



## Screening of Some Genus of Basidiomycota in Chapainawabganj District

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ARTICLE INFO	ABSTRACT
<p><b>Received date:</b> January 21, 2021</p> <p><b>Accepted date:</b> August 25, 2021</p>	<p>Basidiomycota is one of the largest phylum or sub division of fungi which play an important role in the balancing of ecosystem as well as remarkable benefited in culinary and medicinal industry. Diversification of nutrient resources is very important in the food safety where survey report on edible fungus is crucial. Thus, edible mushroom survey in Bangladesh is a prime issue for the pathologist. A survey was conducted on diverse genus of basidiomycota to focus on the potential benefits and distribution in the locality of the north-western region of Bangladesh, Chapainawabganj. Evident microscopic and morphological characteristics of the most predominant collected samples have been identified and described. The data on uses and palatability of studied fungus were collected from the opinions of folk medicine practitioner and local people. Nine different genus were found belongs to seven families' viz. Cortinariaceae (<i>Gymnopilus purpuratus</i>), Agaricaceae (<i>Agaricus sylvicola</i>, <i>Agaricus arvensis</i>, <i>Lycoperdon perlatum</i>), Ganodermataceae (<i>Ganoderma lucidum</i>), Psathyrellaceae (<i>Coprinellus micaceus</i>), Polyporaceae (<i>Trametes versicolor</i>), Tremellaceae (<i>Tremella fuciformis</i>) and Hypoxylaceae (<i>Daldinia concentrica</i>). All of the collected fungus specimens were grown on the high humus content soil or dead wood as saprophytic or parasitic. By the present study, it was clarified that the studied all fungi were non-toxic and edible which have positive impact in the dietary and therapeutic proceedings. The present study will assist in the further advance studies and socio economic prospects of Bangladesh.</p>

**Keywords:** Basidiomycota, Fruiting body, Mushroom, Pharmaceutical, Saprophytic

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### 1. INTRODUCTION

Bangladesh is a South Asian country with a very low proportion of forests. The total 10.2% of the land area in Bangladesh are covered by forest, which amounts approximately 1.3 million hectares (Chandulal et al., 2013). Bangladesh forest can be categories into four broad grouped depending on their location, nature and type of management. They are mangrove forest, tropical moist deciduous forests, and tropical evergreen and semi evergreen forests. Rajshahi

division is under tropical moist deciduous forest region. Generally wild types of basidiomycota are found in the forests and vegetations, are edible having high nutritive and medicinal values (Ogidi et al., 2020; Mattila et al., 2001).

The investigation for screening some genus of basidiomycota is very important for meeting up malnutrition and therapeutics. The basidiomycota ranges from common mushroom to some of the world most important plant pathogens of cereal crops, pulses, oilseed crops, cash crops etc. The rusts and smuts are the main groups of plant

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pathogens, some of have major economic importance (Parker, 2009).

Basidiomycota are producing sexual basidiospores on basidia often these are borne on distinctive basidiocarps or basidioma. The phylum typically has an extended dikaryophase can grow for many years with over many acres. The basidiomycotina is a large group of fungi with over 30,000 species which includes common tree ears, jelly fungi, fairy clubs, toadstools, bracket fungi, puffballs, mushrooms and polypores (Parker, 2009; Stephenson et al., 2003). Typically, they can be differentiated on the basis of their basidiocarps, which show great disparity in forms (de Mattos et al., 2016). Many of the basidiocarps are strikingly beautiful, and some of them are quite tasty.

However, many basidiocarps are poisonous, and a few are deadly. Indeed, the alkaloids are so dangerous that they can move from one mushroom to another if poisonous and nonpoisonous mushrooms are put together in the same basket (de Mattos et al., 2016; Arson, 2015). Most of the genres of basidiomycota are terrestrial with wind-dispersed spores; some grow in freshwater & marine habitats. Many of them are saprotrophic which involved in litter and wood decay, but there are also some destructive pathogens of trees such as the honey fungus, *Armillaria*, which attacks numerous tree species, and *Heterobasidion annosum*, which can seriously damage conifer plantations. Common woodland mushrooms such as species of *Amanita*, *Boletus* and their allies grow in a mutually symbiotic relationship with the roots of trees, forming ectotrophic (sheathing) mycorrhiza. Basidiomycetes mushroom have been valued as both food and medicine for thousands of years. They have high nutritive and medicinal values and contribute to a healthy diet because of their rich source of vitamins, minerals and proteins (Okwulehie & Odunze, 2004; Badalyan, 2003).

There are few species which have high medicinal value such as *Ganoderma* and *Phellinus* they are being used for the manufacture of various drugs by pharmaceutical companies. *G. lucidum* is well known to promote health and longevity, lowers the risk of cancer and heart disease and boosts the immune system (Wachtel-Galor et al., 2004) while the *G. applanatum* have antioxidant, hypoglycemic and anti-hypertension activity (Oyetayo, 2011), *P. gilvus* has been effective against anti-inflammatory, antitumor, antioxidant, anti-hepatotoxicity potential (Kim et al., 2011).

According to Román et al. (2020) the wild edible mushroom could be an alternative source of new antimicrobial potential and possesses antioxidant properties that can play significant roles in preventing various health diseases. Jasim (2017) reported a chemical named 'laccases' found in mushroom which have been subjected of intensive research in the last decades to use in the food as well as pharmaceutical industries.

Main medicinal uses of laccase are as anti-oxidant, anti-diabetic, hypocholesterolemic, anti-tumor, anti-cancer, immunomodulatory, anti-allergic and anti-microbial agents. Basidiomycota have also anti pathogenic value as well as industrial value. A unique feature of species in

Basidiomycetes is the ability to synthesize extracellular enzymes lignin peroxidases, Mn-peroxidase, versatile peroxidases, and laccases with a broad substrate specificity (Benelli, 2015; Dhiman et al., 2010) which allows them to decompose organic matter not only of natural origin but also various xenobiotics.

The most dangerous organic pollutants degradation can be accelerated by using basidiomycetes and their ligninolytic enzymes for detoxification and degradation of pollutants in various industries (Kozarski et al., 2015; Vyas & Mervana, 2015). Many mushroom species produce secondary metabolites that can be severely toxic and may cause psychosis (Kumar & Shah, 2020; Kalac & Svoboda, 2000). The wild mushrooms are richer sources of protein and had a lower amount of fat than commercial mushrooms. Wild mushroom protein also contains considerable amounts of non-essential amino acids such as alanine, arginine, glycine, glutamic acid, aspartic acid, proline and serine. It can be used for the food to solve the malnutrition problem (Manandhar, 2003).

A number of reviews have been published on the nutritional value of mushrooms (Kurtzman, 1997). It is therefore essential to give efforts to introduce new mushrooms as a source of food and medicinal interest (Suseem & Saral, 2013). Basidiomycota have also anti pathogenic value as well as industrial value. A unique feature of taxa belongs to basidiomycota is the ability to synthesize extracellular enzymes lignin peroxidases, Mn-peroxidase, versatile peroxidases, and laccases with a broad substrate specificity (Benelli, 2015; Dhiman et al., 2010) which allows them to decompose organic matter not only of natural origin but also various xenobiotics. Wild or cultivated mushroom related to significant antioxidant properties due to their bioactive compounds, such as polyphenols, polysaccharides, vitamins, carotenoids and minerals. Antioxidant and health benefits, observed in edible mushrooms, seem an additional reason for their traditional use as a popular delicacy food (Souza et al., 2016; Kozarski et al., 2015).

Here are the rust and smut fungi, which are pathogens of higher plants and may cause serious crop diseases such as leaf rust of wheat, loose smut of wheat, bean rust, groundnut rust, coffee rust etc. Scientists are looking for safe and more potent alternate products for controlling plant pathogens and pests.

Over the time few antifungal agents are discovered recently such as Grifoline isolated from *Albatrellus dispansus* was effective against several plant fungi in in-vitro studies (Luo et al., 2005). Phellinsin A was isolated from *Phellinus* sp. capable of inhibiting the growth of fungi such as *Gloeosporium orbiculare*, *Pyricularia grisea*, *Thanatephorus cucumeris*, *Aspergillus fumigatus*, and *Trichophyton mentagrophytes* (Hwang et al., 2000).

Strobilurins are major fungicidal compound in agricultural chemistry which is extracted from the mycelia of pine cone fungus, (*Strobilurus tenacellus*). It is capable of inhibiting respiration of yeast and other filamentous fungi (Anke et al., 1977). The macronutrient profile in general

revealed that the wild mushrooms were rich sources of protein and had low amounts of fat. In general, most of the mushrooms studied had good amounts of minerals, including trace minerals.

This survey was done to discover distinct basidiomycota fungi of this region with respect to their morphology distribution, habitat, use and edibility with focusing on to screen different species of basidiomycota in Chapainawabganj Sadar and Nachole upazila in Bangladesh and to accompany with the beneficial and harmful effects of basidiomycota on agricultural as well as industrial arena.

## 2. MATERIALS AND METHODS

The present study was conducted at Sadar and Nachole upazila of Chapainawabganj district. The study area was located in the north-western region (in between 24°25' and 24°43' north latitudes and in between 88°05' and 88°26' east longitudes) of Bangladesh (Banglapedia, 2015). The mean annual temperature is 26.3°C and rainfall is more than 2,300 mm. The maximum and minimum temperatures are approximately 27.5°C and 18.5°C, respectively. Several kinds of mushroom, jelly fungi, puffball etc., are abundantly grown during the rainy season in the study areas.

A detailed survey was carried out from August, 2019 to September, 2020 and morphological variability in the basidiomycota population was also recorded. The basidiomycota were collected by hand picking in the day light from various substrates such as decaying wood, rotting plant parts, termite's nests, cowdung, leaf litters in the study area where they were grown naturally.

The locality, growing pattern in the habitat and conditions of habitat were observed. The photographs were taken in the habitat of collected basidiomycota and their growing pattern using digital compact camera. The collected samples were packed in polyethylene bags and brought to the laboratory in the Department of Plant Pathology laboratory at EXIM Bank Agricultural University Bangladesh, Chapainawabganj for further study on morphology and microscopic.

Collected specimens were studied for their morphology, macroscopic details, and other phenotypic parameters were noted in fresh form. The specimens were preserved as herbarium in dry condition following the method of Kim (2011) as well as FAA solution for the further study. The following traits were recorded in the laboratory like as color of fruiting body, stipe, cap and gill, and texture of fruiting body.

At that time, spore of each fungal species were characterized under light microscope. For accuracy of identification, the fungal specimens were compared with the help of the mushroom color index (Pegler & Spooner, 1997; Dickinson & Lucas, 1982). Palatability and uses of studied fungal specimens recorded on the opinions of folk medicine practitioners and local aware peoples. Palatability of

collected fungal species was also determined with study of physical characteristics.

## 3. RESULTS

During the survey, naturally grown nine fungi genus was collected from Nachole and Sadar upazilas of Chapainawabganj district. The identified fungi species were, *Gymnopilus purpuratus* (Common Rust gill), *Agaricus sylvicola* (Wood mushroom), *Agaricus arvensis* (Horse mushroom), *Ganoderma lucidum* (Black reishi), *Coprinellus micaceus* (Shiny cap), *Trametes versicolor* (Turkey tail), *Lycoperdon perlatum* (Puffballs), *Tremella fuciformis* (Jelly fungi), *Daldinia concentrica* (Coal fungi) (Table 1).

### 3.1. Common Rust Gill

Common rust gill (*Gymnopilus purpuratus*) fungi, belongs to the family Cortinariaceae, were found to grow on soil as saprophytic (Fig. 1a) and trees of *Cocos nucifera* (Coconut) trunk as saprophyte. Their types of associations were scattered. Both young and mature mushroom was pink and purple in color (Fig.1c). Texture of the fruiting body was spongy. Stipes was brown-red in color, which was equal and dusted by spores in later age (Fig.1b).



Fig. 1 Morphological and microscopic features of *Gymnopilus purpuratus*. a) Fungus growing on soil. b) Mature fruiting body showing lower portion. c) Different growing stages of fruiting body. d) Rusty orange spore.

Context was fleshy, purple, often disappearing. Most of the collected developing specimens were showing blue spots or areas along the surface where the stems have been touched or scratched. The gills were present at the bottom of the cap which carried spore to the surface. Veil is thick and black. The position of stipes was central with moist surface. Cap of the carpophore size was umbonate (umbonate is a raised area in the center of a mushroom cap). Pileus margin was regular, cuticle half peeling, reddish-brown, with small erect scales appearing densely especially in age, not viscid and convex. Gills were close, rounded-adjunct and light



brown (nankeen to primrose) in color. Spores were appeared as rusty, orange and varicose in circumference, without pelage and without a germ pore (Fig.1d). *Gymnopilus purpuratus* was a non-toxic mushroom (Table 2). On the basis of recommendation of folk medicine practitioner and local people, this mushroom were eaten as fresh, cooked and brewed into tea. The dried particles are used sometimes smoked, mixed with cannabis or tobacco. It was used as treatment of mental disorders. Moreover, they were consumed for hallucinogenic effects. They were belonging to a group of drugs known as psychedelics, because of the changes experienced to perception, mood and thought (Table 1).

### 3.2. Wood Mushroom

Wood mushroom (*Agaricus sylvicola*) was collected from soil (Fig. 2a) and *Mangifera indica* (Mango) trees as saprobe, belongs to Agaricaceae family. Young and old carp of the collected specimen were grayish in color. Carpophore shape was convex where pileus was grayish with regular margin and unpeeled cuticle (Fig. 2a). In addition, texture of the fruiting body was soft and moderately broad (shape and width) (Fig. 2b). Lamellae were present with white gill. Equal shaped stipe was present in the center; generally, the surface was moist and colorless (Fig. 2c). Spores were purple and brown in color (Fig. 2d). Non-toxicity feature stand in *Agaricus sylvicola*. It was used as cooked food and a cultivated mushroom. It was also executed as fragrance in food (Table 1).



Fig. 2 Physical and microscopic features of *Agaricus sylvicola*. a) Fungus growing on soil. b) Mature fruiting body. c) Different growing stages of fungus and showing lower portion. d) Basidiospore.

### 3.3. Horse Mushroom

Horse mushroom (*Agaricus arvensis*) is belonging to Agaricaceae family, is a decomposer which was collected as wild edible species that found in pastures, semi-natural grassland as saprophyte (Fig. 3a), open forests and road sides. It was also found on bamboo as saprophyte.

Fresh and fully grown fruiting body was white in color. Umbonate carpophores have present (Fig. 3a). It has regular

margin with half peeled cuticle. Lamellae were broad, gill attachment emarginated and white (Fig. 3c). Fruiting body was soft textured with closer spacing. Flesh odor was disagreeable. Stipe was clavate shaped and central, having moist surface characteristic (Fig. 3c). Annulus (position), volva and scale were absent but umbo present with convex well shaped. Spores were white to light brown in color (Fig. 3d & 3e). As the opinions of folk medicine practitioners and local peoples, this mushroom was used as curative for cancer, type 2 diabetes, high cholesterol, “hardening of the arteries” (arteriosclerosis), liver disease, bloodstream disorders and digestive problems, heart disease, osteoporosis, and stomach ulcers (Table 1).

### 3.4. Black Reishi

Black reishi (*Ganoderma lucidum*.) belongs to the family Ganodermataceae, was found on the bamboo and bark wood of Citrus (Fig. 4a) as both of their types of association were scattered. Early and mature fruiting bodies were brown in color (Table 2). Cap shape of the carpophores was flat (Fig. 4a). Texture of the fruiting body was soft and fleshy. Lamellae present but gills were absent. Stipe and veil were absent and convex shaped umbo present (Fig. 4a). Annulus (position), volva and scale were unavailable. Light brown colored spores were observed in black reishi (Fig. 5e). It has been widely used against a variety of infectious disease such as bronchitis and viral hepatitis. It is also effective antidepressant (Table 1).



Fig.3 Physical and microscopic features of Black reishi. a) Fungus growing on dead wood. b) Fungus growing on citrus plant. c) Mature fruiting body showing lower portion. d) and e) Basidiospore.

### 3.5. Shiny Cap

Shiny cap (*Coprinellus micaceus*) belongs to the family Psathyrellaceae, was found to grow on old decaying wood as saprophyte at sadar upazilla (Fig. 5a). Cap of the carpophore shape was convex and pileus was pinkish (Table 2). Pileus

margin was regular along with half peeled cuticle. Texture of the fruiting body was soft and white to pale in color (Table 2, Fig. 5b & 5c). Furthermore, flesh was thin and soft as well as unpleasant smell. Lamellae present and gill attachment was seceding with light brown color. Stipe was equal shaped and position was central, which have moist surface (Fig. 5c). It's expanding to broadly convex or bell-shaped. Spores were dark brown in color (Fig. 5d). It is used as antioxidant activity (Table 1).



Fig. 4 Physical and microscopic features of Black reishi. a) Fungus growing on dead wood. b) Fungus growing on citrus plant. c) Mature fruiting body showing lower portion. d) and e) Basidiospore.



Fig. 5 Physical and microscopic features of *Coprinellus micaceus*. a) Fungus growing on old decaying wood. b, c) Different stages of fruiting body. d) Basidiospore

### 3.6. Turkey Tail

Turkey tail (*Trametes versicolor*) belongs to the family Polyporaceae. The habitat was found on the dead wood as saprophyte (Fig. 6a), on which they were grown as caespitose cluster (growing in tufts or patches like grass; arranged or combined in a thick mat) or as individual clumps, tufted; having low stems forming a dense turf or

sod. The constancy of occurrence of this particular mushroom in a specific habitat was abundant (Fig. 6a, 6b, 6c). Both fresh and full grown carp was yellow in color. Carpophore was convex, flat and infundibuliform (Fig. 6a). Pileus margin was dimpled and unpeeled cuticle. The texture of carpophore was tough, had frightful odor. Pileus color was yellow and lamellae absent (Fig. 6c). Spores were transparent (Fig. 6d). Turkey tail is a medicinal mushroom with impressive ranges of benefits. It a powerful antioxidant and it may help to boost immune system (Table 1).



Fig. 6 Physical and microscopic features of *Trametes versicolor*. a) Fungus growing on dead wood. b & c) grown as caespitose cluster. d) Basidiospore.



Fig. 7 Physical and microscopic features of *Lycoperdon perlatum*. a) Fungus growing on decaying wood. b) A cluster of different growing stages of fungus, c) Mature fruiting body showing inside. d) Basidiospore.

### 3.7. Puffballs

Puffballs (*Lycoperdon perlatum*) belong to the family Agaricaceae, have found on the decaying wood in mango garden at Sadar upazila (Fig. 7a). Puffballs were spherical to



pear-shaped, have a light-colored layer cell wall (Fig. 7b). Spores were developed inside the ball, normally those escapes either through a pore or by mechanical breakage of the wall of fruiting bodies. This fungus was edible before developing spores in the white interior. The puffballs with a thick rind are poisonous when they have a dark purplish interior after spores develop (Fig. 7c).

The spores were light to dark brown in color (Fig. 7d). It is said to have higher protein content than many other fungi. In common with other puffballs, it has been used as a styptic and staunch blood flow. Medicinally it uses as painkiller, stomach ache, reduce swelling, fever and coughing (Table 1).

### 3.8. Jelly Fungi

Jelly fungi (*Tremella fuciformi*) are belonging to the family Tremellaceae. This fungus was collected from wood logs where they were attached with gelatinous matrix. The

fruiting body gelatinous, orange or yellow (Fig. 8c) to brown in color. Their foliose were irregularly branched on fruiting body. It was composed of thin but erect and seaweed-like (Fig. 8a). It was appeared to with the consistency of jelly. In dried condition, jelly fungi became hard and shriveled (Fig. 8b). When exposed to water, they returned to their original form. The spores covered the total surface and reddish in color (Fig. 8d). It is used in soup. *Tremella* contains high amounts of polysaccharides, which are antioxidants that can help keep skin hydrated, promote nerve growth and support the brain (Ma et al., 2021).

### 3.9. Coal Fungi

A coal fungus (*Daldinia concentrica*) belongs to the family Hypoxylaceae. It was found to grow on dead wood as saprophyte and collected from Nachole upazila. The fungus was ball-shaped with hard, friable, shiny black fruiting body (Fig. 9a, 9b, 9c).

Table 1 Description of identified fungus at Sadar and Nachole upazilas of Chapainawabganj district

Sl. No.	Identified fungus	Common name	Family	Collected region	Uses
1	<i>Gymnopilus purpuratus</i>	Common rust gill	Cortinariaceae	Sadar	<ul style="list-style-type: none"> <li>• Eaten as fresh, cooked or brewed into a tea.</li> <li>• Use as smoked and mixed with tobacco.</li> <li>• Treatment of mental disorders and hallucinogenic effects.</li> </ul>
2	<i>Agaricus sylvicola</i>	Wood mushroom	Agaricaceae	Horticulture centre, Sadar	<ul style="list-style-type: none"> <li>• Eaten as cooked.</li> <li>• Used as fragrance in food.</li> </ul>
3	<i>Agaricus arvensis</i>	Horse mushroom	Agaricaceae	Horticulture centre, Sadar	<ul style="list-style-type: none"> <li>• Treatment for diabetes, liver disease, bloodstream disorders, and digestive problems, heart disease, osteoporosis and stomach ulcers.</li> </ul>
4	<i>Ganoderma lucidum</i>	Black reishi	Ganodermataceae	Nachole	<ul style="list-style-type: none"> <li>• Treatment for bronchitis and hepatitis.</li> </ul>
5	<i>Coprinellus micaceus</i>	Shiny cap	Psathyrellaceae	Sadar	<ul style="list-style-type: none"> <li>• Showed antioxidant activity.</li> </ul>
6	<i>Trametes versicolor</i>	Turkey tail	Polyporaceae	Sadar	<ul style="list-style-type: none"> <li>• Showed antioxidant activity.</li> </ul>
7	<i>Lycoperdon perlatum</i>	Puffballs	Agaricaceae	Sadar	<ul style="list-style-type: none"> <li>• High protein content</li> <li>• Used as remedy for styptic and staunch blood flow.</li> <li>• Used as painkiller, stomach ache, reduce swelling, fever and cough.</li> </ul>
8	<i>Tremella fuciformis</i>	Jelly fungi	Tremellaceae	Nachole	<ul style="list-style-type: none"> <li>• Eaten as soup.</li> <li>• Supported for the lungs, brain, stomach and heart.</li> <li>• Showed antioxidant activity.</li> <li>• Protect skin from hydrated condition.</li> </ul>
9	<i>Daldinia concentrica</i>	Coal fungi	Hypoxylaceae	Nachole	<ul style="list-style-type: none"> <li>• Useful for fire-lighting.</li> <li>• Spark from traditional flint and steel.</li> </ul>

Table 2 Color of different parts of studied fungal species and palpability characters

Sl. No	Fungal species	Fruiting body	Stipe	Cap	Gill	Spore	Palatability
1	Common Rust gill	Pink and purple	Brown-red	Reddish-brown	light brown	Orange	Non-toxic, edible
2	Wood mushroom	Grayish	Grayish to whitish	Reddish-brown	White	Purple and brown	Non-toxic, edible
3	Horse mushroom	Whitish	Whitish	Whitish	White	White to light brown	Non-toxic, edible
4	Black reishi	Brown	Dark brown	Dark to light brown	Brown	Light brown	Non-toxic, edible
5	Shiny Cap	White to pale	Amber	Pinkish	Brown	Dark brown	Non-edible
6	Turkey tail	Yellow	-	Yellow	-	Transparent	Non-toxic, edible
7	Puffballs	Whitish	Whitish	White	-	Light to dark brown	Non-toxic, edible
8	Jelly fungi	Orange, Yellow and Brown	-	Yellow to orange	-	Reddish	Non-toxic, edible
9	Coal fungi	Black	-	-	Deep brown to blackish	Black	Non-toxic, edible

(-) indicates absent

It resembles a chunk of coal. The flesh of the fungus was purple, brown, or silvery-black inside, and was arranged in concentric layers. Deep brown to blackish color gill was observed. Spores were black in color (Fig. 9e). This fungus can be used as kindling to start a fire thus they are called “Carbon” or “Coal” fungi (Table 1).

#### 4. DISCUSSION

The survey was conducted at Sadar and Nachole upazilas of Chapainawabganj district to assess the habitat, distribution and biodiversity of the mushroom population. Morphological and microscopic features were also reported in the present study. Nine different species belongs to 7 families were recorded here. Five species of *Gymnopilus purpuratus* (rust gill), *Agaricus sylvicola* (wood mushroom), *Agaricus arvensis* (horse mushroom), *Ganoderma lucidum* (black rishi), *Coprinellus micaceus* (shiny cap) in association with trees were reported previously at the same studied area. Those species were also reported in India (Thiribhuvanamala et al., 2011).

A detail report on *Trametes versicolor* (Turkey tail) grown in tropical moist deciduous forest region of Chapainawabganj was stated (Rumainul et al., 2015). The habitat of studied fungi was mostly on moist soil, decaying wood, and dead wood as saprophyte and different trees as parasite. Some of examined fungi were grown on soil and tree (*Gymnopilus purpuratus*, *Agaricus sylvicola*), pastures and semi-natural grassland (*Agaricus arvensis*), bark (*Ganoderma lucidum*, *Coprinellus micaceus*, *Trametes versicolor*, *Lycoperdon perlatum*, *Tremella fuciformis* and *Daldinia concentrica*). Temperature and humidity have a significant impact on the growth of basidiomycota at different times of the year. Fungi are very successful in habitants of soil, due

to their high plasticity and their capacity to adopt various forms in response to adverse conditions (Sun et al., 2005).

The members of basidiomycota are able to break down all kinds of organic matter, decomposing soil components and there by regulating the balance of carbon and nutrients due to their ability to produce a wide variety of extra cellular enzymes (Manzi & Pizzoferrato., 2000). Fungi convert dead organic matter into biomass, carbon dioxide, and organic acids. Fungi can be found in almost every environment and can live in wide range of pH and temperature (Frac et al., 2015). The fungal specimens collected from the study area were found to grow in humus wealthy soil, decaying wood and dead wood. To consider the habitats of experimented fungi, it was suggested that they acted for decaying dated plant materials. Though nitrogen and phosphorus are not spilling over in the environment those are required in large quantities on biological systems. Fungi release these elements from decaying matter and making them available for other living organisms (Kumar & Shah, 2020).

Due to beneficial properties (nutritional value, industrial uses pharmaceutical and drugs) as well as the economic importance of mushroom, it increases the interest to modern research in food and drug safety. Crude fiber is one of the most dominant elements in both wild and commercial edible mushrooms.

In higher basidiomycota, members have chitin, hemicellulose, mannans, glucans, glycogen, and trehalose in their cell wall which is bound with much insoluble dietary fiber (Manzi & Pizzoferrato, 2000). Fernandes et al. (2015) and Cheung (2013) reported that, the health benefits of dietary fibers are prevention of constipation, colon disease, hemorrhoids as well as maximizing the viscosity of the food matrix, slowdown the process of digestion, lower blood glucose, and strengthens immune system with antitumor activity. Hence, mushrooms are excellent source of dietary

fiber that can be used for the enrichment of biopharmaceutical products.

As per survey reports collected from folk medicine practitioner and local people, the studied fungi were used as food, supplements of tea, fragrance in food, remedy such as, mental disorders, hallucinogenic effects, diabetes, liver disease, bloodstream disorders, digestive problems, heart disease, osteoporosis, stomach ulcers, bronchitis, hepatitis, antioxidant, painkiller, stomach ache, reduce swelling, fever and cough. The previous reports also stated the chemical substances and the uses of nine fungal species studied. Either wild or cultivated common rust gill experimented mushroom are contained psilocybin, psychoactive and hallucinogenic compound. Some people have felt that their use of this substance has resulted in remarkable spiritual experiences (Krebs & Johansen, 2013).

Common rust gill are eaten fresh as well as cooked and brewed into a tea. The dried version is sometimes smoked, mixed with cannabis or tobacco. There has recently been a resurgence of interest in common rust gill for the treatment of mental disorders. Psilocybin mushrooms are also used as recreational drugs (Wurst et al., 2002). Moreover, they are consumed for their hallucinogenic effects. They belong to a group of drugs known as psychedelics, because of the changes experienced to perception, mood and thought. When the key ingredient psilocybin is taken, it is converted in the body to psilocin, which is the chemical with the psychoactive properties (Krebs & Johansen, 2013). Wild medicinal mushrooms are used for a variety of applications such as bioconversion of agricultural wastes into food and other valuable products (Ogidi et al., 2020; Mattila et al., 2001). Besides, mushrooms have high demand in foreign country where mushroom can be exporting to earn a huge amount of foreign currency (Ferdousi, et al., 2019, Mattila et al., 2001).

*Agaricus* genus represents the most important cultivated edible mushroom. *A. bisporus*, a “common button mushroom,” has the leading position among edible cultivated mushrooms, whereas *A. brasiliensis* is cultivated all around the world for its medicinal properties (Loria-Kohen et al., 2013). These species have been demonstrated to express diverse and valuable medicinal properties including antitumor, anti-aromatase, antimicrobial, immunomodulatory, anti-QS anti-inflammatory, as well as antioxidant, activities (Soković et al., 2018)

Reishi mushroom has been widely used against a variety of infectious disease such as bronchitis and hepatitis. It stimulates phagocytosis (Phagocytosis is the process by which a cell uses its plasma membrane to engulf a large particle, giving rise to an internal compartment called the phagosome), increases T-cell activity and is a treatment for viral hepatitis. Reishi has been reported to increase CD4 cells in vivo. It is also effective antidepressant. But it is documented that sometimes consumption of reishi mushroom may be risky in case of low blood pressure, for diabetes patients as well as who have immune system disorders (Venturella et al., 2021). The antioxidant activity of cultured liquid, mycelial extract and biomass suspension

obtained from cultures of Shiny cap mushroom (*C. micaceus*) has been shown to have anti-oxidative potential to inhibit the reaction of free-radical peroxide oxidation of lipids in rat brain homogen (Badalyan, 2003).

Jelly fungi often grow on logs, stumps and twigs. Some species are parasitic on other fungi, mosses, ferns or seed plants. Some jelly fungi have interesting common names like “witches’ butter” or “tree ear.” They are common on dead tree branches, but some fruit on the ground. Although these fungi are too small and appear too infrequently to be important as edibles, one type is cultivated and sold in oriental markets.

Some people like the slippery, crunchy texture of Jelly fungi. It is used in soup. Chinese and Japanese herbalists have used *Tremella* as a strong yin tonic (Yin tonics affect body fluids and provide moisture in conditions of dryness), believing it offers support for the lungs, brain, stomach, heart and immune system. *Tremella* contains high amounts of polysaccharides, which are antioxidants that can help keep skin hydrated, promote nerve growth and support the brain (Ma et al., 2021; Torkelson et al., 2012).

## 5. CONCLUSION

In this investigation, nine members of basidiomycota belonging to nine genera and seven families were collected and identified. The identified 3 species of Agaricaceae were *Agaricus sylvicola*, *Agaricus rvensis* and *Lycoperdon perlatum*. On the other hand, one species of each of *Ganoderma lucidum*, *Coprinellus micaceus*, *Trametes versicolor*, *Tremella fuciformis*, *Daldinia concentrica* were collected.

In the present investigation, different genus of basidiomycota has identified. Their unique features of potential uses along with their benefits and negative effects have also studied. This article provides an opportunity to help other researchers discover the unique characteristics of these mushrooms and their various uses. In the future, we will find various uses for these mushrooms based on this research paper and strive to motivate other researchers to engage in this type of research. Furthermore, the farmers as well as consumers of the selected area will get an outline for the further utilization of mushroom in distinct areas such as food industry, and drugs industries. Mushroom cultivation can be eradicated unemployment, poverty and also reduce malnutrition to meet up the domestic demand of protein and food security. So, this is the appropriate time for government to emphasis on to take different steps to encourage unemployed people and farmers to cultivate mushroom for commercial production.

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