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The Forest Flora/Vegetations in Different Seasons of Selected Areas of Chhatarpur Forest for Sample Collection of Fungi

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Abstract

The study delves into the morphological adaptations of fungi, such as the development of hyphae, rhizomorphs, and spores, which aid in nutrient acquisition and survival during nutrient-scarce periods. Significantly, the thesis highlights the critical role fungi play in nutrient cycling, their interactions with other organisms, and their contribution to the ecological balance by acting as natural decomposers. It also examines the impact of fungi on agriculture and industry, noting their potential in bioremediation and as sources of pharmaceuticals due to their complex secondary metabolites.

Keywords: Morphological, fungi, adaptations, secondary metabolites, nutrient acquisition

Introduction

The primary role of the fungi in nature has been fittingly described in the prophetic statement of B.O. Dodge (1939). The fungi are not degenerate organisms which are on their way out in a scheme of evolution and so of little economic importance and scientific interest. The fungi, on the contrary, are progressive, ever changing and evolving rapidly in their own way so that they are capable of becoming readily adapted to every condition of life. We may rest assured that as green plants and animals disappear one by one from the face of the globe, some of the fungi will always be present to dispose of the last remains.

The most important role of the fungi in the economy of nature is to act as all scavengers in disposing of dead and fallen vegetation. In this way the biologically essential elements are released for reuse, and the balance of nature is maintained. However, these are not the only functions of the fungi which are of interest and importance to man. Since the beginning of agriculture fungi have been used to prepare bread and other foods, as well as fermented beverages. Some fungi cause diseases of plants and animals. Knowledge of their role as the causal agents of plant diseases long antedated the recognition of bacterial diseases. While yeasts have long been used to produce alcohol, the vast potentialities of other species for the industrial production of organic acids and antibiotics have been recognised more recently. An understanding of life processes of the fungi is essential whether one wishes to control the fungi which cause disease to employ them in industry or to use them in the laboratory to unlock the secrets of nature.

The domains of physiology are the study of functions or life processes. Fungal physiology is the study of living fungi, their functions and activities, how they affect their environment and how the environment affects them like other branches of science. Fungal physiology has four phases of development.

1. Finding and confirming facts, which are the bedrock of all scientific disciplines.
2. Putting all of this information into a logical and consistent framework.
3. The dissemination of newly discovered facts and Formulating concepts based on both known and freshly found facts.
4. Formulating concepts based on both know and freshly found facts.

Fungi are great model organisms for studying the mysteries of nature because they are very sensitive to their surroundings. It is sometimes impossible to assess the impact of a single variable when dealing with environmental and dietary variables due to their complexity. In the lab, precise questions may be asked by manipulating the circumstances in which a fungus is cultured. Modern methods and the insatiable curiosity of the investigator are, in fact, the only constraints on the breadth and depth of inquiries that may be posed to fungus.

concept of parasitism and resistance. Knowledge of fungal physiology also improves comprehension of related domains. In order to study parasitic fungi in their natural habitat, plant pathologists often need to isolate the organism from its host and familiarize themselves with its culture techniques and nutritional needs. Physiological approaches are necessary for the investigation of the many unanswered questions that mycologists and plant pathologists confront. This is one of the trickiest aspects of growing obligatory parasite fungus on synthetic medium with a known formula. In the meanwhile, Unfortunately, it is not possible to ascertain the precise dietary needs of these mushrooms. Having this kind of information would definitely result in a superior

Literature review

Ashraf, Mehboob associated with (2021) [1] fungus in aquatic environments is crucial to the breakdown of aquatic trash. In light of the significance of aquatic fungus, researchers in India's Madhya Pradesh examined the variety of these creatures in two marshy habitatsKhurji Nala and the Gaur River, close to Jabalpur. In this investigation, 34 species of fungi and 6 species of chromista were found on substrates that were breaking down. The submerged litter samples of Dendroclamusstrictus and Tectona grandis included the highest number of fungus species. Different fungal species that colonies tree litter have their maximum percentage frequencies documented as well. Clustering has shown that an abundance of diversity is seen across fungal communities found on different plant hosts.

Bahram, Mohammad et al. (2021) [2]. Pretty much everywhere Earth's ecosystems Fungal play an important and varied role. They range in size from microscopic to macroscopic, and They display a diverse array of functional variety and dispersion strategies. The assembly patterns and processes of fungi are distinct from those of bacteria and other microbes, as well as from plants and other microorganisms, as has become more apparent as our understanding of microbial biogeography has expanded. The capacity of fungus to traverse several no other collections of organisms can match in terms of the complexity of their spatial, temporal, and biological interactions, and it is this quality that allows them to thrive and impact the environment. More and more research suggests that fungi mediate interactions between various ecosystem components, which may have an impact on the macroecology and evolutionary trajectory of the animals involved. The fact that fungal interactions link the environment and ecosystem functioning to various on the ecological and biological hierarchy of the organisms that support them, rivals, and their opponents implies that these interactions constitute a driving force in ecology. By concentrating with other groups regarding the dynamics of interactions between fungi with other groups of organisms across different habitats, we evaluate these new lines of evidence. Our research leads us to believe that fungus play an essential mediating function in Earth's ecosystems because of what happened intricate continuously evolving ecological relationships in which they are involved.

Baerlocher, Felix et al. (2015) [3]. Autochthonous primary producers, such as macrophytes, usually support terrestrial ecosystems, while allochthonous trees and shrubs provide the bulk of the food for smaller bodies of water. The development of planktonic bacteria and algae is also facilitated by open seas. Because macrophytes are very rare, aquatic fungal endophytes, mycorrhizas, and diseases have been unable to evolve and establish themselves. Terrestrial habitats support a much greater variety of fungi than aquatic ones, as expected (at least according to traditional, culture-based estimation methods). The net downstream displacement that occurs in running rivers is due to the unidirectional flow of water and the movement of organic materials. With the exception of lake sediments, where fungal development is not supported by anaerobic conditions, this stops the gradual buildup of leaves and twigs. The formation of rhizomorphs and other permanent exploring structures has been impeded by the lack via predictable organic refuse at progressively worsening deterioration stages. Passively disseminated asexual conidia mostly account for dispersal within temperate streams flowing through deciduous woods; the quantity of these conidia closely tracks seasonal changes in the number as they meander through deciduous forests in temperate streams of imported leaves. Fungi that live in water have a very small temperature range, and aquatic creatures are more resistant to sudden changes in temperature than their terrestrial counterparts. Aquatic fungus does not have water as a limiting element until there is a drought. Both total moisture (saturated soils, substrata) and lack of moisture (desiccation) may prevent the growth of fungi in terrestrial settings; however, in the latter situation, oxygen deficiency expected to take part in the deciding role. The solubility of oxygen in water is low and decreases as the temperature rises. It may rapidly decrease to levels that significantly suppress fungal growth when exposed to organic chemicals that degrade swiftly, such as pollution. The presence of water currents may partially make up for depleted oxygen levels, just as they do for nutrients like N or P. Fungi, whether they live in water or on land, mediate interactions between plant structures and the animals that feed on plant debris. Typically, when fungi colonies plant debris, the carbon: nitrogen and carbon: phosphorus ratios decrease. Macroscopic fungal structures, such as rhizomorphs and big fruit bodies, are almost nonexistent in aquatic environments, which has hindered the development of macroinvertebrates that are exclusively mycophagous.

Sidorova, I.I. et al. (2020) [7]. Fungi are anticipated to be impacted by global change in two ways: directly and via related species. Fungi are ubiquitous and play multi-faceted functions in ecosystems; as a result, their reactions to climate change, severe weather, increased carbon dioxide and nitrogen levels, and other adverse stresses are crucial. The enormous diversity among organisms of fungus and guilds, in addition to persistence of knowledge gaps in yeast infection geography and ecology, make it difficult to distinguish between fungal and non-climatic reactions to climate change variables. We give a review of new data on several kinds of terrestrial fungus, including saprotrophic, mycorrhizal, and pathogenic fungi, and their views on climate change. We also explore potential processes that might explain the observed or expected consequences of this shift.

Wang, Yan other people. (2023) [8]. The variety the kingdom of fungi is estimated to be second to none, thanks to their millions of years of evolution. Many creatures' evolutionary paths have been influenced by fungi because of their cross-kingdom interactions. When it comes to understanding changing from fungus moving from the water to the land habitats, zygomycete fungi have a significant impact on fungal tree of life. Based on their evolutionary relationships, zygomycete fungi have split into two categories: the plant-associated Mucoromycota and the animal-associated Zoopagomycota. Interactions between these fungi and many organisms, including plants, mammals, bacteria, and other microorganisms, may have influenced genetic components that caused these lineages to diverge and improve in fitness. In order to delve into this, we used our newly generated collection of zygomycete genomes-which includes nine genomes specifically designed for this study-to conduct comparing genetic studies of the two zygomycete clades within the framework of Kingdom Fungi. We found genetic material that is exclusive to a certain lineage, which would explain why these zygomycetes have such different biology. Our research uncovered previously unknown variation in the Mucormycosis pathogenicity factor CotH, which was present in a wide diversity of zygomycetes. Reconciliation study revealed a rise in the number of copies of CotH and many duplication events in the lineages of Neocallimastigomycota, Basidiobolus, Mortierellomycotina, and Mucoromycotina. Furthermore, a phylogenomic study at the kingdom level uncovered new evolutionary links among the Mucoromycota and *Zoopagomycota subphyla*. Basidiobolus was identified as a sister to other lineages of Zoopagomycota, and the sister-clade connection between Glomeromycotina and Mortierellomycotina was confirmed by these associations.

Materials and Methods

This is DESeq2. By using DESeq2 (version 1.10.1), we were able to ascertain if there were statistically significant variations in the relative abundances of ASV across treatments. Based on the methods employed by Pelikan et al., we adjusted the procedure presented in conjunction with DeSeq2, during the phyloseq addition and put it into practice. No ASV was retained unless it had five or more readings and was found in five or more samples from each environment. In order to feed the ASV table from phyloseq into DESeq2, we needed to convert all of the 0s to 1. If the p-value after adjusting for false-discovery rates (FDRs) was less than 0.05, the findings were deemed statistically significant. The command used to extract these data was results (cooks Cutoff = FALSE, contrast = c ("ecosystem"," terrestrial", "oceanic").

The visualization and accessibility of data. Every single figure was made in R with the help of plot, then merged using the open-source and free program Inkscape, and then exported as svg files.

Results

Cda in Sturm Deutschlands Flora 3:41 (1831-1832)

Colletotrichum caseariaensis sp. nov. Plate 1

Dark brown to black leaf spots is epigenetically produced, and they are persistent, dot-like structures that appear on the top surface of the whole leaf in a regular pattern. Colony epiphyllous, round, brown to black in colour. Branching, interior mycelium. Cervular and cuticular conidiomata with uneven dehiscence 38–162 × 35–159µm in diameter. Inconspicuous dark brown sclerotia that are often confluent and setose; conidiomata have setae and sclerotia have fewer setae. The setae develop from any location where conidiomata are present; they may be short or long, straight or curved, enlarged at the base and narrowing towards the tip; the tip is sharp; they are around 14.5-139 × 1.5-11µm in length, and they are septate. Made up of cells from the conidiomata, conidiophores are often vague, transparent, and segmented. Cells that produce conidia are enteroblastic, phialidic, hyaline, determinate, and homogeneous. The conidia are transparent, aseptate, one-celled, round to oval, and smooth. 11.7–17.5 × 8.5–15.5µm.

TYPE: Based on specimens collected in December 2014 from the Badamalehra South Forest in Chhatarpur, Madhya Pradesh, India, on the live leaves of the Salicaceae plant (Casearia tomentosa Roxb., holotype AMH-9785, isotype S. U. Herb No. Bot. RK-16).

Etymology: The Latin word caseariaensis comes from the host genus's name.

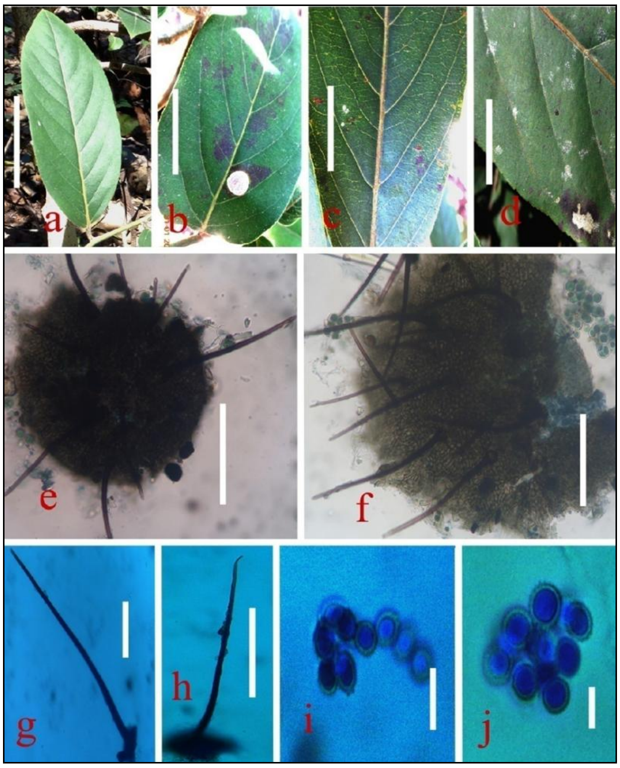

Plate 1: Microphotograph of Colletotrichum Caesariensis (holotype, AMH- 9785); a-d - Symptoms; e-f - Conidiomata The scale bars include the following: a-d= 20mm, e-f= 100µm, g -h= 100µm, i-j= 20µm, and Setae (g-h).

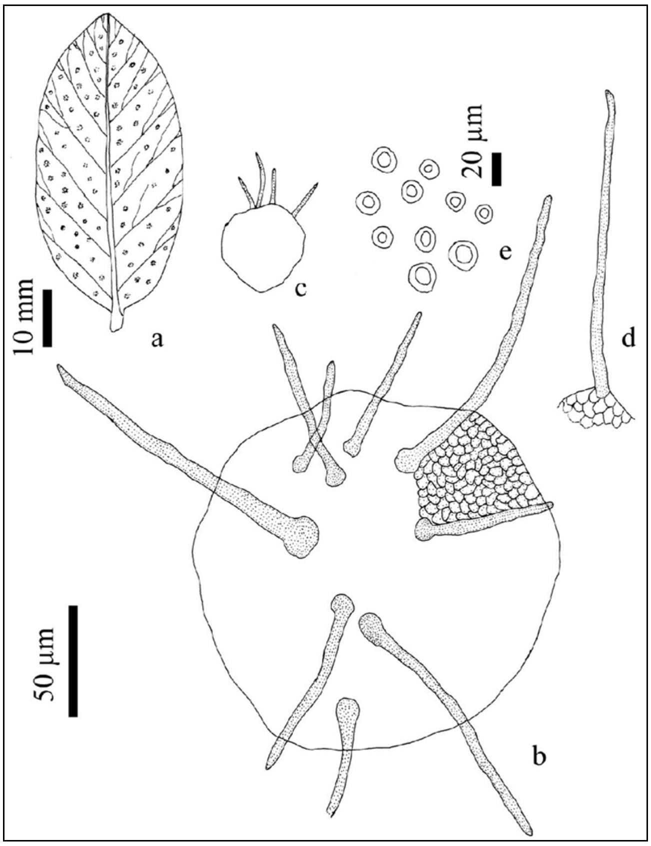

Fig. 1: Camera lucida drawing of Colletotrichum caseariaensis (holotype, AMH- 9785); a- Symptoms; b- c) Conidiomata, which have setae; d) Conidia, which have a single seta; Bars representing scale: a= 10 mm, b-d = 50 µm, and e = 20 µm.

Table 1: Comparative study of *Colletotrichum caseariaensis* sp. Nov. with allied species.

Character	*Colletotrichum crassipes* Sutton (1980)	*Colletotrichum gloeosporioides* Sutton (1980)	*Colletotrichum caseariaensis* **sp. nov.**
Colony	Variable development of dark chocolate brown, aerial mycelium.	Very variable, sclerotia occasionally present.	Colonies epiphyllous, persistent, dense, brown to blackish, sclerotia indistinct.
Conidiomata	Dark brown, conidial mass honey, sclerotia absent.		Acervulus rounded to cuticular, epidermal, separate, dehiscence irregular 37-162 × 35-159 µm. diam.
Appressoria	Abundant, medium to dark brown, long clavate or circular but with crenate or deeply divided edges, 10.5- 14 × 7-9.5 µm. often becoming complex.	Appressoria are 6-20 × 4-12 µm. clavate or irregular sometimes becoming complex.	
Conidia	Conidia straight, cylindrical, obtuse at the apices, 10-15 × 4.5-6.5 µm.	Conidia are straight, obtuse at the apex, 9-24 × 3-4.5 µm.	Conidia hyaline, aseptate, single cell, spherical to ovoid, smooth, 11-17 × 8.5-15 µm.
Setae	Present		Straight to slightly curved, swollen at the base and tapering to the apex, apex acute, dark brown to blackish, 14.5-139 × 1.5-11 µm. long.

According to a comprehensive literature review, our collection has only been compared to two other species, *Colletotrichum crassipes* and C. *gloeosporioides* (Table-1). According to the statistics, the suggested tax is quite diverse in terms of the structure, size, and symptoms of a number of taxonomic traits.

Also, so yet, the host genus has not yielded any Colletotrichum species. From what we can see, it seems to be a new species that is being discarded.

Conclusion

The study focus Substratum differences between the Arctic and Antarctica are a major contributor to the polar regions' divergent fungal species richness. Fungi detection technologies are not very good at seeing biodiversity, thus it's best to take a holistic view. It should be approached with care when asserting that certain fungi are endemic to the polar areas or both poles, since the majority of fungal species found are cosmopolitan and there is little evidence of endemic species in polar regions. With respect to microbes, we think the remark "Everything is everywhere, but the environment selects" would be applicable for almost a hundred years. "Fungi are everywhere but the environment selects those that can become established." A little tweak to the original remark on fungus.

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