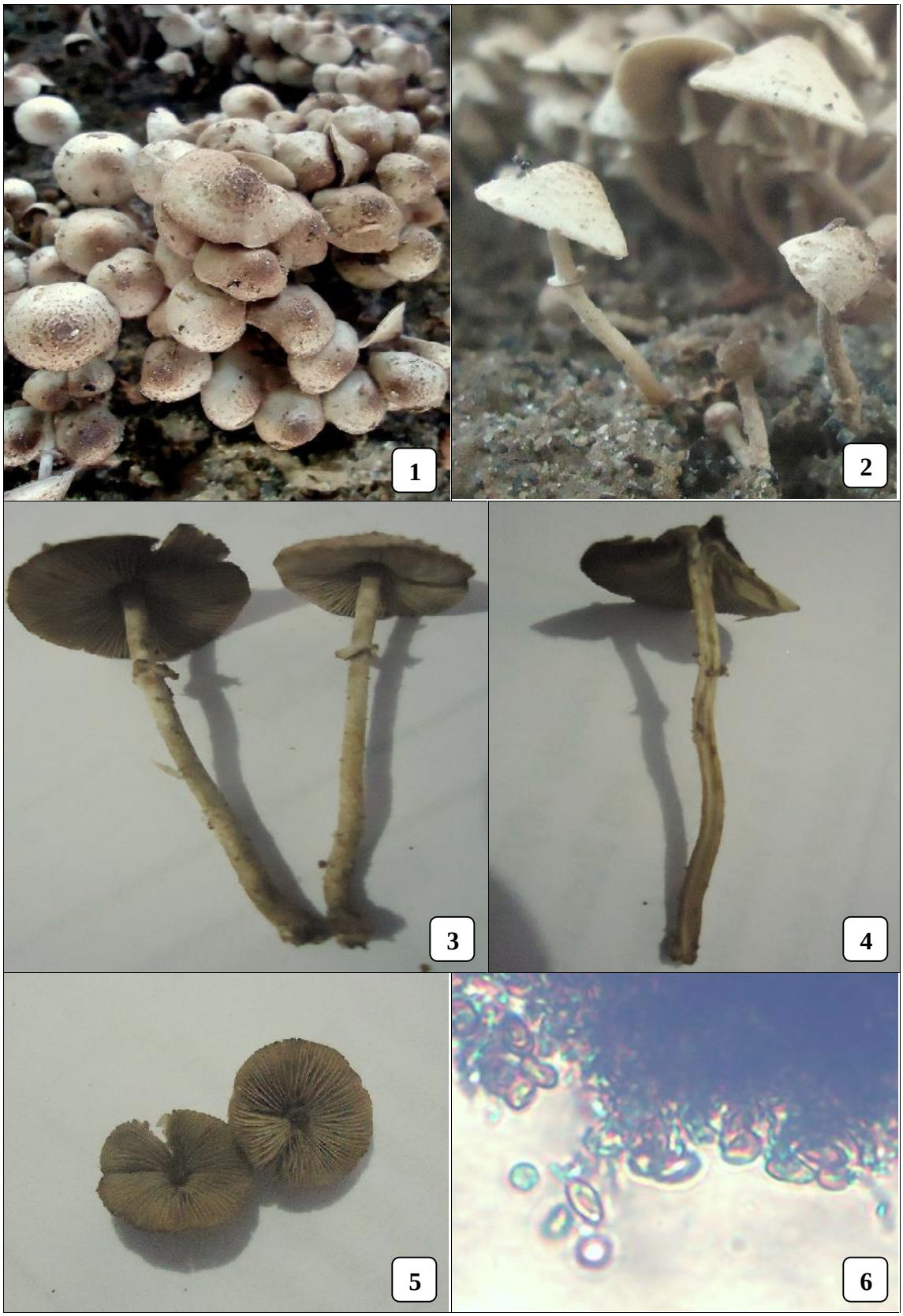

Figure 34. *Armillaria mellea;* (1 & 2). Mature fruiting body, (3). Annulus or ring attachment, (4). Longitudinal section, (5). Spore bearing hymenium, (6). Spores (40x)

DISCUSSION

Mushrooms alone are represented by about 41,000 species (Deshmukh, 2004). Due to their beneficial properties as well as the economic importance, it increases the interest to the modern research. The occurrence of such familiar substrate as wood, litter and soil, implies a role for them in these micro habitats (Lakhanpal, 1996). Usually in the rainy season (July to October), fleshy mushrooms are found. Some are also found in the summer as well as in the winter season and it basically grown in everywhere, where they get adequate moisture or their favorable environment. They actually emerge from substrates such as peat, along or soil, humus, dung, saw dust, charcoal heaps etc. (Sharman and Samota, 2006).

An investigation was carried out to collect identify and preserve mushrooms from the tropical moist deciduous forest region in Bangladesh. Through this investigation, 21 genera and 33 species were identified including 6 species of *Ganoderma*, 4 species of *Lepiota*, 3 species of *Marasmius*, 2 species of *Daedaleopsis* and *Collybia* and 1 species of rest of the genera, viz. *Trametes*, *Pycnoporus*, *Hebeloma*, *Craterellus*, *Boletus*, *Ramariopsis*, *Ampulloclitocybe*, *Tuber*, *Lycoperdon*, *Volvariella*, *Russula*, *Termitomyces*, *Amanita*, *Panaeolus*, *Mycena* and *Armillaria* accordingly.

Ganoderma sp. was found at Rajshahi, Pabna, Jaipurhat and Dhaka district of the tropical moist deciduous forest region in Bangladesh. On the other hand, it was also found in 1905 by American mycologist named William Murrill (Murrill, 1905). Furthermore, it was also reported in China (Wang *et al.*, 2012) and in India (Ram *et al.*, 2010; Dwivedi *et al.*, 2012; Thiribhuvanamala *et al.*, 2011). The pathogenicity mechanisms of *G. boninense* was examined (Cooper *et al.* 2011). Meanwhile, *Trametes* sp. was found at Dinajpur district of the tropical moist deciduous forest region in Bangladesh. It was first described by Elias Magnus Fries in 1835. The genus has a widespread distribution and contains about fifty species (Kirk *et. al.,* 2008). This genus was also found in India (Thiribhuvanamala *et al.,* 2011), whereas, *Daedaleopsis* sp. is the widely distributed genus contains six species (Kirk *et. al.,* 2008). In this investigation, these species were found in Dhaka, Bangladesh. This genus was first reported from Europe in 1791. On the other hand, *Pycnoporus* sp. was found at Bogra district in Bangladesh. This genus contains five distinct species (Eggert *et. al.,* 1998). It

was also found within Europe and North America. Moreover, *Hebeloma* sp. was found in Dhaka of Bangladesh, whereas, it was also common all over the world especially in Western Australia. It was also reported in the western United States by Alexander H. Smith, 1904. Meanwhile, *Craterellus* sp. was found in Dhaka, whereas, the same genus was first defined by Elias Magnus Fries in 1821. Later on it was more specified by the DNA studies (Dahlman *et. al.* 2000). On the other hand, through the investigation, all the four *Lepiota* species were found at Dhaka. Around 400 species were already identified all over the world and most of them are poisonous. The species was first reported by South African-born mycologist Christian Hendrik Persoon in 1797 (Chater and Brummitt, 1966). It was also found in India (Dwivedi *et al.*, 2012; Thiribhuvanamala *et al.*, 2011). Furthermore, *Boletus* sp. was also found in Dhaka of Bangladesh and was first reported by Elias Magnus Fries in 1821. Almost 100 species were identified of this same genus. This genus was also found earlier in Lithuania, Poland and so on (Ramsbottom, 1953). The phylogenic, morphological and taxonomic characteristics of *Borofutus*, a new genus of *Boletaceae* from tropical Asia were also studied in China (Hosen *et al.*, 2013). Through the investigation, *Ramariopsis* sp. was found in Dhaka district of Bangladesh. This genus has a widespread distribution and contains 44 species (Kirk *et. al.* 2008). Two species of this genus were reported in Western Ghats, Kerala, India (Mohanan, 2011).

Ampulloclitocybe sp., *Tuber* sp., *Lycoperdon* sp. and *Volvariella* sp., were collected from Dhaka district of Bangladesh. *Ampulloclitocybe* sp. has three species and widely distributed (Kirk *et. al.*, 2008), whereas, *Tuber* sp. was found in almost all European countries (Hall *et. al.* 2007). On the other hand, *Lycoperdon* sp. and *Volvariella* sp. both contains about 50 species (Kirk *et. al.* 2008) and widely distributed all over the world. Recently, *Volvariella* sp. and *Lycoperdon* sp. were also reported in India (Senthilarasu *et. al.*, 2012; Thiribhuvanamala *et al.*, 2011). Furthermore, *Russula* sp., *Termitomyces* sp. and *Amanita* sp. were found at Pabna, Dinajpur and Dhaka district of Bangladesh respectively. *Amanita* sp. was also found in India (Dwivedi *et al.*, 2012). Around the world, *Russula* sp. has almost 750 species, *Termitomyces* sp. has 30 species and *Amanita* sp. has about 300 species. The genus *Russula* sp. was reported in India (Mohanan, 2011; Thiribhuvanamala *et al.*, 2011), whereas, *Termitomyces* sp. was circumscribed by Roger Heim in 1942 (Heim, 1942). *Termitomyces* sp. was also found in India (Thiribhuvanamala *et al.*, 2011) and the morphological characterization and

yield potential of *Termitomyces* spp. mushroom was studied at Gorakhpur forest division in India (Srivastava *et al.*, 2011). However, *Amanita* sp. was reported in Europe, South-East Asia, Australia, eastern Canada and eastern Mexico. The same genera was also reported in India (Thiribhuvanamala *et al.*, 2011).

Furthermore, 3 species of *Marasmius* were found in Dhaka district of Bangladesh. It contains about 500 species (Kirk *et. al.* 2008) and it was also reported in Madagascar as well as the Mascarenes (Antonín and Buyck, 2006). Furthermore, *Collybia* sp., *Panaeolus* sp., *Mycena* sp. and *Armillaria* sp. were also found at Dhaka district of the tropical moist deciduous forest region in Bangladesh throughout the investigation. However, *Collybia* sp., *Panaeolus* sp., *Mycena* sp. and *Armillaria* sp. have nearly 3 species, about 98 species, over 33 species respectively (Desjardin *et. al.*, 2010) and commonly 45 species accordingly. The genus *Collybia* sp. have a widespread but rarely distributed in north temperate areas (Knudsen and Vesterhout, 2008). On the other hand, *Armillaria* sp. was also found in India (Ram *et al.*, 2010). *Mycena* sp. was also reported in India (Thiribhuvanamala *et al.*, 2011).

SUMMARY AND CONCLUSION

Mushroom is an important component of our ecosystem. Bangladesh has basic four types of forest, among them, this investigation was conducted in Dhaka, Gazipur, Bogra, Rajshahi, Pabna, Jaipurhat, and Dinajpur, which is situated in the tropical moist deciduous forest region of Bangladesh. Due to the wide variety of climates, soils and plant communities, the tropical moist deciduous forest region of Bangladesh has within its boundaries is one of the greatest diversity of species of mushrooms. The systematic and periodical survey of different locations in these regions were done specially in rainy season. Most mushrooms are found in forest area, in field area, on branches of trees, and some time in waste land area; although they may be found all year if temperature and moisture are not limiting. In the investigation, 21 genera including 33 species were identified from the 50 collected samples from the tropical moist deciduous forest region of Bangladesh. The identified genera were *Ganoderma* sp., *Trametes* sp., *Daedaleopsis* sp., *Pycnoporus* sp., *Hebeloma* sp., *Craterellus* sp., *Lepiota* sp., *Boletus* sp., *Ramariopsis* sp., *Ampulloclitocybe* sp., *Tuber* sp., *Lycoperdon* sp., *Volvariella* sp., *Russula* sp., *Termitomyces* sp., *Amanita* sp., *Marasmius* sp., *Collybia* sp., *Panaeolus* sp., *Mycena* sp. and *Armillaria* sp. According to the previous information gathered from different journals, books, etc., nearly 40% of all mushrooms are edible and only about 30% were dangerous species, whereas, nearly 30% was remained unknown in case of edibility. Through this study, the main purpose of the present investigation is to identify the mushrooms up to genus, species level and some of the features that were recorded and compared the diversity of mushrooms to other areas and to bring awareness among people to conserve mushrooms as well as for ecological consumptions. Though, this investigation was the very short and first diversity analysis of mushroom was done in this forest region of Bangladesh, the future investigation is also needed in different seasons as well as in different forest regions to identify the new exotic varieties of mushroom flora, which will be able to represent a complete overview about the available mushroom flora in Bangladesh.

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