

Biodiversity of the Macromycetes from Amirgadh and Danta Talukas of North Gujarat

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The state of Gujarat is well known for its contrasting ecoregions such as moist deciduous forests and deserts. Hence, A survey was conducted for ten selected villages of Amirgadh and Danta talukas to know biodiversity of fleshy macrofungi of danta and amirgadh talukas of Banaskantha district of North Gujarat during 2019-23. Biodiversity studies on macromycetes carried out in Amirgadh and Danta talukas of Banaskantha district revealed a species richness of 47 and 41 respectively. The total 48 mushroom species were distributed among Twenty different family, nine different orders, two classes and two divisions. Among identified species 9 are edible, 10 inedible, 16 medicinal, 10 are conditionally edible and 4 are poisonous species of mushroom. The Shannon diversity index of 1.48 and 1.43 and Simpson index of 1.23 and 1.43 was observed in Amirgadh and Danta talukas, respectively. The identified mushrooms were *Podaxispistillaris*, *Coprinus comatus*, *Agaricus hondensis*, *Agaricus trisulphuratus*, *Leucocoprinus sp.*, *Agaricus campestris*, *Agaricus rotalis*, *Leucoagaricus americanus*, *Leucocoprinus cretaceus*, *Amanita sp.*, *Macrolepiota procera*, *Lepiota sp.*, *Parasola sp1.*, *Parasola sp2.*, *Psathyrella sp.*, *Parasolaconopilus*, *Schizophyllum commune*, *Schizophyllum sp.*, *Termitomyces sp.*, *Macrocybe crassa*, *Cyathus striatus*, *Marasmius elegans*, *Marasmiellus ramealis*, *Marasmius sp.*, *Marasmius paratrichotus*, *Marasmius rotula*, *Mycenagalericulata*, *Clitocybe glaucocana*, *Clitocybe sp.*, *Pleurotus sp.*, *Pleurotus djamore*, *Geastrumsaccatum*, *Ramaria flaccida*, *Ramariopsis kunzei*, *Crepidotus sp.*, *Amyloporus campbellii*, *Ganoderma lucidum*, *Polyporus sp.*, *Favolustenuiculus*, *Ganoderma sp.*, *Microporus xanthopus*, *Auricularia auricula-judae*, *Phallus impudicus*, *Phallus sp.*, *Tremella foliacea*, *Xylaria polymorpha*, *Xylaria sp.*, and *Daldinia concentrica*.

Keywords : Biodiversity, Gujarat, mushroom, Shannon diversity, Simpson index

INTRODUCTION

Gujarat is endowed with a great diversity of natural ecosystems ranging from moist deciduous forests to pure desert conditions. Though the climatic conditions are favorable and unique for the luxurious growth of fungal flora; there are only a few sporadic reports on fungal diversity for the state of Gujarat.

Mushrooms, the macroscopic fruiting bodies of fungi, represent a significant, yet often underappreciated, component of global biodiversity. They are a diverse group of organisms encompassing a wide range of life

forms and occupying diverse ecological niches across terrestrial and even some aquatic ecosystems. Threats to diversity and conservation-Despite their vital ecological roles, mushroom biodiversity faces increasing threats. Habitat loss due to deforestation, urbanization, and agricultural expansion are major concerns. Pollution from fertilizers and other sources can negatively impact fungal communities, according to the Natural History Museum. Over-harvesting of certain prized species can also lead to population declines. Climate change is also increasingly being considered a threat to diversity of species, according to IUCN. In the forest ecosystem, fungi, one of the significant groups of saprophytes, recycle carbon which has been stored into complex organic matter (Fazio *et al.*

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2010; Koyani and Rajput, 2010; Sanghvi *et al.* 2013). In the forest ecosystem, fungi function as primary decomposers and significant saprophytes. They are essential for recycling carbon stored in complex organic matter, such as lignin and cellulose, back into the soil and atmosphere. With high protein, vitamin, mineral, fiber, trace elements content, minimal to no calories, and cholesterol, mushrooms have a rich nutritional value. Mushrooms possess high nutritional value due to their rich content of proteins, vitamins, minerals, fiber, and trace elements, all while containing minimal calories and no cholesterol. Mushrooms have the ability to grow on a range of substrates, including lignin-rich plant debris, cellulose, hemicellulose, humus soil, and even hairs (Patel and Pithawala, 2024). Also, they are important biotechnological tools for the synthesis of several enzymes and secondary metabolites (Lodge, 2004). Studies on mushrooms, particularly those concentrating on their use, therapeutic benefits, and edibility, along with earlier research on larger fungi, may be beneficial for humans (Hedawoo, 2010). The most common kind of mushroom has a pileus and stipe in the shape of an umbrella, although some species also include a volva, annulus, or both. In addition, some mushrooms have a cup-like shape, while others are coral; others are yellow or orange jelly like globs and some even much resemble the human ear; In fact, there are countless varieties of mushrooms (Miles and Chang, 2004). Gujarat is endowed with a great diversity of natural ecosystems ranging from moist deciduous forests to pure desert conditions. Bounded by the Arabian Sea to the southwest, Gujarat is situated between latitudes 20° 6' N–24° 42' N and longitudes 68° 10' E–74° 28' E. Out of its total landmass of 1,96,204 km² (75,755 sq. miles), less than 20 lakh hectares are forested. This forest cover is highly fragmented, clustering primarily in the eastern hills, middle part and south region of state. Driven by sharp regional variations in rainfall and temperatures ranging from 1°C to 46°C, Gujarat exhibits diverse forest ecosystems alongside an arid desert in its northern zone. Though the climatic conditions are favorable and unique for the luxurious growth of fungal flora; there are only a few sporadic reports on fungal diversity for the state of Gujarat (Tadvi, 2013). Despite this rich

environmental and vegetational heterogeneity, documentation of the state's mycobiota remains scarce. To address this gap, our study explores and documents local fungal diversity of North Gujarat region which was not done previously due to presence of less forest area and low rainfall.

MATERIALS AND METHODS

The mushroom survey was carried out between 2019 and 2022 in North Gujarat using a multistage sampling design. Ten villages were selected from the Danta taluka (24.1930° N, 72.7659° E; 270 m) and 10 villages from the Amirgadhd taluka (24.4070° N, 72.6403° E; 229 m) to know biodiversity of Macromycetes in North Gujarat (Table 1).

Macro and microscopic characteristics of fungal specimens were observed and recorded by considering various morphological and anatomical features, standard microscopic methods given by Walting (1973) and Singer (1986). Microscopic features of fruiting bodies in detail were studied for characterization using a binocular research microscope. Spore colour is a useful character, particularly in gilled mushroom. Though the individual spores can't be seen through naked eye, their colour in mass can be observed by taking spore print. Spore print was collected following the method of Arora (1986).

For identification of the specimen different identification manuals were consulted (Bessey, 1950; Walting, 1973; Natarajan and Raman, 1983; Purkayastha and Chandra, 1985; Singer, 1986; Arora, 1986; Zhishuet *al.* 1993; Van der Gucht, 1995; Roy and De, 1996; Keizer, 1998; Pegler, 1999; Calonge, 2005). MycoBank Database was consulted for the current valid name of the fungal species (<http://www.mycobank.org/defaultinfo.aspx?Page=home>). Some authentic web sites viz. www.mushroomobserver.org, www.mushroomexpert.com, www.rogersm-mushrooms.com and www.dmr.solan.icar.gov.in were also accessed and DMR, solan taxonomist also help us for identification.

Frequency of occurrence for each species was calculated by following formula :

$$\frac{\text{Frequency of fungal species (\%)} = \frac{\text{Number of sites in which the species present} \times 100}{\text{Total number of sites}}}$$

Shannon diversity index for mushroom was calculated as follows :

$$H = - \sum (n/N) \log_c (n/N)$$

where,

H is the diversity index,

N is the total number of individuals of all the species and n is the total number of individuals of the individual species.

Simpson Index of Diversity was calculated as follows :

$$\text{Simpson Index of Diversity} = 1 - D, D = \frac{\sum n(n-1)}{N(N-1)}$$

where,

n = The total number of organisms of a particular species

N = The total number of organisms of all species

D = Simpson's index

RESULTS AND DISCUSSION

Rainfall patterns strongly dictate fungal phenology, causing most mushrooms to fruit during rainy seasons despite being available year-round. This study identified 48 mushroom species classified across two divisions, two classes, nine orders, and twenty families. Among these documented species, 16 possess medicinal properties, 10 are inedible, 10 are conditionally edible, 9 are edible, and 4 are poisonous. Structurally, these fungi grow on diverse organic substrates, including soil, dead grass, dead leaves, small sticks, hard wood, tree trunks, and the bases or roots of dead trees. Distribution of different mushroom species in their respective order and family have been shown in Table 2. Species diversity of mushrooms by Shannon diversity Index and Simpson Index of Diversity of Amirgadh and Danta talukas of North Gujarat is revealed in Table 3 and Frequency percentage in Fig.1. There was no significant difference among the 2 districts.

Shah *et al.* (2023) studied diversity of mushroom species found on different substratum in the

Table 1: Villages selected from Danta and Amirgadh talukas for survey

Amirgadh	Danta
Khuniya	Vadusan
Kakwada	Panudara
Dungarpura	Paniyari
Khari	Khaivad
Savaniya	Ratanpur
Balundra	Harivav
Iqbalgadh	Pipalvadi vav
Dholiya	Dabhani vav
Jessor forest area	Kheroj
Karmadi	Devaliyavali vav

premises of sundarvan-A nature discovery centre, Ahmedabad by emphasizing the good biodiversity of the area despite being in the busy and confined location of the city. The field, in which they carried out survey, i.e., at Sundarvan Nature Park, has identified about 30 species of mushrooms. Species have been found in different substratum, Sundarvan is a nature reserve open to the public, but it is rich in flora diversity, with different species of trees and shrubs. The survey was conducted

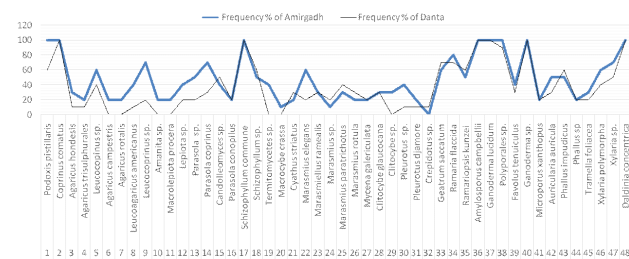


Fig 1: Frequency of Mushrooms of in Amirgadh and Danta talukas of North Gujarat

in rainy season of 2013 in 3 different places which included Mountains, Grassland and Forest areas of Mahal forest of Gujarat by Parihar *et al.* (2015) and they recorded total number of 46 species. They found dominating species belong to genera *Agaricus*, *Pleurotus*, *Termitomyces*, *Cantharellus*, *Ganoderma*, *Xylaria*, *Schizophyllum*, *Polyporus*. Patel *et al.* (2025) surveyed Vansda National Park, Navsari and found edibility of 21 mushroom species by the locals.

Detailed descriptions of the 48 species identified from the 2 districts have been given below, and

Table 2: Distribution of different mushroom species in their respective order and family

Name of species	Order	Family	Property
<i>Podaxispistillaris</i>	Agaricales	Agaricaceae	Conditionally edible and medicinal
<i>Coprinus comatus</i>	Agaricales	Agaricaceae	Conditionally edible and medicinal
<i>Agaricus hondensis</i>	Agaricales	Agaricaceae	Poisonous
<i>Agaricus trisulphuratus</i>	Agaricales	Agaricaceae	Poisonous
<i>Agaricus rotalis</i>	Agaricales	Agaricaceae	Inedible
<i>Agaricus campestris</i>	Agaricales	Agaricaceae	Edible
<i>Amanita sp.</i>	Agaricales	Agaricaceae	Poisonous
<i>Leucoagaricus americanus</i>	Agaricales	Agaricaceae	Inedible
<i>Leucocopinus sp.</i>	Agaricales	Agaricaceae	Edible
<i>Leucocoprinus cretaceus</i>	Agaricales	Agaricaceae	Inedible
<i>Macrolepiota procera</i>	Agaricales	Agaricaceae	Edible
<i>Lepiota sp.</i>	Agaricales	Agaricaceae	Inedible
<i>Parasola sp.1</i>	Agaricales	Psathyrellaceae	Inedible
<i>Parasola sp.2</i>	Agaricales	Psathyrellaceae	Inedible
<i>Psathyrella sp.</i>	Agaricales	Psathyrellaceae	Inedible
<i>Parasola conopilus</i>	Agaricales	Psathyrellaceae	Inedible
<i>Marasmiellus ramealis</i>	Agaricales	Marasmiaceae	Conditionally edible
<i>Marasmius paratrichotus</i>	Agaricales	Marasmiaceae	Conditionally edible
<i>Marasmius sp.</i>	Agaricales	Marasmiaceae	Conditionally edible
<i>Marasmius elegans</i>	Agaricales	Marasmiaceae	Conditionally edible
<i>Marasmius rotula</i>	Agaricales	Marasmiaceae	Conditionally edible
<i>Mycenagalericulata</i>	Agaricales	Mycenaceae	Inedible
<i>Pleurotus sp.</i>	Agaricales	Pleutaceae	Edible
<i>Pleurotus djamore</i>	Agaricales	Pleutaceae	Edible
<i>Ganoderma sp.</i>	Polyporales	Ganodermataceae	Medicinal
<i>Ganoderma lucidum</i>	Polyporales	Ganodermataceae	Medicinal
<i>Polyporus sp.</i>	Polyporales	Ganodermataceae	Medicinal
<i>Favolustenuiculus</i>	Polyporales	Ganodermataceae	Medicinal
<i>Microporus xanthopus</i>	Polyporales	Ganodermataceae	Inedible
<i>Clitocybe sp.</i>	Agaricales	Tricholomataceae	Conditionally edible

(contd. part table 2)

<i>Clitocybe glaucocana</i>	Agaricales	Tricholomataceae	Conditionally edible
<i>Macrocybecrassa</i>	Agaricales	Tricholomataceae	Edible
<i>Geastrumsaccatum</i>	Geastrales	Geastraceae	Medicinal
<i>Amylosporuscampbellii</i>	Russulares	Bondarzewiaceae	Edible and medicinal
<i>Auricularia auricula-judae</i>	Auriculariales	Auriculariaceae	Edible and medicinal
<i>Phallus impudicus</i>	Phallares	Phallaceae	Edible at egg stage
<i>Phallus sp</i>	Phallares	Phallaceae	Edible at egg stage
<i>Schizophyllum commune</i>	Agaricales	Schizophyllaceae	Medicinal
<i>Schizophyllum sp.</i>	Agaricales	Schizophyllaceae	Medicinal
<i>Termitomyces sp.</i>	Agaricales	Lyophyllaceae	Conditionally edible
<i>Cyathus striatus</i>	Agaricales	Nidulariaceae	Medicinal
<i>Ramariaflaccida</i>	Gomphales	Gomphaceae	Medicinal
<i>Ramariopsiskunzei</i>	Gomphales	Gomphaceae	Medicinal
<i>Tremella foliacea</i>	Tramellales	Tremellaceae	Edible
<i>Crepidotus sp.</i>	Agaricales	Crepidotaceae	Inedible and some are poisonous
<i>Daldiniaconcentrica</i>	Xylariales	Hypoxylaceae	Medicinal
<i>Xylaria polymorpha</i>	Xylariales	Xylariaceae	Medicinal
<i>Xylaria sp.</i>	Xylariales	Xylariaceae	Medicinal

Table 3 : Species diversity of mushrooms by Shannon diversity Index and Simpson Index of Diversity of Amirgadh and Danta talukas of North Gujarat

Location	Shannon Index of Diversity	Simpson Index of Diversity
Amirgadh	1.48	1.23
Danta	1.43	1.41

photographs of the collected specimen have been provided in Fig.2. Mushrooms can be used in monitoring of land ecosystems, woodlands in particular, as indicators of air and soil pollution and, among others, as bioindicators of environment pollution with heavy metals. Diversity of mushroom in a confined area with regular human interference also marks the good biodiversity of the area, and richness of the soil and land.

Description of the mushrooms (Fig. 2, 1-48)

Podaxis pistillaris

Podaxis pistillaris, commonly known as the desert shaggy mane or stalked puffball. Description:

Spore size was 8–10 x 8–12 µm. Spore print was not obtainable as a “spore print,” but mature specimens shed very dark brown to nearly black spore powder. Stipe diameter was 1.0-2.5 cm and Stipe colour was whitish to brownish. Stipe length was 8-12 cm at maturity. Pileus shape was oval when young, becoming more or less cylindrical, with a rounded apex shaggy to scaly, dry, white to whitish or pale brownish; the margin tucked under and attached to the stem, the outer layer shredding in old age to expose the mass of spore dust inside. Pileus colour was white to whitish or pale brownish and Pileus diameter was 1.0-3.0 cm. Ecology (Habitat) of *Podaxis pistillaris* was sand soil after rain it was found. Edible when

sporocarp was white, local people eating this mushroom when it was unmaturing and they use as black powder of it on wound. conditionally edible.

Coprinus comatus

Gills colour was initially white and turn black (ink) and gills attachment was free from the stem; white, becoming pinkish, then black; turning to black "ink"; very crowded. Spore size was 9-13 x 7-9 µm, elliptical with a central to slightly eccentric pore. Spore print was black. Stipe diameter was 1-2 cm thick and Stipe colour was white. Stipe length was 4.5-14.0cm long. Pileus shape was oval to rounded-cylindrical when young, expanding to bell-shaped with a lifting margin, in age turning to black "ink". Pileus colour was initially white and at maturity black and Pileus diameter was 1-3cm. Ecology (Habitat) was sandy soil/saprophytic condition.

Agaricus hondensis

Gills colour was initially light pink and turns brown at maturity and gills attachment was free, close. Spore size was 3.0-4.0 X 2.5-4.0 µm. Spore print was brown to black. Stipe diameter was 1.3-2.5 cm thick and Stipe colour was light yellow. Stipe length was 5-7.2 cm long. Pileus shape was convex at first, then plane round. Pileus colour was white shading to a light yellow-brown, covered with appressed pale pinkish yellow - brown to lilac brown scales and pileus diameter was 5-7.3 cm. Ecology (Habitat) of *Agaricus hondensis* was on soil near to water flowing area of rainwater.

Agaricus trisulphuratus

Gills colour was white and gills attachment was close-free. Spore size was 5-6 × 3.2-4 µm. Spore print was brown. Stipe diameter was 0.5 cm and stipe colour was orange. Stipe length was 6.3 cm long. Pileus shape was hemispherical, conical, broadly conical and convex. Pileus colour was orange with scales over body and stalk and Pileus diameter was 2.5 cm. Ecology (Habitat) was saprobic found below shade trees.

Agaricus rotalis

Gills colour was pink. Gills attachment was free from the stem and spacing close or crowded.

Spore size was 6.5–8 µm and 4.0-6.0 µm varies and spore print was brown. Stipe diameter was 1.0-1.5 cm and Stipe colour was white. Stipe length was 4.5-6.0 cm. Pileus shape was initial button shape after maturation round. Pileus (Cap) having with very distinctive radially cracked black fibrous and pileus diameter was 4.5-6 cm. *Agaricus rotalis* was found at base of perennial trees

Agaricus campestris

Gills colour was pink, becoming blackish-brown at maturity and gills attachment was close-free. Spore size was 6.5–8.5 µm and spore print was blackish-brown. Stipe diameter was 1-2cm and stipe colour was white. Stipe length was 3-6 cm long. Pileus shape was cap like 5-10 cm broad, convex. Pileus colour was whitish and centre is little brown with drops of depression. *Agaricus campestris* was saprobic found in rich soil scattered, below bamboo tree also.

Amanita sp

Gills colour was white and gills attachment was free, or nearly free, from the stem, close or crowded. Spore size was 5.0-6.5 × 3.0-4.0 µm and spore print was white. Stipe diameter was 1-1.5 cm and stipe colour was white. Stipe length was 3-4 cm. Pileus shape was convex, white annulus, sack like volva encasing the base. Pileus colour was white and pileus diameter was 4.5-5.5 cm. *Amanita sp.* was saprobic found in rich soil scattered.

Leucoagaricus americanus

Gills colour was white to pink and gills attachment was close-free to crowded. Spore size was 11.0-13.00 × 6.0-8.0 µm and spore print was cream-colored. Stipe diameter was 0.5-1.0 cm and Stipe colour was pinkish to white. Stipe length was 7.0-8.0 cm. Pileus shape was roundish when young, becoming convex and eventually broadly convex. Pileus colour was white and cinnamon-brown to dull reddish-brown at center cap is scaly, and also turns reddish as the mushroom matures. Pileus diameter was 5.0-7.0 cm. *Leucoagaricus americanus* was saprobic found in rich soil scattered.



Fig 2. Photographs of macromycetes collected during the study. 1-*Podaxis pistillaris* 2.*Coprinus comatus* 3. *Agaricus hondensis* 4. *Agaricus trisulphuratus* 5.*Agaricus rotalis* 6. *Agaricus campestris* 7. *Amanita* sp. 8. *Leucoagaricus americanus* 9. *Leuocopinus* sp. 10. *Leuocoprinus cretaceus* 11. *Macrolepiota proceara* 12. *Lepiotas* sp. 13. *Parasola* sp. 14. *Parasola* sp. 2 15. *Psathyrella* sp. 16. *Parasola conopilus* 17. *Marasmiellus ramealis* 18. *Marasmius paratrichotus* 19. *Marasmius* sp. 20. *Marasmius elegans* 21. *Marasmius rotula* 22. *Mycenagalericulata* 23. *Pleurotus* sp. 24. *Pleurotus djamore* 25. *Ganoderma* sp. 26. *Ganoderma lucidum* 27. *Polyporus* sp. 28. *Favolustenuiculus* 29. *Microporus xanthopus* 30. *Clitocybe* sp. 31. *Clitocybe glaucocana* 32. *Macrocybe crassa* 33. *Geastrum saccatum* 34. *Amyloporus campbellii* 35. *Auricularia auricula-judae* 36. *Phallus impudicus* 37. *Phallus* sp. 38. *Schizophyllum commune* 39. *Schizophyllum* sp. 40. *Termitomyces* sp. 41. *Cyathus striatus* 42. *Ramaria flaccida* 43. *Ramariopsis kunzei* 44. *Tremella foliacea* 45. *Crepidotus* sp. 46. *Daldinia concentrica* 47. *Xylaria polymorpha* 48. *Xylaria* sp

***Leuocoprinus* sp.**

Gills colour was white and gills attachment was free from the stem, close or crowded. Spore size was 4-9 x 3.5-7.0- μm and spore print was white to creamy. Stipe diameter was 0.5-0.7 cm and bulbous at base. Stipe colour was creamy and stipe length was 5-8 cm. Pileus shape was roundish and sub-cylindric, expanding to convex. Pileus colour was creamy peripheri and center is orange. Pileus diameter was 3.5-6.5 cm. *Leucoagaricus* sp. was found at base of tree.

Leuocoprinus cretaceus

Gills colour was white and gills attachment was free from the stem, close or crowded. Spore size

was 6-12 x 4-7- μm and spore print was white to creamy. Stipe diameter was 0.3-0.5 cm and bulbous at base. Stipe colour was white and stipe length was 5-8 cm. Pileus shape was roundish or blocky and sub-cylindric when young, expanding to convex or nearly flat, white covered with small, wart-like scales. Pileus colour was white. Pileus diameter was 3.5-6.5 cm. *Leucoagaricus cretaceus* was saprobic found in crack of ficus sp. tree, dead wood also rich soil scattered.

Macrolepiota proceara

Gills colour was pink to white and gills attachment was crowded, and free from the stem. Spore size

was 11.5–13.0×6.5–10.5 μm and spore print was white. Stipe diameter was 1-1.5 cm and bulbous at base. Stipe colour was white and stipe length was 6-8.5 cm. Pileus shape was initially convex latter on flat round. Pileus colour was little bump in the center of the mature cap, the brown scales over cap. Pileus diameter was 15-20 cm. Ecology (Habitat) was saprobic condition.

***Lepiota* sp.**

Gills colour was pink and in mature brown to black. Gills attachment was free or crowded gills. Spore print was white. Stipe diameter was 0.7-1.3 cm. Stipe colour was pinkish white and stipe length was 3.0-6.5 cm. Pileus shape was initially hemispherical, becoming broadly convex and sometimes almost flat. Pileus colour was white to pink and pileus diameter was 4 to 4.5cm. *Lepiota* sp. was found on soil and near base of tree.

***Parasola* sp.1**

Gills colour was grey to blackish and gills attachment was free, close to sub distant in age. Spore size was 3.0-4.0 x 5.0-6.8 x 4.0-5.5 μm , heart to apple-shaped to weakly angular in face-view. Spore print was black. Stipe diameter was 0.3-0.7- cm thick. Stipe colour was smooth white and stipe length was 4.5-6.5 cm long. Pileus shape was broad at maturity, expanding to convex and sometimes almost flat. Pileus colour was grey to white, alternate white grey stripe and pileus diameter was 3-3.5 cm broad at maturity. *Parasola* sp.1 was found scattered on soil seen after rain.

***Parasola* sp. 2**

Gills colour was greyish brown to blackish at maturity and gills attachment was free, close to sub distant in age. Spore size was 9-13 x 7-9 μm , heart to apple-shaped to weakly angular in face-view. Spore print was black. Stipe diameter was 1-2 cm thick. Stipe colour was smooth white and stipe length was 5-14 cm long. Pileus shape was small, umbrella-shaped fruit bodies, initially elliptical before flattening out, and colored reddish-brown to greyish initially white and at maturity black. Pileus colour was grey brown at centre and

rest area white to grey and pileus diameter was 2.0-2.5 cm. *Parasola* sp.2 was found on sandy soil / saprobic condition.

***Psathyrella* sp.**

Gills colour was pale grey-brown becoming medium-brown in age and gills attachment was adnate to seceding, narrow- close. Spore size was 7-9 x 3.5-5 μm , elliptical, smooth. Spore print was dark brown. Stipe diameter was 0.3-0.5 cm. Stipe colour was hollow, fragile and white. Stipe length was 3-6 cm tall. Pileus was broad, broadly conic, and then convex in age; margin wavy. Pileus colour was light-brown to honey-brown cracked when mature and pileus diameter was 1.5-3.5 cm. *Psathyrella* sp. was found on on living tree cut branches area and cracks of branches.

Parasola conopilus

Gills colour was pale brown and gills attachment was crowded, adnate. Spore size was 9.5–13.5 x 4.5– 7.5 μm , ellipsoid. Spore print was brown. Stipe diameter was 1-2 cm thick. Stipe colour was yellowish. Stipe length was 5-14cm long. Pileus shape was conical and pileus colour was reddish-brown (when young). Pileus diameter was 2.0-3.5 cm. *Parasolaconopilus* was found solitary, scattered, or clustered in woodchips, rich soil, and waste places.

Marasmiellus ramealis

Gills colour was white and gills attachment was adnate, narrow. Spore size was 7.5-11 x 2.5-4 μm . Spore print was white. Stipe diameter was 0.2-0.4 cm. Stipe colour was white. Stipe length was 4-5.5 cm. Pileus shape was round and pileus colour was white. Pileus diameter was 2.5-3 cm. *Marasmiellusramealis* was found in crack of tree, old branches of tree, on dead twigs fallen from plant.

Marasmius paratrichotus

Gills colour was light orange and gills attachment was adnate, narrow. Spore size was 10.5-12 x 3.5-4.6 μm . Spore print was white. Stipe diameter was 0.2-0.4 cm. Stipe colour was brown and thin thread like. Stipe length was 6-7.5 cm. Pileus shape was obtusely conical to convex, expanding to plano-convex. Pileus diameter was 1.3-2.5 cm

and pileus colour was orange. *Marasmius paratrichotus* was found old branches fallen, on dead twigs and rich soil area.

Marasmius sp.

Gills colour was white to light orange and gills attached to a tiny “collar” that encircles the stem at distant. Spore size was 6.5-7.5 x 3-5 μm . Spore print was whitish. Stipe diameter was 0.1 cm. Stipe colour was shiny, wiry, pale, dark brown to black. Stipe length was 3.5-7.5 cm. Pileus shape was broadly convex, center orange. Pileus diameter was 0.5-2.0 cm and pileus colour was light yellow to pale orange. *Marasmius sp.* was found at base of tree and on trunk of tree, fallen leaves.

Marasmius elegans

Gills colour was white and gills were narrowly attached to the stem, nearly distant. Spore size was 7-10 x 4-5.5 μm . Spore print was white. Stipe diameter was 0.3 cm. Stipe colour was whitish stipe with white hairs at the base. Stipe length was 3.5-4.3cm. Pileus shape was convex. Pileus diameter was 1.9 cm and pileus colour was reddish-brown. *Marasmius elegans* was found on decaying wood.

Marasmius rotula

Gills colour was white to yellowish white and gills attached to a tiny “collar” that encircles the stem at distant. Spore size was 6.5-10 x 3-5 μm . Spore print was whitish. Stipe diameter was 0.1 cm. Stipe colour was shiny, wiry, pale, dark brown to black except at the apex. Stipe length was 3.5-8 cm. Pileus shape was broadly convex, soon developing a navel-like central depression; pleated. Pileus colour was pink to yellow and pileus diameter was 0.5-3.0 cm. *Marasmius rotula* was found at base of tree and on trunk of tree.

Mycena galericulata

Gills colour was white and gills were narrowly attached to the stem, nearly distant. Spore size was 7-10 x 4-5.5 μm . Spore print was white. Stipe diameter was 0.1-0.3 cm. Stipe colour was white and translucent. Stipe length was 5-7 cm. Pileus shape was convex to hemispherical. Pileus colour

was white and pileus diameter was 2-3 cm. *Mycena galericulata* was growing in clusters on hardwood logs and stumps.

Pleurotus sp.

Gills colour was white to yellow and gills were decurrent, white, and yellowish in age and veil was absent. Spore size was 6-9 x 2.5.5-3.9 μm , elliptical, nonamyloid. Spore print was white. Spore print was white. Stipe colour was absent. Pileus shape like margin lobed to wavy, margin rolled in young one fruiting body, surface smooth, white to light yellow. Pileus diameter was 3-8.4 cm long. *Pleurotus sp.* was found on decaying wood.

Pleurotus djamore

Gills colour was pink and gills attachment was decurrent. Spore shape was elliptical. Stipe colour was absent. Pileus shape was like margin lobed to wavy, curly cap to downward. Pileus colour was pink and pileus diameter was 3-6.5 cm broad. *Pleurotus djamore* was found on decaying wood of palm tree.

Ganoderma sp.

Gills colour was absent and gills were porus. Spore size was 7.5x6.25 μm , Spores rusty brown, oval, double walled. Spore print was Reddish brown. Pileus was having zonate rings of reddish-brown to dark brown, glabrous initially then becoming rough and corky, depressed, hemispherical, fan shaped brackets with undulate margin. Pileus colour was initially white then dark brown and pileus diameter was 15- 25 cm broad. *Ganoderma sp.* was growing on decaying wood logs of perennials tree like mango and neem tree.

Ganoderma lucidum

Gills colour was yellow pores and gills were porus. Spore size was 7.5x6.25 μm , spores rusty brown, oval, double walled. Stipe diameter was 1-2.5 cm. Stipe colour was dark brown. Stipe length was 3-5 cm. Pileus was kidney shape initially then depressed, hemispherical round shape seen and with white border latter on color changes to totally brix's brown. Pileus colour was reddish-brown to

dark brown and margin is white. Pileus diameter was 15- 25 cm broad. *Ganodema lucidum* was growing on decaying as well as living tree /wood logs of perennials tree like mango and neem tree.

***Polyporus* sp.**

Gills pore was seen and was hallow yellow. Gills attachment was small in small fruiting body and in big one it was visible and hallow. Stipe diameter was 0.5-1.1 cm. Stipe colour was yellow-orange. Stipe length was 1-2.5 cm. Pileus was kidney shape or fan shaped. Pileus colour was yellow-orange. Pileus diameter was 9-18 cm. *Polyporus* sp. was found on *Ficus* sp. tree.

Favolus tenuiculus

Gills colour was white-yellow and gills were porus. Spore size was 7-11 x 3-4 μm . Stipe diameter was 5 mm. Stipe colour was white to pale yellowish and stipe length was 1-2 cm. Pileus was semicircular to round or lobed in outline. Pileus colour was white to pale yellowish (may because of rain) and pileus diameter was 5.0-7.5 cm. *Favolus tenuiculus* was found on the deadwood of various hardwoods.

Microporus xanthopus

Gills colour was white and gills lower surface are white with lots of micropore on it. Stipe diameter was 0.5 cm. Stipe colour was dull white and stipe length was 2.1 cm. Pileus was funnel-shaped cap and are concentrically zoned in various shades of brown and white border at edge. Pileus colour was brown and white. Pileus diameter was 4.5-7.5 cm. *Microporus xanthopus* was found on the dead wood, fallen branches and barks.

***Clitocybe* sp.**

Gills colour was pale pink to pale purplish and gills attached to the stem, crowded, short-gills frequent. Spore size was 4-7 x 2.5-3 μm . Spore print was pink to white. Stipe diameter was 1.5-2 cm thick. Stipe colour was pale purplish to white and stipe length was 3-5 cm long. Pileus shape was convex with an in rolled margin when young, becoming broadly convex to nearly flat or with an uplifted. Pileus colour was whitish to very pale

tan. Pileus diameter was 5-8.3 cm. *Clitocybe* sp. was found solitary to scattered to gregarious soil where organic matter high.

Clitocybe glaucocana

Gills colour was pale purplish and gills attached to the stem, crowded, short-gills frequent. Spore size was 4-7 x 2.5-3 μm . Spore print was pink to white. Stipe diameter was 2.0-2.3 cm thick. Stipe colour was pale purplish and stipe length was 3-4 cm long. Pileus look like Small fruiting body initially button shape and latter on become round. Pileus colour was pale tan to purple. Pileus diameter was 2.5-7.5 cm. *Clitocybe glaucocana* was found solitary to scattered to gregarious soil where organic matter high, found only after rain.

Macrocybe crassa

Gills colour was white and gills were crowded cream to white gills are adnexed to sinuate. Spore size was 5.0-6.5 μm long by 3.7-4.5 μm . Spore print was light creamy to white. Stipe diameter was 1.5-3.0 cm. Stipe colour was white and stipe length was 5.0-9.0 cm. Pileus shape was convex before expanding out and flattening. Pileus colour was creamy-white. Pileus diameter was 3.5-5.0 cm. *Macrocybe crassa* was found at wood of banian tree.

Geastrum saccatum

Spore shape and size was Globose, 3.5-4.5 μm , covered in small spiny warts. Spore print was light creamy to white. Fruiting body (Pileus) was puffball-shaped at first and measures 4-5.5cm wide. Pileus colour was whitish centre yellow. Pileus diameter was 7.3 cm. *Geastrum saccatum* was found on fallen decomposed leaves.

Amylosporus campbellii

Gills colour was white and gills were porus. Spore size was 3.0x 4.7-9 μm . Stipe diameter was 1.5-2.0 cm. Stipe colour was white and stipe length was 3-5 cm. Pileus shape was round. Pileus colour was white at initial and latter pink. Pileus diameter was 50-70 cm at maturity. *Amylosporus campbellii* was found at base of tree and soil.

Auricularia auricula-judae

Spore size was 16-18 x 6-8µm and sausage shaped (allantoid). Pileus was ear shape. Pileus colour was pink to brown and fine velvety down. Pileus diameter was 3-5.5 cm. *Auricularia auricula-judae* was found at dead elder trees and also on fallen branches.

Phallus impudicus

Spore size was 3-3.5x1-2.1 im and shape was elliptical to oblong. Stipe diameter was 1.6-2.3 cm. Stipe colour was yellow spongy. Stipe length was 6.0-8.0 cm. Pileus shape was phallus and pileus colour was slimy gleba, which is dark olive green. Pileus diameter was 1.5-2.5 cm. *Phallus impudicus* was found on sandy soils.

Phallus sp.

Spore size was 3-3.5x1-2.1 im and shape was elliptical to oblong. Stipe diameter was 2.0-3.1 cm. Stipe colour was whitish spongy, hollow and stipe length was 6.0-8.0 cm. Pileus shape was phallus. Pileus colour was grey to whitish gleba. Pileus diameter was 2.0-3.0 cm. *Phallus sp.* was found on sandy soils and near to water running area.

Schizophyllum commune

Gills colour was white and gills were longitudinally split. Spore size was 6-8 x 1-1.5 µm. Spore print was white. Stipe diameter was absent. Pileus was leathery and fan-shaped bracket. Pileus colour was ashy grey to white. Pileus diameter was 1-3.5 cm. *Schizophyllum commune* was found on died wood, branches in cracks.

Schizophyllum sp.

Gills colour was white to grey and gills were longitudinally split. Spore size was 6-8 x 1-1.5 µm. Spore print was white. Stipe diameter was absent. Pileus was a leathery, fan-shaped bracket. Pileus colour was light greyish-brown at center around its ashy grey to white and overlapping. Pileus diameter was 2-3.5 cm. *Schizophyllum sp.* was found on died wood, branches in cracks.

Termitomyces sp.

Gills colour was white and gills attachment were free, broad and crowded. Spore print was brown.

Stipe diameter was 0.5-0.7 cm. Stipe colour was whitish at base little swelling seen. stipe length was 8-10 cm. Pileus was a round cap and after maturation cracks seen from margin. Pileus colour was greyish-white cap with white gills. Pileus diameter was 4.0-8.0 cm. *Termitomyces sp.* was found on soil which is rich in organic matter/on termite mounds.

Cyathus striatus

Common name: Bird's nest fungi. Spore size was 18-20 x 8-10 µm and oval-Ellipsoidal. Pileus was funnel-shaped fruiting bodies, inverted cone like or cup like. Peridia size was 6 to 10 mm across and 6 to 15mm tall. Pileus diameter was 2.0 cm. *Cyathus striatus* was found in clusters on dead wood.

Ramaria flaccida

Gills colour was white. Spore was ellipsoidal, 6.5-8.5 x 3-5 µm, ornamented with spiny warts; inamyloid. Spore print was rusty yellowish. Stipe diameter was 0.1-0.2 cm. Stipe colour was white below colored like the branches above attached to numerous white-yellow. stipe length was 4-10 cm wide. Pileus was branching repeatedly. Pileus colour was yellowish to creamy. *Ramaria flaccida* was found on decaying wood.

Ramariopsis kunzei

Spore size was 3-5 x 3-4.5, globose, subglobose. Spore print was rusty yellowish. Stipe diameter was 0.1-0.2 cm. Stipe colour was White below colored like the branches attached to one above. Stipe length was 4.0-5.0 cm. Pileus shape was branching repeatedly, coral like. Pileus colour was white. Pileus diameter was 2-12 cm high up to 10-15cm wide, repeatedly branched. *Ramariopsis kunzei* was found on decaying wood.

Tremella foliacea

Spore size was 7-8.5 x 6-8.5 µm. Pileus shape was like folded leaf. Pileus colour was red to brown. Pileus diameter was 5-20 cm broad. *Tremella foliacea* was found on tree of karanj and other perennial tree.

Crepidotus sp.

Gills was whitish in colour and Radiating from the point of attachment, nearly distant. Spore size

was 4.5-5.0 to 5.0-6.5 μm and spore print was brown. Pileus was shell-shaped or fan-shaped, finely hairy. Pileus colour was white to whitish. Pileus diameter was 2.0 – 3.0 cm. *Crepidotus sp.* was found on fallen decomposed leaves.

Daldinia concentrica

Spore size was 5x2.5 μm . Spore print was black in colour. Pileus shape was spherical, tuber like and hard. Pileus was pale violet to light purple colored, Surface smooth on upper side, rough and tanned black on underside. Pileus diameter was varied from 3- 6.5 cm. *Daldinia concentrica* was found on dead wood.

Xylaria polymorpha

Conidia seen as spore. Pileus was varied in shape like human finger, erect and tough. Pileus was whitish to grey in color after maturation become black and it was 3 to 5 cm in diameter and 8-10cm long. *Xylaria polymorpha* was found on tree.

Xylaria sp.

Pileus was Varied in shape like human finger, erect and tough. Pileus colour was whitish to grey in color after maturation become black. Pileus diameter was 0.2- to 0.5 cm and 3-4 cm long. *Xylaria sp.* was found on tree and fallen branches.

CONCLUSION

In conclusion, this study underscores the rich macrofungal biodiversity harboured within the ecologically diverse landscapes of North Gujarat, specifically across the Amirgadh and Danta talukas. The quantitative assessment using diversity metrics reveals that both talukas maintain a highly comparable and robust distribution of macromycetes. Amirgadh taluka displayed marginally higher species richness and evenness with a Shannon Diversity Index of 1.48 (Simpson Index: 1.23) compared to Danta taluka's Shannon Index of 1.43 (Simpson Index: 1.41). The baseline inventory compiled between 2019 and 2022. Crucially, the structural composition of the local Mycobiota is heavily dominated by members

of the division Basidiomycota (45 species) over Ascomycota (3 species). These findings significantly expand the documented fungal flora of the region and provide critical ecological baseline data essential for the conservation and sustainable management of macrofungal resources in Gujarat.

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Conflict of Interest. Authors declare no conflict of interest.

REFERENCES

- Arora, D. 1986. *Mushrooms Demystified: A Comprehensive Guide to the Fleshy Fungi*. Ten Speed Press, Berkeley.
- Bessey, E. A. 1950. *Morphology and Taxonomy of Fungi*. The Blakiston Company, Philadelphia.
- Calonge, F. D. 2005. *Gasteromycetes, I. Lycoperdales, Nidulariales, Phallales, Sclerodermatales, Tulostomatales. Flora Mycologica Iberica*, Vol. 4. J. Cramer, Berlin-Stuttgart.
- Fazio, A. T., et al. 2010. Fungal deterioration of a Jesuit South American polychrome wood sculpture. *Intern. Biodeterior. Biodegrad.* **64**: 694-701.
- Hedawoo, G. B. 2010. Wild mushroom flora from Amravati region, Maharashtra, India. *J. Mycol. Plant Pathol.* **40**: 441.
- Keizer, G. J. 1998. *The Complete Encyclopedia of Mushrooms*. Rebo International, Netherlands.
- Koyani, R. D., Rajput, K.S. 2014. Light microscopic analysis of *Tectona grandis* Lf wood inoculated with *Ipexlacteus* and *Phanerochaete chrysosporium*. *Eur. J. Wood and Wood Prod.* **72**: 15.
- Lodge, D. J. et al. 2004. Terrestrial and lignicolous macrofungi. In: *Biodiversity of Fungi, Inventory and Monitoring Methods*. 127-158.
- Marchisio, V. F. 2000. Keratinophilic fungi: their role in nature and degradation of keratinic substrates. *Biol. Dermatoph. and other Keratinoph. Fungi* **17**: 86-92.
- Miles, P.G., Shu-Ting, C. 2004. *Mushrooms: cultivation, nutritional value, medicinal effect, and environmental impact*. CRC press.
- Natarajan, K., Raman, N. 1983. *South Indian Agaricales: A Preliminary Study of Some Dark Spored Species. Bibliotheca Mycologica*, Band 89. J. Cramer, Vaduz.

- Patel, S. R., Pithawala, M. 2024. A Survey of Mushroom Diversity, Identification, And Preservation in Five Different Districts of South Gujarat. *Acta Scientif. Microbiol.* 7: 16-26.
- Patel, J., Patel, D., Patel, D. 2025. Evaluation of wild edible mushrooms in Vansda National Park, Gujarat, India. *Curr. Bot.* 16: 278-285
- Parihar, S., Pithawala, E. A., Lahiri, S. K., Shukla, M.D., Jain, N.K., Modi, H.A. 2015. Mushroom diversity of mahal forest range of dang district, Gujarat, India. *Ind. J. Fundam. Appl. Life Sci.* 5: 43-51
- Pegler, D. N. 1999. *Agarics of São Tomé, West Africa*. Kew Bulletin, Royal Botanic Gardens.
- Purkayastha, R. P., Chandra, A. 1985. *Manual of Indian Edible Mushrooms*. Today & Tomorrow's Printers and Publishers, New Delhi.
- Ravat, H., John, P. 2016. Macrofungi diversity in Dangs district, Gujarat, India. *IJSN* 7: 477-482.
- Roy, A., De, A. B. 1996. *Polyporaceae of India*. International Book Distributors, Dehra Dun.
- Sanghvi, G.V., Koyani, R.D., Rajput, K.S. 2013. Anatomical characterisation of teak (*Tectona grandis*) wood decayed by fungus *Chrysosporium asperatum*. *J. Trop. For. Sci.* 25: : 547-553.
- Singer, R. 1986. *The Agaricales in Modern Taxonomy*. 4th ed. Koeltz Scientific Books, Koenigstein.
- Shah, D., Gangwar, K., Patel, K. 2023. Diversity of Mushroom in Sundarva in Sundarvan A Nature Discovery. *Species24*: e64s1567. Doi: [10.54905/species24.v24i74.e64s1567](https://doi.org/10.54905/species24.v24i74.e64s1567)
- Tadvi, D. S. 2013. *Floristic diversity of Dangs*. Diss. Ph. D. Thesis. MS University, Baroda, Vadodara.
- Van der Gucht, K. 1995. *A taxonomic revision of the genus Xylaria (Xylariaceae, Ascomycota) in Papua New Guinea*.
- Watling, R. 1973. *Identification of the Larger Fungi*. Hulton Educational Publications, Amersham.
- Zhishu, B., Zheng, G., Taihui, L. 1993. *The Great Chinese Mushrooms*. Science Press, Beijing.