



COMMON FUNGI OF THE DELHI RIDGE

DEPARTMENT OF FORESTS AND WILDLIFE, GNCT OF DELHI



Common Fungi of The Delhi Ridge

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*To walk attentively through a forest, even a
damaged one, is to be caught by the abundance
of life: ancient and new; underfoot and reaching
into the light.*

But how does one tell the life of the forest?

*We begin by looking for drama and
adventure beyond the activities of
humans.*

ANNA TSING

WHAT ARE FUNGI?

Fungi are neither plants nor animals. Unlike plants they cannot produce their own food since they lack chlorophyll, and unlike animals, they lack mobility, complex organ systems, and reproduce through microscopic spores. Thus, fungi are a unique group of organisms in their own right with great variations in sizes – from single-celled ones like yeast to ones with large fruiting bodies and extensive underground networks. Fungi dwell in diverse habitats across the world, benefitting humans and the larger ecosystems they are part of.

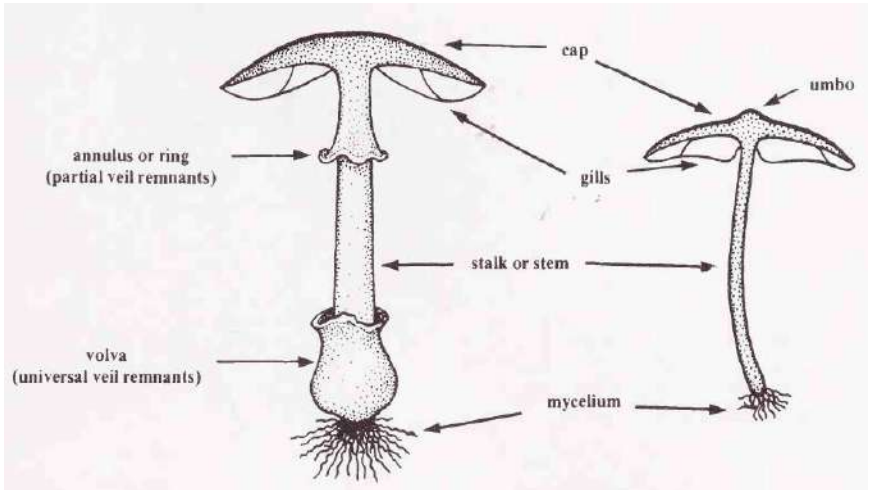
Fungi are made up of threadlike structures called hyphae, which together form networks called mycelium. Mycelium infuses all landscapes, holds soil together and is extremely tenacious. In a single cubic inch of healthy forest soil, there is about 12 kilometers of closely packed mycelium. The denser the net of mycelium, the more water the soil absorbs, and the healthier it is.

Mycelium also facilitates intergenerational exchange of nutrients between trees and other plants. Humans are more closely related to fungi than any other kingdom of organisms, the same pathogens infect both humans and fungi, and so the most potent antibodies are extracted from medicinal fungi. Moreover, fungi produce oxalic acid and other acids and enzymes which combine with calcium in rocks to produce calcium oxalate which makes those rocks crumble and leads to new soil formation.

HUMONGOUS FUNGUS!

The largest organism in the world is a giant fungus of the species *Armillaria ostoyae* that occupies some 2,384 acres (965 hectares) of soil in the Blue Mountains in Oregon in the United States of America.

While fungi exist in soil throughout the year, it is nearly impossible to identify fungi through the mycelium alone. However, under favorable conditions of temperature and moisture, fungi produce fruiting bodies called mushrooms, which can be used for identification. This is why the monsoon season is particularly important, it is the best time for finding mushrooms and identifying fungi.



Parts of a gilled mushroom (David Arora, *Mushrooms Demystified*, 1986)

The most common type of mushroom is the gilled kind (shown above), others may have tiny pores or protuberances underneath. The gills are lined with spores, which are dispersed by air currents and help the fungi reproduce.

Fungi are often feared to be dangerous, but very few are parasitic. Most are saprophytic, they break down complex organic matter like wood and dung into simple reusable compounds in the soil. This is why mushrooms are called “nature’s recyclers”.

Other mushrooms are mycorrhizal, that is, they form mutually beneficial associations with the roots of plants and trees, and even with ant and termite colonies. This is why fungi are important for the health of our forests, without them many trees may not grow.

IMPORTANCE OF FUNGI

I. Ecosystem Services: Fungi play an important role in the nutrient cycle, they are decomposers converting debris to humus, releasing nutrients back into the soil and making them available for plants. They carry out nitrogen fixation and availability of phosphorus in the soil, increasing fertility.

Together plants and fungi carry out a process known as soil carbon sequestration, taking carbon from the atmosphere and storing into the soil, it not only improves the soil fertility but also keep a check on carbon already emitted in the atmosphere due to human activities.

II. Medicinal Properties: These forest friendly creatures provide numerous health benefits. Many mushrooms have medicinal properties which can help prevent diseases and strengthen the immune system. The first discovered and the widely used antibiotic Penicillin was derived from a fungus *Penicillium* which secretes an anti-bacterial substance.



The species *Ganoderma* is known as ling chih or “mushroom of immortality”, in China and it is believed to promote health and longevity.

III. Culinary Uses: People from across the world consume different local mushrooms which have become part of their culinary cultures. Wild edible mushrooms can be a great source of protein, vitamins, fibre, and minerals and is a good meat alternative for plant-based diets.



Wood ear fungus (*Auricularia sp.*) is used in Chinese soups & stir fry recipes.

IV. Myco-remediation: Fungi can assist in the degradation of a variety of environmental contaminants such as plastics, petroleum-based products, pharmaceuticals and oil. These persistent toxins take a long time to break down and accumulate in living organisms. Fungi can be an effective measure for lowering environmental pollutants.

Fungi have been successfully used in ecological restoration projects due to their mycoremediation properties.

V. Sources of Raw Materials: The underground complex root structure mycelium is used as a substitute in market for unsustainable products like plastics. The products made from mycelium are biodegradable and can be produced with lesser water and land resources.

MUSHROOM MYTHS

MYTH 1: Most Wild Mushrooms are Poisonous

Touching wild mushrooms is not a dangerous activity. One may wash hands after prolonged handling, but they will typically not cause any real harm unless ingested. In fact, tasting mushrooms from the tip of the tongue is a method used by mycologists to identify mushrooms.

MYTH 2: All Poisonous Mushrooms are Brightly Coloured

It is often believed that it is nature's rule of presenting dangerous elements in bright colours. However, this is not always true, especially when it comes to mushrooms. Some of the deadliest mushrooms like *Amanita* (death cap) are white.

MYTH 3: Health Benefits of Mushrooms are Unscientific

Mushrooms like *Ganoderma* and *Schizophyllum* have historically been used in traditional medicines. Numerous scientific studies validate traditional medicinal uses of fungi, and compounds extracted from fungi are being increasingly used to produce new and effective antibiotics.

MYTH 4: All Medicinal Mushrooms are Edible

The amount in which medicinal mushrooms should be ingested is important to know, as even the famous species *Ganoderma* has blood thinning properties which can have negative implications.

MYTH 5: Edible Mushrooms Can be Eaten Without Cooking

Button mushrooms can be used raw in salads but not every mushroom can be eaten raw. Mushrooms are composed of chitin, and to break down the fibre they must be carefully prepared.

EXPLORING THE DELHI RIDGE

The Delhi Ridge is the northernmost part of the ancient Aravallis, which date their formation back to 1500 million years ago. The Aravalli range starts in Gujarat and passes through Rajasthan and Haryana before entering Delhi from the south-west at Gurgaon. It stretches almost parallel to the Yamuna in the north-easterly direction, sometimes disappearing to re-emerge again and halts near Wazirabad in north Delhi.

The Ridge in Delhi is characterized by rocky projections and thin sandy soil best suited to support an open-canopied thorn forest. The native trees of the northern Aravallis have xerophytic adaptations, that is, they have adapted to withstand drought-like conditions.



Slender leaves of Dhau tree.

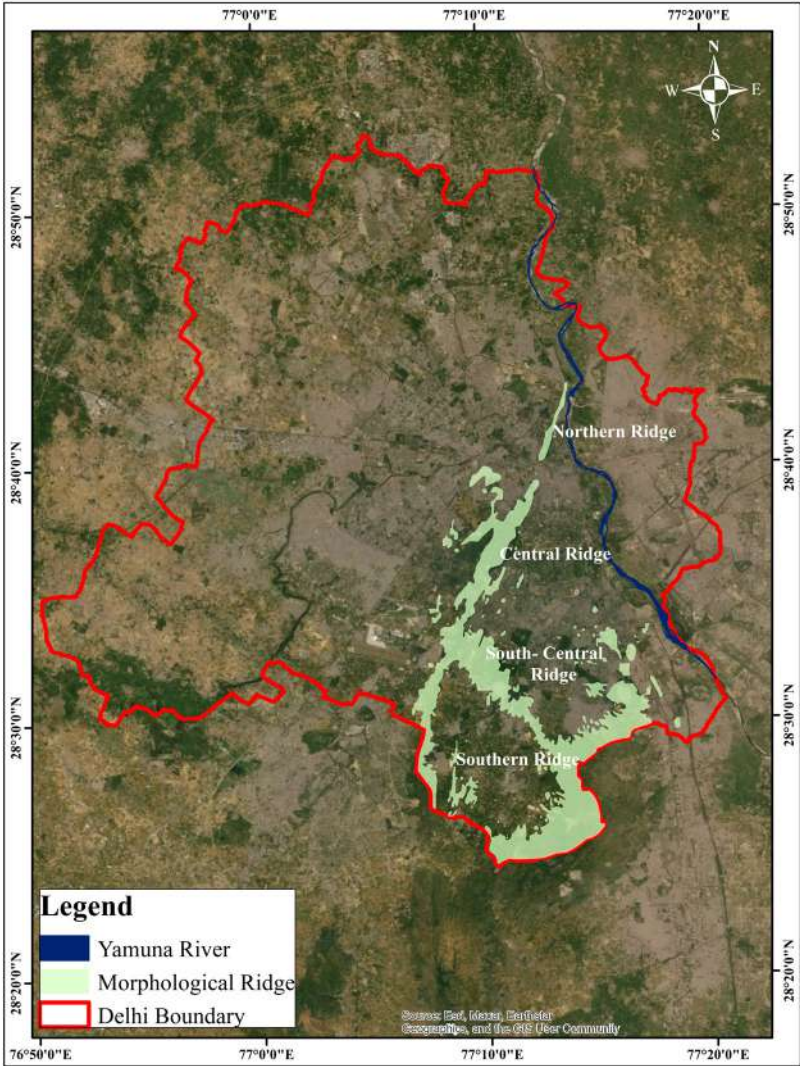


Red flowers of Dhak tree.

Anogeissus pendula (dhau) is a tree specialized to the Ridge habitat, with delicate leaves that emerge new at the height of the summers. Other native trees include *Butea monosperma* (dhak), the “flame of the forest” with red flowers that light the Ridge in April, and thorny species such as *Vachellia leucophloea* (ronjh), *Senegalia catechu* (khair), *Senegalia modesta* (phulai), *Senegalia senegal* (kummtha), and *Dichrostachys cinerea* (goya khair). In the monsoon, several annual plants emerge and disappear by the winter.

The Ridge supports mammals such as leopards, hyenas, hares, civet cats, nilgai, monkeys and reptiles like frogs, toads and snakes. Butterflies and other insects are also found in large numbers.

The Delhi Ridge is a sight to behold in monsoons, the tree foliage grows denser, annual herbs and vines emerge, making the landscape lush and green. The rains are also when mushrooms of all shapes, sizes and colors pop out of the soil, growing and releasing spores before wilting. July, August and September are the best months for mushroom hunting in the Delhi Ridge.



Map of the Delhi Ridge which is classified into four administrative sections, Northern, Southern, Central and South Central.

BASICS OF IDENTIFICATION

Fungi hunting is about more than just walking through a forest and frantically picking mushrooms. You must pay close attention to the landscape and observe carefully. Rather than trying to identify too many fungi, try to master the identification of a few.

EQUIPMENT

1. **A rigid box or basket:** You must carry a strong container, one that can withstand moisture from the collected mushrooms and the rain.
2. **Wax paper:** Wrap the collected mushroom specimens separately in wax paper to keep them separate and prevent them from turning to mush.
3. **A knife:** In order to cleanly extract the specimens, you will need a knife, this is also useful when you need to slice a mushroom egg for identification.
4. **Stationery:** Keep a pencil or a pen and a small notebook to jot down details about the mushroom you find (size, location, smell, environment, etc.)

Apart from these, wear sturdy shoes, keep a raincoat, sunscreen, mosquito repellent, water and snacks like dried fruits. Install a GPS app in your phone for recording the location of your finds, and use your phone camera or professional camera to click them.

FIELD NOTES

1. **Date, weather conditions, abundance** (how many times you observed a particular mushroom).
2. **Growth habit** (solitary, scattered, clustered, in rings, etc.), **substrate** (humus, soil, grass, moss, dung, wood, etc.), **vegetation** (types of trees and shrubs within 20 metres).

Few field guides are available for mushrooms in India, but there are many other resources. You can do a search on Google Lens and then narrow the results using books such as David Arora's *Mushrooms Demystified* (1986). You can crowdsource identification through Instagram and Facebook pages. However, to identify a mushroom you will need to make note of the following information:

1. **Size**, whether it is large, medium or small.
2. **Colour**
3. **Smell**
4. **Texture**
5. **The shape of the cap**
6. **The underside**, whether there are gills or pores.
7. **The stalk**, whether it is present or absent, and whether it is located centrally or at the side.
8. **Presence of ring**
9. **Presence of volva**: In some mushrooms the veil leaves visible remains at the base of the stalk in the form of a sack, collar or scales, this is called the volva.
10. **Spore prints**: In order to make your identifications more accurate, you can also collect spore prints. Simply slice the cap off the stalk and place it with the gills down on a piece of paper, cover it with a small utensil and leave overnight. The gills or pores will release spores and the colour of the spore-print will indicate the genus it may be from.



STINKHORNS

Stinkhorns are among the most fascinating and complex types of fungi. Their life cycle begins with round or oval shaped white eggs which pop out from the ground.

Slicing into the egg reveals a gelatinous substance underneath the skin, brown coloured spore mass surrounding the stalk in the middle. The eggs grow with time and crack upon maturity to release the phallus shaped fruiting body which emanates a foul odour. Two common genera of stinkhorns are *Phallus* and *Mutinus*.



Common Stinkhorn

Phallus sp.

1. Medium-sized mushroom with a stalk and head.
2. It has a strong, disturbing odour that permeates the air around it.
3. It emerges from the ground or rotten wood.
4. The head is covered with brown-black spore slime.
5. The stalk is spongy, fragile and hollow.
6. The base of the stalk is surrounded by a loose sack, remnant of the egg from which it emerges.

Dog Stinkhorn

Mutinus sp.



1. Smaller in size, fruiting body more delicate than the Phallus sp.
2. It has a distinct conical cap on top of a spongy, hollow stalk.
3. It has a foul odour, less strong than common stinkhorns.
4. The base of the stalk is surrounded by a stalk, remnant of the egg from which it hatches.



Stinkhorn eggs and sliced cross-section



Dungbell

Panaeolus sp.

1. Growing near or on dung in small colonies.
2. Cap cone or bell shaped, grey to brown in colour.
3. Cap smooth when fresh, breaking up to form scales with time.
4. Slender and delicate stalk, grey or brown in colour.
5. Gills grey to black in colour, spores also distinctly black.
6. Black spore print.





Parasol

Macrolepiota sp.

1. Medium to large sized, grows on ground, usually in open fields or grassy areas.
2. Spherical shaped; initially creamish or pale brown in colour with smooth texture, darker brown central portion that breaks into scales.
3. Cap is almost flat from each side with a central bump known as umbo. Flesh is white in color.
4. White colored gills in all the stages, free from stalk. Tall and slender stalk, base without volva.
5. Veil present, merging with the gills at first, later forming a ring.
6. White spore print.





Powder Parasol

Cystoderma sp.

1. Small or medium sized mushrooms, typically terrestrial.
2. Cap is dry and coated with mealy, powdery granules.
3. Gills are white in colour and spore print is white or cream.
4. The stalk is central and the lower portion sheathed with powdery granules.
5. Ring is often present on the stalk.



White Dapperling

Leucocoprinus sp.



1. Small white mushroom which emerges from the earth.
2. Bulbous when immature becoming convex with a protuberance which may be darker in the centre against the white colour of the rest of the cap.
3. White gills discolouring to pinkish brown with age.
4. Slender stem, white to yellowish to pinkish brown.
5. White spore print and indistinct smell.



Pure white gills of *Leucocoprinus* turn pinkish brown with age.



Toadstool

Agaricus sp.

1. Grows on the ground, flat cap creamy white in colour.
2. Triangular scales in concentric rings present in the centre.
3. Crowded gills, deep chocolate brown and free from the stalk.
4. Thick white stalk with ring present.
5. Spore print is chocolate brown.





Pink Gilled Agaricus

Agaricus sp.

1. Grows on ground, cap creamy white in colour
2. Wavy margins, thick flesh white in color, often turn slightly pink when dissected.
3. Crowded gills, deep pink at first, turning dark brown to almost black as they mature.
4. Thick stalk, white in color, smooth above and scaly below the delicate ring.
5. Spore print is a deep chocolate brown.





Scaly Tangerine

Agaricus trisulphatus

1. Small to medium sized mushroom, grows on the ground.
2. Bright yellow-orange cap, rounded when young, flattening with age.
3. Surface is bright yellow to orange, and covered with triangular scales arranged in concentric rings.
4. Orange stalk covered in yellow-orange scales below the faintly visible ring.
5. Gills are white when young, turning brown after the mushroom matures and releases spores. Spore print is brown.





Xanthagaricus sp.

1. Belongs to the *Agaricaceae* family
2. Small to medium sized circular fruiting body.
3. Purple coloured surface with a darker shade of purple in the centre.
4. Centrally aligned thin stalk, grey to purplish in colour, ring absent, dark brown underside, radially arranged gills.
5. Can be found growing on ground as well as dead logs, margins have triangular thread-like scales.



Common Rust gill

Gymnopilus sp.

1. Size varies from medium to large, mostly found on wood.
2. Cap is convex when young, flattens out as they age. Texture could be smooth or scaly and dry. Surface is yellow to rusty orange in colour.
3. Stalk is centrally aligned and is fleshy. Whitish to orange in colour, covered with off-white fibres that run down the stem.
4. Veil is not always common, but usually present, at times forming a ring.
5. Gills are packed and adnate. Slight yellowish when young, rusty orange spores darken the gills with age.
6. Spore print- orange to rusty orange to bright rusty brown



Mushrooms

by Sylvia Plath

Overnight, very
Whitely, discreetly,
Very quietly

Our toes, our noses
Take hold on the loam,
Acquire the air.

Nobody sees us,
Stops us, betrays us;
The small grains make
room.

Soft fists insist on
Heaving the needles,
The leafy bedding,

Even the paving.
Our hammers, our rams,
Earless and eyeless,

Perfectly voiceless,
Widen the crannies,
Shoulder through holes.
We

Diet on water,
On crumbs of shadow,
Bland-mannered, asking

Little or nothing.
So many of us!
So many of us!

We are shelves, we are
Tables, we are meek,
We are edible,

Nudgers and shovers
In spite of ourselves.
Our kind multiplies:

We shall by morning
Inherit the earth.
Our foot's in the door.



Bhatolian

Termitomyces sp.

1. All species in genus *Termitomyces* are dependent on termites for survival and are found on termite mounds.
2. Fruiting body can be very small or large, depending on the species.
3. The cap is white with occasional umbo in the centre, splits with age.





Pinwheel Fungus

Marasmius rotula

1. Tiny mushrooms with thin, membranous caps in varying colours according to habitat.
2. The caps are sunken in the centre, and pleated with scalloped margins.
3. Stems are slender, hollow and wiry.
4. The underside of the caps have widely spaced white gills that are attached to a collar encircling the stem.
5. These grow typically in clusters on decaying wood such as fallen twigs and sticks, moss-covered logs, and stumps





Split Gill

Schizophyllum commune

1. Tiny cap like fungi which grows in shelf-like groups on dead wood or stumps.
2. Caps are woolly and stalks are absent.
3. The distinct longitudinal gills split when dry, giving the name split-gill.
4. It can be spotted during most months in Delhi, including winter.

USES OF THE SPLIT GILL

In recent years split-gill has been recognized for its immunomodulatory, antifungal, antineoplastic and antiviral properties.

It is consumed in different parts of the tropical world, including India. In Manipur, it is known as kanglayen and one of the ingredients for Manipuri-style pancakes called paaknam. In Mizoram, the local name is pasi and it is one of the highest rated edible mushrooms among the Mizo community.

Oysterling

Crepidotus sp.

1. Small sized, thin fleshed, convex to fan-shaped caps, resting on the surface of either large trunks or branches or plant debris as solitary, scattered to gregarious.
2. Smooth or hairy surfaced with soft fragile flesh, gills white in colour, brown when mature.
3. Stalk usually absent or undeveloped, off-centred attachment point if present, radiating gills.
4. Spore print is dull brown or pinkish brown at maturity.



*Nature alone is antique,
and the oldest art is a mushroom.*

- Thomas Carlyle

Wood ear/Black fungus

Auricularia auricula-judae



1. Small to mid-sized rubbery mushrooms that get tougher with age.
2. Brown in colour with hints of purple, red or tan.
3. Emerge in groups from tree trunks and resemble ears due to their cup shape.
4. No stalk present.
5. Wood ears are edible and included in East Asian soups and stir-fry recipes. They are used medicinally in China for reducing cholesterol in blood.



Coal Fungus

Daldinia concentrica

1. Ball-shaped fungi, hard shiny brown or black exterior with shades of purple.
2. It resembles a chunk of coal, which gives it several of its common names, including coal fungus and carbon balls.
3. The flesh of the fungus is purple, brown, or silvery-black inside, and is arranged in concentric layers.
4. Coal fungus is typically found growing on dead and decaying wood.



USES OF COAL FUNGUS

The fungus is a useful form of tinder for fire-lighting. The brown variety is usually too heavy and dense to be much good; the black variety is lighter and better. It does need to be completely dry, whereupon it will burn slowly, much like a charcoal briquette, with a particularly pungent smoke

Reishi/Lingzhi
Ganoderma sp.



1. Medium to large sized fruiting body, tough and woody.
2. Hoof or shelf-like body with grooves and a shiny top.
3. Cap yellow-orange when young, turning darker and maroon with age.
4. Underside white with minute pores, staining brown when scratched.
5. Most species grow on tree trunks or stumps; some emerge directly from the ground.





Dyer's Polypore

Phaeolus sp.

1. Medium to large sized, usually growing on ground or at the base of trees, often in two or three overlapping tiers.
2. Initially soft, squishy and velvety, eventually becoming hard, merging with the wood.
3. Round or fan shaped with a distinctive yellow margin, central part turns darker-brown as it matures.
4. Underside has pores, greenish-yellow to rusty-brown in colour but never white at maturity.
5. Spore print is extremely pale yellow.



The name Dyer's polypore comes from its use in dyeing yarn various shades of yellow, gold and brown.



Fire Sponge/Cork Fungus

Phellinus sp.

1. Fruiting bodies are found growing on wood; they are sessile and perennial.
2. The flesh is tough and woody or cork-like, and brown in colour.
3. The underside has irregular pores, brown in colour





Amyloporus campbellii

1. Large fruiting body with wavy edges and rubbery texture.
2. White surface at first, a pinkish hue emerges in the middle when fresh; it darkens with age and becomes a dull shade of red.
3. The stipe or stem is rudimentary.
4. Base is white with minute pores.
5. Develops from the base of trees or directly from moist ground.





Diamond Polypore or Hexagonal-pored polypore
Polyporus alveolaris

1. Grows on dead branches; scaly caps, color varies from cream to orange or reddish brown.
2. Rounded to fan-shaped, cap surface is dry, becomes tough with age.
3. Usually attached directly to the growing surface, stalk central to laterally aligned if present, white to tan colored.
4. Solitary to grouped; margins usually curved.
5. Large diamond shaped tubes underside, arranged in radial rows, pore surface white to buff. color.
6. Spore print is white.



Polyporus grammacephalus

1. Usually grows on dead logs, can be found growing on live trees as well, scattered.
2. Cap fleshy to tough, convex to plane, curved edges; creamish brown to reddish brown in color.
3. Pores underside of the cap, very minute to large.
4. Central to off-center aligned stalk, or lateral.
5. Spore print is white to light brown.



Trametes sanguineus

1. Orange coloured polypore; usually grows on dead hardwoods in shelflike or bracketlike form in groups.
2. Laterally attached to the surface, small to medium sized fruiting body; thin cap, hairy or velvety textured.
3. Stalk absent or rudimentary.
4. Small and shallow pores, oblong to cylindrical shaped.





Hexagonia sp.

1. Hexagonia is derived from the Latin word *hexagonus*, meaning with six angles.
2. Solitary or found in clusters; flat when fresh and often bent when dry.
3. Fruiting body is thin, leathery bracket growing on wood from the sides. Stem is usually absent, lateral and short if present.
4. Upper surface is velvety with concentric zones in brown, rusty brown shade.
5. Pore surface is somewhat flat with large shallow pores, snuff brown in colour; hexagonal or honeycomb like; spores released from the pores.





Puffball Mushroom

Calvatia sp.

1. Terrestrial species, medium to large, irregularly round or pear shaped, no prominent stalk or base.
2. Two-layered skin, rupturing irregularly when mature, removing outer flaky layer reveals white mass beneath, which later turns brown and powdery.
3. Grows in the open or in grassy fields.
4. Does not have spore-bearing gills, produced inside the spherical fruit body.
5. Exterior without spines but flaky, it turns brown or lead-colored with age.



Earthstar

Geastrum sp.



Earthstars are modified puffballs, with a somewhat flattened spore case in the centre surrounded by star-like rays.

1. Terrestrial species, grows in association with trees or rotting stumps.
2. Small to medium sized. Round fruiting body when young, usually underground at this stage and as it grows the outer wall splits, curling back to create the shape of a star.
3. Surface becomes greyish or brownish as they age, cream colored rays are usually six to nine in numbers.
4. Stalk absent; spore case has a rough surface, not mounted on a short stalk.
5. Spore mass white when young and underground, turns brown and powdery with age.
6. The spores expel in a puff from the inner sack through a pore in the middle.



This booklet showcases some common fungi found in the Delhi Ridge. As climate change alters rainfall patterns across the world, this is an attempt to record the beautiful fungi that give life to Delhi's forests and a reminder to preserve them.

