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On the cover: Adult bug *L. augur*. and its host plants. (a) *S. saponaria*, (b) *S. saponaria* (rearing box), (c) *B. monosperma* (Palas), (d) *E. geniculata* (Dudhani), (e) *A. latifolia* (Dokela), and (f) *C. pentandra* (Savar). Image credit: Badwaik and Barsagade (2021).

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Microstructure characterization of male and female external genitalia of soapberry bug, *Leptocoris augur* (Hemiptera: Rhopalidae)

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ABSTRACT

Morphological studies were conducted on male and female genitalia of *Leptocoris augur* (Fabricius, 1781) by using light microscopy as well as scanning electron microscopy (SEM) studies. Detailed morphological descriptions of the genitalia of *L. augur* (male and female) were studied for the first time. Five main types of sensilla, i.e., sensilla trichoidea, sensilla basiconica, microtrichia, sensilla coeloconica, and setae, were observed, and their possible role with respect to taxonomy, host plant selection, and copulatory behavior have been discussed.

1. INTRODUCTION

Heteropteran "stink bug" (e.g., Pentatomidae) possess scent glands in their abdominal segments that secrete an unpleasant smelling substance to save themselves from being attacked. On the contrary, the Rhopalid bugs, *Leptocoris augur* (Fabricius 1781), do not have any scent gland(s) in their abdominal segments, which is a characteristic of the Rhopalidae family [1]. They are plant bugs and belong to the superfamily Coreoidea, which includes 21 genera [2]. The Rhopalid bugs are commonly called scentless plant bugs, as the scent glands are absent. However, this term is misleading and inappropriate (in terms of identifications) because some rhopalids commonly produce redolent compounds [3].

External genitalia and its microstructure play an important role in identifying species; in some instances, it is difficult to identify on the basis of morphology only [4]. Rhopalidae bugs are particularly "plant bugs", as they are always associated with plants [5-7]. Mead and Fasulo [1] and Barsagade and Badwaik [8] reported

on Sapindaceae as primary hosts plants for *Leptocoris* and its closely related genus *Jadera*. In addition, we also noted that the bug, *Leptocoris*, colonizes on other secondary host plants like, *Butea monosperma* (Palas), *Euphorbia geniculata* (Dudhani), *Ampelocissus latifolia* (Dokela), *Ceiba pentandra* (Savar), *Psidium guajava* (Guava), *Bougainvillea*, and *Lablab* sp. (Fig. 1a-f). Scentless plant bugs, *L. augur* and *Liorhyssus hyalinus*, are economically important, as they can attack certain vegetable crops like cucumber, pumpkin, and cabbage, which leads to economic loss [9,10]. To avoid such damage, pest population (e.g., plant bugs) needs to be checked. In addition, to study the behavioral aspect and alternative pest control strategies (e.g., pheromone traps), the sensory microstructure has been investigated during the course of the present study.

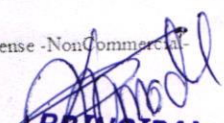
The external genitalia of plant bugs have been characterized for taxonomic applications, while the external female genitalia of the Triatominae subfamily have been rarely characterized for taxonomy [11-13]. Scanning electron microscopy (SEM) study of the external genitalia of some insect species, e.g., *Rhodnius prolixus*, *Rhodnius colombiensis*, *Panstrongylus herreri*, and *Panstrongylus megistus*, suggests the role of its genitalia morphology in taxonomical study [14].

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An Analytical Study of Institutional Infrastructure for Export Promotion: Issues and Implications

Prof. Dr. Siddhartha D. Nagdive
Vidyabharti College, Seloo, Dist:-Wardha (MS)

Introduction

The structure of Indian exports is typical of a developing economy. India has traditionally been an exporter of agricultural raw material and manufactures based on agricultural raw material. There has been continuous decline in the share of agricultural raw materials and allied products. One reason for the relative decline of food, beverages and tobacco in the total exports is the increase in population and consequent increase in domestics' consumption of these goods. Accordingly, the export surplus in many traditional commodities like Tea, has not been increasing as much as the Government would have wished. In this connection the growing importance of certain product, cashew kernels, coffee and rice. Vegetable and fruits are also growing in importance.

Since 1960, under the impact of industrialisation exports of non-traditional items are gaining in importance. These items consist of engineering goods, handicrafts, which include pearls, precious and semi-precious stones and jewellery, iron and steel, machinery and metal manufactures, chemicals, readymade garments, fish and fish preparations. These goods constitute about 70 per cent of Indian export. The fact that some of these non-traditional item's such as engineering goods, handicrafts, ready-mades etc. have established themselves in the markets of even the most advanced countries show that they would continue to be part of India's exports in the years to come.

India is now in a position to take advantages of both favourable demand situation and attractive price situation in international market. While some commodities have tremendous exports potentials e.g. handicrafts, engineering goods, ready-mades, sugar, jute, yarn and manufactures, iron and steel have fluctuated widely. With the announcement of the new agricultural policy emphasis is being given to boosting the export of agricultural products. Rice export is gaining importance besides this fruits and vegetables and processed foods are also becoming significant in our exports.

The export promotion programmes Initiated by the Government

A Firm has to overcome several barriers in its process of internationalization. It, therefore, become necessary for an export manager to know about the institutional



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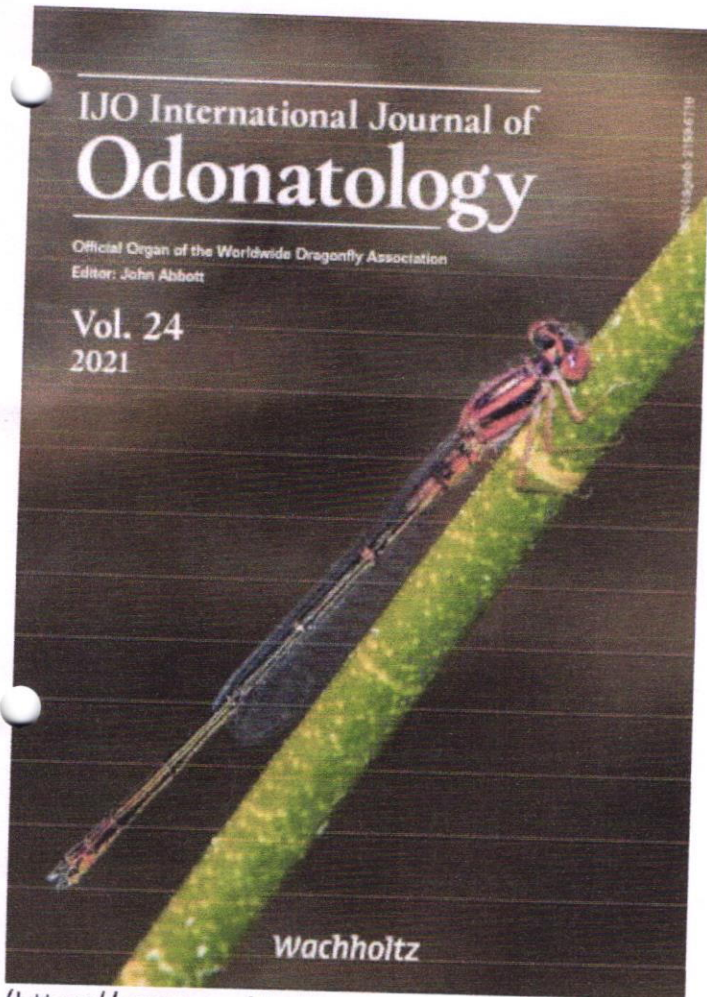
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Lost in Time: Re-description and Ecological Re-assessment of two Indian Endemic *Flattoneura* Cowley, 1925 (Platygnemididae)

Pankaj Koparde^{1*}, Sridhar Halali^{2†}, Ashish Tiple³, Parag Ranganekar⁴, Amol Sonawane⁵, Arajush Payra⁶, Prosenjit Dawn⁷, Ashwini Raju⁸ and K.A. Subramanian⁹

Lost in Time: Re-description and Ecological Re-assessment of two Indian Endemic *Elattonaura* Cowley, 1935 (Platycnemididae) Damselflies

[†]These authors contributed equally to this work

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Abstract: The Indian *Elattonaura* are a difficult group to identify due to their extreme morphological similarity and sparse information in identification keys and on geographical distribution. The ambiguity is prominent among two Peninsular Indian *Elattonaura* species, *E. nigerrima* (Laidlaw, 1917) and *E. tetrica* (Laidlaw, 1917), described a hundred years ago. Both species were described based on male specimens with scant information on their females. The species are IUCN Red-listed, *E. nigerrima* (Data Deficient) and *E. tetrica* (Least Concern). Hitherto it was thought that *E. nigerrima* was smaller than *E. tetrica* and both have non-overlapping geographical distribution. Here, we re-describe both sexes of *E. nigerrima*; *E. tetrica* along with morphometric data and geospatial analysis. We found that *E. nigerrima* is significantly larger than *E. tetrica*. The species are largely allopatric in distribution, with the former having a much wider spatial distribution than previously thought. Based on our geospatial analysis, we provide occurrence data useful for the future IUCN assessments of *E. nigerrima* and *E. tetrica*. We highlight the importance of updating taxonomic status information and data on spatiotemporal distribution to proceed with the conservation of endemic insects such as *Elattonaura* damselflies. Our study indicates ecological and threat assessments of Indian Odonata species are urgently needed.

Keywords: Odonata, dragonfly, citizen science, conservation, Morphometry, re-description, Peninsular India, threadtails

Introduction

Extreme morphological similarity among species often hinders accurate identification. Ambiguity in identification can result in severely erroneous data on the natural history and ecology (Chesters, 2017). If the species of interest are rare, endemic or endangered, such taxonomic ambiguities can severely hamper undertaking conservation measures (reviewed in Bickford et al., 2007; Delić et al., 2017). Misidentification problems are often encountered in tropical insects as the majority of the groups exhibit a high level of cryptic diversity; therefore accurate taxonomic identification of such species takes an enormous amount of expertise, time, cost, and human resources (Stork, 1988; Gadagkar et al., 1989; Godfray et al., 1999). Improper taxonomic identification of species may severely affect the assessment of conservation status of many taxa (Cardoso et al. 2011, Chenuil et al.,

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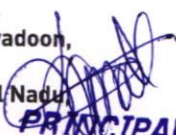
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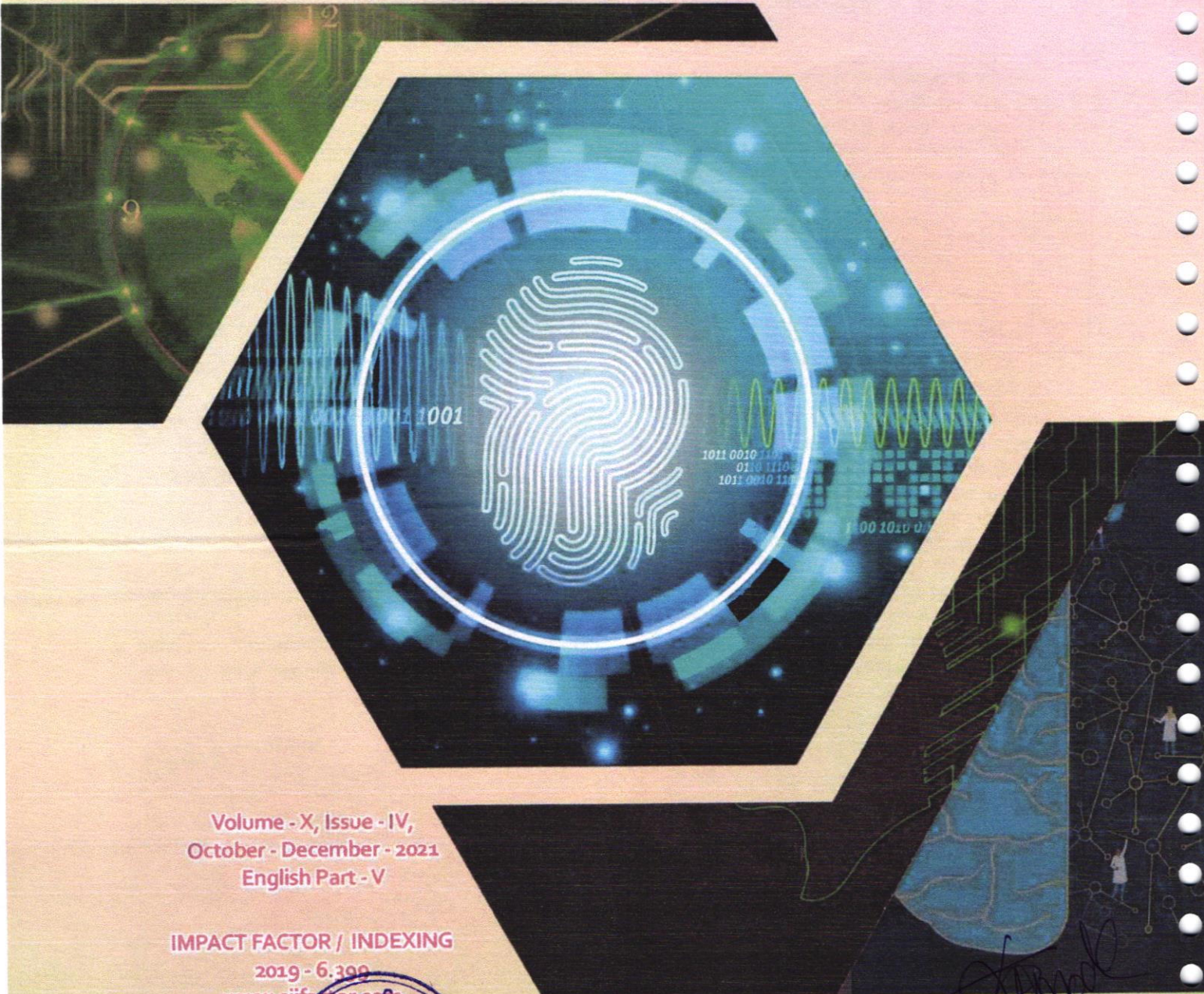
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10. Impact of Global Economic Recession on Indian Economy: Current Scenario

Prof. Dr. Parag R. Kawale

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Abstract

It is hard to deny, that we are currently in a financial crisis. This is true not just in the United States but in the entire world! Indeed having look at what has been happening in Europe, the United States is not even in the worst shape among the advanced countries. However the United States is the world's largest economy, so our milder economic problems have a larger proportional effect on the rest of the world. As the saying goes among economists, "When the U.S. catches a cold; the rest of the world gets pneumonia!" Therefore there is tremendous pressure on the United States to resolve the current financial crisis

Due to the economic crisis economics world over are considered to be entering into prolonged slowdown in economic activities. The intensity of present economic crisis is so high that is being compared with the global economic recession in 1873, great depression of 1930s and East Asian crisis of 1990s. The current economic slowdown is considered to be sub-prime mortgage crisis in the financial sector of United States. Global economics recession and its impact on Indian economy, in this paper we try to explain the impact of three distinct channels, that is, the capital flows, sectoral contribution and financial sector. The global economic recession has taken its toll on the Indian economy that has led to multi-crore loss in business and export orders, tens of thousands of job losses, especially in key sectors like the IT, automobiles, industry and export-oriented firms.

Indian economy also passed through these stages during the year 2008. The economic growth rate, which was above 8% for consecutive period of three years since 2006, suddenly plunged to an average of 5.5%. Developed world is under the fear that recession may not turn out to be continuous process resulting into great depression. Generally recessions are for two quarters, but depression is a severe economic downturn that lasts several years. Earlier India was affected less by external world depressions as it relied more on internal consumption, saving and import substitutions.

However, after 1991 India opened up its economy to global players, share of exports, both goods and services, in GDP grew significantly.





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A COMPETENT AND AN ECONOMICALLY CHEAP SYNTHESIS OF AMIDES CATALYZED BY CALCIUM CHLORIDE

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ABSTRACT

CaCl₂ has been found to be an efficient and economically cheap catalyst for the rapid synthesis of amides in high yields. The use of stoichiometric quantities of acetic anhydride under solvent free conditions without any additional purifications makes this etiquette a safe and sound alternative to the existing methods.

Keywords: Amide, acetylation, amine, CaCl₂.

1. INTRODUCTION

The protection of any functional groups in protection and deprotection techniques via environmentally compassionate trial is vastly advantageous as are the commonly encounter employ for the synthesis of complex organic materials. Hence, a group is one of the most important group present in surplus of biologically relevant compound. Many protective groups are available for the protection of amine functionality. Of which acetyl group is the most common being stable in acidic conditions and can be removed easily under alkaline conditions [1]. Different reagents used for the acetyl protection of amines are acetic acid, acetyl chloride [2] anhydride [3], acetyl acetone [4], zinc acetate [5] acetic acid [6], and thioacid [7]. Amongst, acetic anhydride is the most commonly used reagent as it is cheap, readily available and easy to handle. Besides their use as a protecting group, amides are present in various important natural products and pharmaceuticals such as lacosamide, paracetamol, zonisamide, etc. that are required in mass quantities. Various methods are available for the amide synthesis under acidic as well as basic conditions using acetic anhydride [8].

However, most of the methods suffer from less or more demerits such as tedious conditions, elevated temperatures, costly catalysts and reagents, more reaction times and high toxicity. Recently, Kim [9] *et al* reported the synthesis of acetamides using sulfated choline ionic liquid as a catalyst using grindstone method, though this method is quite efficient in terms

of yield and reaction times, however the catalyst is not commercially available, and require preparation. To overcome these drawbacks still there is a chance to develop a new catalyst system that can minimize these boundaries. Therefore, desirable efficient catalysts which are more economical, environmentally friendly and use stoichiometric amount of reagent in absence of volatile organic solvents. Calcium chloride (CaCl₂) is a readily available, cheap dehydration reagent used and recently gaining thrust as a green catalyst in various organic reactions. To exemplify, CaCl₂ has been used in Kabachnik-Fields [10] Mannich reaction [11], Biginelli three component reaction [12] and aldol transformations [13]. In recent times, it has been utilized as an efficient Lewis acid catalyst for the synthesis of 9-aryl-1, 8-dioxooctahydroxanthene [14].

2. MATERIAL AND METHODS

All commercially available reagents were used without purification. Acetic anhydride was distilled prior to use. Reaction was monitored by using TLC plates (Merck Silica Gel 60 F254), I₂ and anisaldehyde in ethanol as development reagents and visualization with UV light (254 and 365 nm). Mass spectra were recorded on LC-MS. Optical rotations were measured with a JASCO P 1020 digital polarimeter. ¹H and ¹³C NMR spectra were recorded on a Bruker AC-200 NMR spectrometer. Spectra were obtained in CDCl₃. Chemical shifts are reported in δ (ppm) and coupling constants are reported in Hertz (Hz).

PHYSO-CHEMICAL ANALYSIS OF WATER SAMPLE FROM SELOO TAHSIL OF DISTRICT
WARDHA MAHARASHTRA

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ABSTRACT

The water quality is determined in various area of seloo city of wardha district. The water samples taken from Various area fromhouse well, Borewell water. In Physico-chemical analysis, various quality parameter are measured including pH, Specific conductivity (SP), total dissolved solids (TDS), total hardness, compared with WHO standards of water quality; also in present research paper classification of water samples of various sites was investigation on the basis of TDS, anions, cations and TH. All Parameters were within the permissible limits. The results indicated and discussed.

Keywords- physico-chemical analysis, TDS, COD, BOD, Nutrients and Total Hardness.

INTRODUCTION-

Water plays an essential role in human life. Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water. Fresh water is one of the most important resources crucial for the survival of all the living beings. It is even more important for the human being as they depend upon it for food production, industrial and waste disposal, as well as cultural requirement. Human and ecological use of ground water depends upon ambient water quality. Human alteration of the landscape has an extensive influence on watershed hydrology. Ground water plays a vital role in human life. The consequences of urbanization and industrialization leads to spoil the water for agricultural purposes ground water is explored in rural especially in those areas where other sources of water like dam and river or a canal is not considerable. During last decade, this is observed that ground water get polluted drastically because of increased human activities. Consequently number of cases of water borne diseases has been seen which a cause of health hazards. An understanding of water chemistry is the bases of the knowledge of the multidimensional aspect of aquatic environmental chemistry which involves the source, composition, reactions and transportation of water. The quality of water is of vital concern for the mankind since it is directly linked with human welfare. It is a matter of history that facial pollution of drinking water caused water-borne diseases

METHODOLOGY-

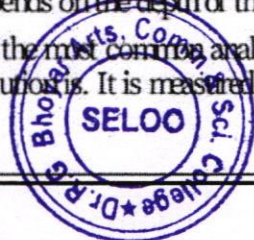
The Water Samples were collected from various sites in the Morning Hours between 9 to 11am, in Polythene Bottles. The Water samples were immediately brought in to Laboratory for the Estimation of various Physico-chemical Parameters like Water Temperature, pH were recorded by using Thermometer and Digital pH Meter. (Systronics). Specific conductivities were measured by using digital conductivity meter. The TDS values were measured by using TDS meter. While other Parameters Such as Hardness, Sodium, and potassium by Flame

photometry. Manganese, Calcium & Magnesium Chloride, Sulphate and Nitrate were Estimated in the Laboratory By using Standard laboratory methods. Present Study involves the Analysis of Water Quality in Terms of Physico-chemical methods. (Trivedy and Goel, 1986) increased in the similar direction, i.e., from Sample 1 to Sample 4. Concentration of nutrients like Chloride, Sulphate was within the permissible limits for Sample- 3 & 4. BOD remained less than 3 in all cases, showing normal microbial activity. Physicochemical parameters affected the primary production in different Areas. The physicochemical of chemical characteristics of water samples in the study area suggested that there was no harmful chemical contamination. The sample 3 & 4 were found to be more free from various micro gram positive bacterial activities. The sample - 4 is more healthier in the long run.

Parameter Included In Water Quality Assessment

Following different physico-chemical parameter are tested regularly for monitoring quality of water.

- 1) Temperature: Temperature is the most importance environment factor with effect on plants and animals. Water has several unique thermal properties which combine to minimize temperature change. The Water temperature depends on the depth of the water column, climatic and topographic changes.
- 2) pH: pH, one of the most common analyses in soil and water testing, is the standard measure of how acidic or alkaline a solution is. It is measured a scale from 0 -14. pH of 7 is neutral, pH is less than 7 is acidic and



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ABSTRACT BOOK



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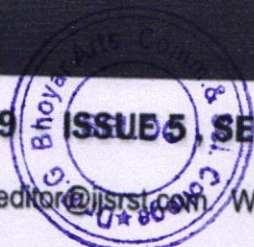
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Physico-Chemical Analysis Of Soil Sample From Wardha District

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Abstract-

Natural environment is very healthy and suitable for all kinds of organisms, but his various activities though he is the climax of creation of this world, polluted which resulting environmental pollution. About thirty representative samples were obtained and analyzed for its alkalinity content, sulphate, pH, chloride, conductivity, sodium and potassium. The value of chloride content was ranging from 1.20 to 2.00 g/100g, alkalinity was found to be from 2.5 to 85.0 meq/100 gm, sulphate was found to be between 0.067 to 0.745 g , conductivity was ranging from 0.5 to 2.0 micro mohs, range of sodium was between 150.6 to 250 ppm and potassium from 100.9 to 190 ppm.

Keywords- Physico-chemical analysis, soil samples, pH, Sodium-potassium.



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Physico-Chemical Analysis of Soil Sample from Wardha District

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ABSTRACT

Natural environment is very healthy and suitable for all kinds of organisms, but his various activities though he is the climax of creation of this world, polluted which resulting environmental pollution. About thirty representative samples were obtained and analyzed for its alkalinity content, sulphate, pH, chloride, conductivity, sodium and potassium. The value of chloride content was ranging from 1.20 to 2.00 g/100g, alkalinity was found to be from 2.5 to 85.0 meq/100 gm, sulphate was found to be between 0.067 to 0.745 g , conductivity was ranging from 0.5 to 2.0 micro mohs, range of sodium was between 150.6 to 250 ppm and potassium from 100.9 to 190 ppm.

Keywords- Physico-chemical analysis, soil samples, pH, Sodium-potassium.

I. INTRODUCTION

Soil is a fundamental component, medium of nutrients and materials, forms the life layer of earth. It developed as a result of pedogenic processes through weathering of rocks, consisting of inorganic, organic, soil organisms, soil moisture, soil solution and soil air. approximately, the soil contains 50-60% mineral matter, 15-25% air and little percentage of organic matter (Chatwal et al, 2005).

Soil possesses definite, physical, mineralogical and biochemical properties, having inconsistency from depth to surface of the earth, and provides a medium for the growth of plant Kingdom [1]. The soil forms the intermediate zone between the atmosphere and the rock layer of the earth, the lithosphere. It also forms the interface between hydrosphere and the lithosphere and thus forming a part of biosphere. The soil may be defined as the uppermost weathered layer of the earth's crust in which are mixed organisms and products of their death and decay. Soil pollution is caused by more and more use of minerals to soils by man, from the use of agriculture chemicals such as herbicides, fungicides and insecticides, from the dust fall and precipitation and use of chemical fertilizers and contaminated water. It is also caused by the industrial waste, agricultural waste, urban waste, biological pathogens etc.

The industrial pollution increases the soil toxicity. The soluble salt given out as pollutants damages the cultivated farms. The soil pollution due to sewage is also very high. Several diseases are inflicted in human beings due to pathogenic forms present in the soil. It is the need of every time that we have to study the physico-chemical parameters of soil to know its quality. Thirty representative samples were collected from





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On the cover: The morphology of *S. brachyandra* Diels collected in Lào Cai, Vietnam. (Image credit: Pham et al., 2021)


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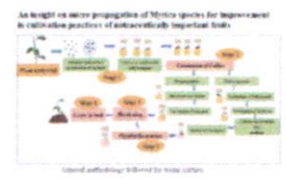
10 Nov, 2021

An insight on micro propagation of *Myrica* species for improvement in cultivation practices of nutraceutically important fruits

Sohan Lal, Amita Kumari, Ishita Guleria, Jyoti Dhatwalia, Shabnam Thakur, Shailja Kumari, Subhash Sharma

DOI: 10.7324/JABB.2021.9604 Pages: 34-40

Abstract Full Text PDF



10 Nov, 2021

The linkage between the second wave of COVID-19 and the severity of mucormycosis in India

Kshama Wamanrao Murarkar, Shilpa Prakash Mankar

DOI: 10.7324/JABB.2021.9605 Pages: 41-50

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The linkage between the second wave of COVID-19 and the severity of mucormycosis in India

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ABSTRACT

The whole world was fighting the danger of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) since 2019. The SARS-CoV-2 virus was mutating with great speed, and putting new challenges in front of the world. In India, the whole healthcare system was engaged in tackling the second wave of COVID-19 as a result of virus mutation. Additionally, a fungal co-infection, mucormycosis started to invade the COVID-19 patients. Mucormycosis is an acute infection, caused by an opportunistic fungus, mostly attacks the immunosuppressed, diabetic, and neutropenia patients. The other causes of infection include inappropriate use of immunosuppressive drugs, entry of *Mucorales* through open wounds, cancer, acquired immune deficiency syndrome, organ transplant, and malnutrition. In the recent mucormycosis outbreak in India, all the mucormycosis cases included eyesight damage, facial deformities, and even death in critical conditions. These reported mucormycosis cases in India were mostly diabetes, which were treated with immunosuppressive drugs. The mucormycosis fungus was probably invading the recovered, or near to recovery the second wave COVID-19 patients. In this review, we discussed the important risk factors responsible for the sudden outbreak of mucormycosis, and its severity linked to second wave COVID-19 patients in India.

1. INTRODUCTION

In entire India, COVID-19 cases due to double mutant severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) virus were jumping up in an uncontrolled manner, and the country was also imagining the fear of third COVID-19 wave. In inclusion to these calamities, India was also facing the rising cases of COVID-19 linked mysterious infection "mucormycosis" creating significantly more complications in COVID-19 patients [1-7].

In the year 2021, during the second wave of COVID-19 (SWCOVID-19), 10-100 number of the COVID-19 patients in India were getting infected with fungal co-infection mucormycosis, causing eye damage, facial deformities, blindness, and further death in severe conditions like diabetes [8-10]. News media reported the various cases of mucormycosis among the SWCOVID-19 patients from Pune, Gujarat, Ahmedabad, Madhya Pradesh, Odisha, Karnataka, Uttarakhand, Telangana, Madhya

Pradesh, and Bihar [11,12]. With this inclusion, total number of cases was rising continuously in India [13-20] (Table 1).

Mucormycosis is an acute angio-invasive infection [21-23] causing embolism and death of tissues [24,25]. In most of the cases, the infection progresses as a nosocomial infection [26-34]. Mucormycosis fungus enters inside the body through environmental routes by inhalation [35-38] and captures the broad range of immunologically compromised, and immunocompetent traumatic wound patients [39-41]. Mucormycosis is caused by a group of opportunistic mold "mucoromycetes" [42], belonging

Table 1: Rising mucormycosis cases in India during the second wave of COVID-19 diseases.

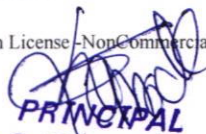
Date	Number of mucormycosis cases
May-21-2021	8,848
May-26-2021	11,717
May-28-2021	14,872
June-07-2021	28,252

Source of data [16-18,20].

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2.2. The Link between Mucormycosis Infection and SWCOVID-19

COVID-19 is a disease caused by the SARS-CoV-2 virus, showing a broad range of medical complications, which spreads from human-human by respiratory droplets [110]. SARS-CoV-2 virus infects the pulmonary tissues causing alveolar-interstitial lesion, which may be responsible for more susceptibility of COVID-19 patients to mucormycosis co-infection. In such cases, primarily portal of entry of fungus is through nasal route and lung airways [78,111].

During the SWCOVID-19, mucormycosis outbreak in India, all the cases of mucormycosis co-infection were COVID-19 recovered, or near to recovery patients. In COVID-19 disease, immune system of the patient gets weakened on account of virus replication and lung damage, furthermore uncontrolled diabetes mellitus, use of immunosuppressive drugs [80-83,112], comorbidity, and malnutrition also contribute to it (Fig. 1). Therefore, the vulnerability of mucormycosis co-infection is more in the case of COVID-19 disease [113], which is potentially responsible for further health complications, and also death in many cases [114]. It was found that among the 10%-30% of co-infections in hospitalized and critically ill COVID-19 patients, the fungus was ten times more frequent causative agent [115]. The greater risk factors for mucormycosis fungal co-infection in COVID-19 patients was owing to: use of immunosuppressive medications, lack of a diagnostic specific test for the incidence of fungal infections in COVID-19 patients [116], diabetes, hematologic malignancies, prolonged neutropenia, allogeneic hematopoietic stem cell transplantation, solid organ transplant [117], and long-term lymphopenia [113,118].

In COVID-19 disease, replication of virus triggers plenty of cytokines called "cytokine storm," showing an inflammatory reaction, and extensive damage to the lung [112,119]. Such immunosuppressive state of immune system leads to an uncontrolled reduction in CD4+ and CD8+ cells [19,119-122], B-lymphocytes, and natural killer cells [123,124]. It was also reported that, SARS-CoV-2 infection also decreases the monocytes, eosinophils, and basophils count in patients [125,126]. Such acute lung tissue damage may be prone to secondary infections after the outset of COVID-19 disease [121,127-129].

In COVID-19 in diabetic patients, the mortality can be directly linked with diabetes mellitus. In SARS-CoV-2 infection, there is increased activity of angiotensin-converting enzyme-2-receptors present on pancreatic islet cells, as well as an excess of cytokines secretions generates insulin resistance creating hyperglycemic condition [130].

In COVID-19 patients, iron metabolism is also altered [131]. In severe COVID-19 cases, ferritin level increases, which conducts extra intracellular iron, generating reactive oxygen which damages the tissue. Because of severe infection and diabetic acidoketosis, cytokines particularly IL-6 activate ferritin production, which results in intracellular iron overload [131], and creates an acidic stage, responsible for the risk of mucormycosis [132].

2.3. Mucormycosis and Therapeutic Drug in COVID-19 Disease

During the SWCOVID-19, most of the COVID-19 patients in India were treated with steroids (Tocilizumab), antiviral drugs (Remdesivir), antiparasitic drug (Ivermectin), and antibiotics

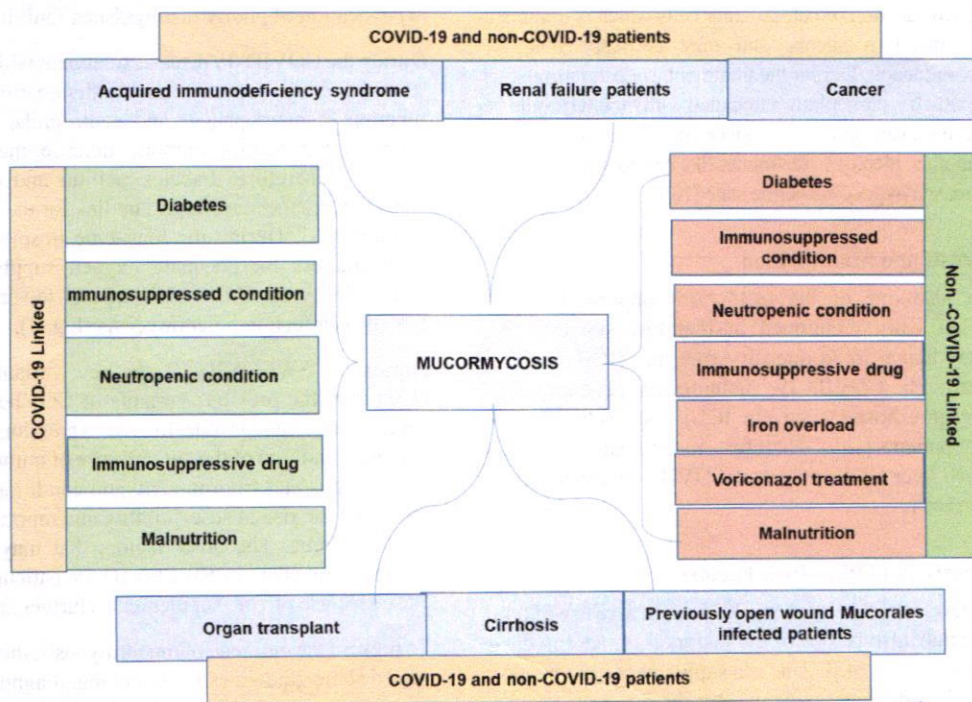


Figure 1: Important factors responsible for mucormycosis infection in COVID-19 and non-COVID-19 patients



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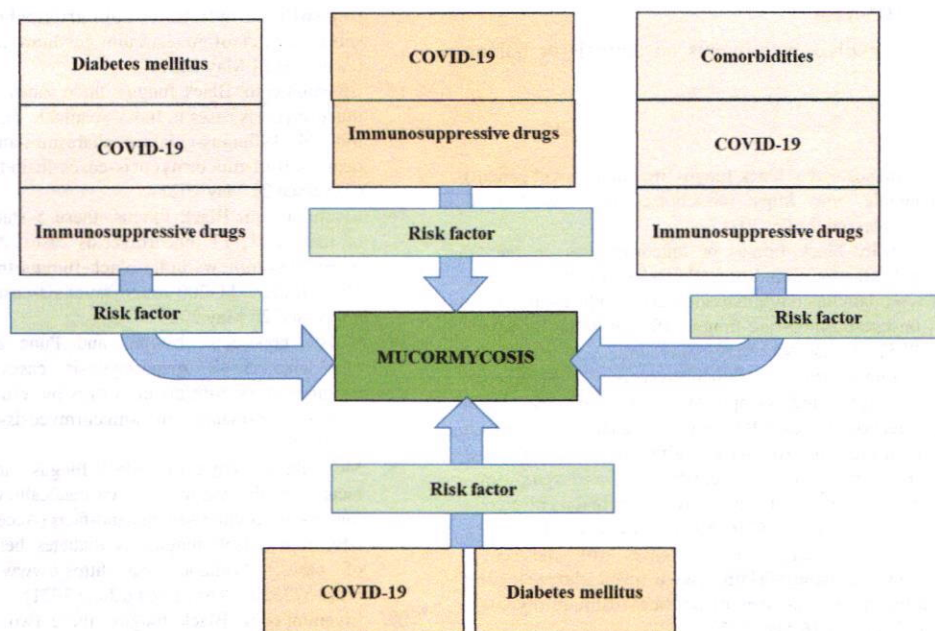


Figure 2: A risk factor in mucormycosis disease.

Directorate General of Health Services (DGHS) had issued the guidelines to stop the use of Ivermectin and doxycycline in COVID-19 patients [155], and also removed Ivermectin, azithromycin, doxycycline, zinc, favipiravir, and plasma therapy from recommendation list [156,157].

4. CONCLUSION

Mucormycosis is an opportunistic fungal infection. The rising cases of COVID-19 linked mucormycosis in many states of India may be related to one or more factors. In SWCOVID-19 disease, severity of infection was more than the earlier COVID-19 disease, which was one of the causes for opportunistic infections like mucormycosis. Secondly, the COVID-19 sufferer who had uncontrolled diabetes mellitus, hypertension, and comorbidity was more prone to mucormycosis infection due to various hyper mechanisms in patients. Thirdly, treatment with immunosuppressive steroidal drugs in critically ill COVID-19, and other COVID-19 patients was one of the reasons for mucormycosis co-infection. To prevent these complications, unnecessary use of steroidal drug should be avoided. In the case of critically ill COVID-19 patients, the right dose and duration of steroidal drug should be used. The other drugs in COVID-19 treatments also contribute to immunosuppressive condition among COVID-19 patients, and mucormycosis infection. The diabetes mellitus COVID-19 patients already suffer from lots of complications due to COVID-19 disease, and treatment with inappropriate steroidal dose and other drugs further suppresses the immune system of patients during the recovery. These were the major links for life-threatening mucormycosis infection in India. Apart from this, malnutrition in under-recovery and recovered COVID-19 patients is very common, which weakens the immune system, can also be the reason for mucormycosis co-infection.

All the above factors are linked with each other for the severity of mucormycosis in SWCOVID-19 patients than non-COVID-19 patients. AIIMS and DGHS have issued various guidelines to prevent the new SWCOVID-19 patients from the danger of mucormycosis co-infection. However, already infected and suspected mucormycosis cases can be protected by: early diagnosis of fungus, an adequate dose of the antifungal drug (Amphotericin B) and other drugs, control over the hyperglycemic condition, maintaining oxygen level of patients, and proper diet.

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6. AUTHOR CONTRIBUTIONS

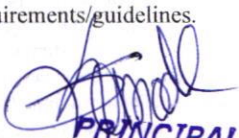
All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work. All the authors are eligible to be an author as per the international committee of medical journal editors (ICMJE) requirements/guidelines.

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8. CONFLICT OF INTEREST

There is no conflict of interest.


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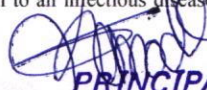
- report of four cases in thalassemia and review of the literature. *Bone Marrow Transplant* 1996;17(3):409–14.
33. Ribes JA, Vanover-Sams CL, Baker DJ. Zygomycetes in human disease. *Clin Microbiol Rev* 2000;13(2):236–301; doi:10.1128/CMR.13.2.236
 34. Melsom SM, Khangure MS. Craniofacial mucormycosis following assault: an unusual presentation of an unusual disease. *Australas Radiol* 2000;44(1):104–6; doi:10.1046/j.1440-1673.2000.00751.x
 35. Krasinski K, Holzman RS, Hanna B, Greco MA, Graff M, Bhogal M. Nosocomial fungal infection during hospital renovation. *Infect Control* 1985;6(7):278–82; doi:10.1017/s0195941700061750
 36. Kontoyianis DP, Vartivarian S, Anaissie EJ, Samonis G, Bodey GP, Rinaldi M. Infections due to *Cunninghamella bertholletiae* in patients with cancer: report of three cases and review. *Clin Infect Dis* 1994;18(6):925–8; doi:10.1093/clinids/18.6.925
 37. Lee FY, Mossad SB, Adal KA. Pulmonary mucormycosis: the last 30 years. *Arch Intern Med* 1999;159(12):1301–9; doi:10.1001/archinte.159.12.1301
 38. Kontoyianis DP, Wessel VC, Bodey GP, Rolston KV. Zygomycosis in a tertiary-care cancer center. *Clin Infect Dis* 2000;30(6):851–6; doi:10.1086/313803
 39. Rabin ER, Lundberg GD, Mitchell ET. Mucormycosis in severely burned patients. Report of two cases with extensive destruction of the face and nasal cavity. *N Engl J Med* 1961;264:1286–89; doi:10.1056/NEJM196106222642504
 40. Paparello SF, Parry RL, MacGillivray DC, Brock N, Mayers DL. Hospital-acquired wound mucormycosis. *Clin Infect Dis* 1992;14(1):350–2; doi:10.1093/clinids/14.1.350
 41. Roden MM, Zaoutis TE, Buchanan WL, Knudsen TA, Sarkisova TA, Schaufele RL, et al. Epidemiology and outcome of Zygomycosis: a review of 929 reported cases. *Clin Infect Dis* 2005;41(5):634–53; doi:10.1086/432579
 42. Lin E, Moua T, Limper AH. Pulmonary mucormycosis: clinical features and outcomes. *Infection*, 2017;45(4):443–8; doi:10.1007/s15010-017-0991-6
 43. Kwon-Chung KJ. Taxonomy of fungi causing mucormycosis and entomophthoromycosis (Zygomycosis) and nomenclature of the disease: molecular mycologic perspectives. *Clin Infect Dis*. 2012;54(Suppl 1):S8–15; doi:10.1093/cid/cir864
 44. Patra S, Vij M, Chirila DK, Kumar N, Samal SC. Unsuspected invasive neonatal gastrointestinal mucormycosis: a clinicopathological study of six cases from a tertiary care hospital. *J Indian Assoc Pediatr Surg* 2012;17(4):153–6; doi:10.4103/0971-9261.102329
 45. Chakrabarti A, Singh R. Mucormycosis in India: unique features. *Mycoses* 2014;57(Suppl 3):85–90; doi:10.1111/myc.12243
 46. Chander J, Stchigel AM, Alastruey-Izquierdo A et al. Fungal necrotizing fasciitis, an emerging infectious disease caused by *Apophysomyces* (*Mucorales*). *Rev Iberoam Micol* 2015;32(2):93–8; doi:10.1016/j.riam.2014.06.005
 47. Sugar AM. Agents of mucormycosis and related species. In: Mandel GL, Bennett JE, Dolin R (eds.). *Principles and practice of infectious diseases*. 5th edition, Churchill Livingstone, Philadelphia, PA, vol 2, pp 2685–95, 2000.
 48. Skiada A, Pavleas I, Drogari-Apiranthitou M. Epidemiology and diagnosis of mucormycosis: an update. *J Fungi (Basel)* 2020;6(4):265; doi:10.3390/jof6040265
 49. Waldorf AR. Pulmonary defense mechanisms against opportunistic fungal pathogens. *Immunol Ser* 1989;47:243–71.
 50. Morace G, Borghi E. Invasive mold Infections: virulence and pathogenesis of *Mucorales*. *Int J Microbiol* 2012;2012:349278; doi:10.1155/2012/349278
 51. Corzo-León DE, Chora-Hernández LD, Rodríguez-Zulueta AP, Walsh TJ. Diabetes mellitus as the major risk factor for mucormycosis in Mexico: epidemiology, diagnosis, and outcomes of reported cases. *Med Mycol* 2018;56(1):29–43; doi:10.1093/mmy/myx017
 52. Spellberg B, Edwards J Jr, Ibrahim A. Novel perspectives on mucormycosis: pathophysiology, presentation, and management [presentation]. *Clin Microbiol Rev* 2005;18(3):556–69; doi:10.12688/f1000research.15081.1
 53. Pilmis B, Alanio A, Lortholary O, Lantermier F. Recent advances in the understanding and management of mucormycosis. *F1000Res* 2018;7:F1000.
 54. Chakrabarti A, Das A, Sharma A, Panda N, Das S, Gupta KL, et al. Ten years' experience in Zygomycosis at a tertiary care center in India. *J Infect* 2001;42(4):261–6; doi:10.1053/jinf.2001.0831
 55. Chakrabarti A, Das A, Mandal J et al. The rising trend of invasive Zygomycosis in patients with uncontrolled diabetes mellitus. *Med Mycol* 2006;44(4):335–42; doi:10.1080/13693780500464930
 56. Chakrabarti A, Chatterjee SS, Das A, Panda N, Shivaprakash MR, Kaur A, et al. Invasive Zygomycosis in India: experience in a tertiary care hospital. *Postgrad Med J* 2009;85(1009):573–81; doi:10.1136/pgmj.2008.076463
 57. Manesh A, Rupali P, Sullivan MO, Mohanraj P, Rupa V, George B, et al. Mucormycosis—A clinicoepidemiological review of cases over 10 years. *Mycoses*, 2019;62(4):391–8; doi:10.1111/myc.12897
 58. Prakash H, Chakrabarti A. Global epidemiology of mucormycosis. *J Fungi (Basel)* 2019;5(1):26; doi:10.3390/jof5010026
 59. Patel A, Kaur H, Xess I, Michael JS, Savio J, Rudramurthy S, et al. A multi-centre observational study on the epidemiology, risk factors, management and outcomes of mucormycosis in India. *Clin Microbiol Infect* 2020;26(7):944.e9–15; doi:10.1016/j.cmi.2019.11.021
 60. Chakrabarti A, Sood P, Denning D. Estimating fungal infection burden in India: mucormycosis burden as a case study [Internet]. 2021. Available via <https://www.gaffi.org/wp-content/uploads/P1044.pdf>
 61. Chander J, Kaur M, Singla N, Punia RPS, Singhal SK, Attri AK, et al. Mucormycosis: battle with the deadly enemy over a five-year period in India. *J Fungi (Basel)*, 2018;4(2):46; doi:10.3390/jof4020046
 62. Werthman-Ehrenreich A. Mucormycosis with orbital compartment syndrome in a patient with COVID-19. *Am J Emerg Med* 2021;42:264.e5–8; doi:10.1016/j.ajem.2020.09.032
 63. Cocanour CS, Miller-Crotchett P, Reed 2nd RL, Johnson PC, Fischer RP. Mucormycosis in trauma patients. *J Trauma* 1992;32(1):12–5; doi:10.1097/00005373-199201000-00003
 64. Yohai RA, Bullock JD, Aziz AA, Markert RJ. Survival factors in rhino-orbital-cerebral mucormycosis. *Surv Ophthalmol* 1994;39(1):3–22; doi:10.1016/s0039-6257(05)80041-4
 65. Hamdi T, Karthikeyan V, Alangaden GJ. Mucormycosis in a renal transplant recipient: case report and comprehensive review of literature. Alangaden, Hindawi Publishing Corporation. *Int J Nephrol* 2014;2014:950643; doi:10.1155/2014/950643
 66. Hernandez Jorge L, Buckley CJ. Mucormycosis. StatPearls, Treasure Island, FL, 2020.
 67. Bell S, Mahoney L. Mucormycosis: a case study. *Crit Care Nurse* 2000;20(1):18–23; doi:10.4037/ccn2000.20.1.18
 68. Chow V, Khan S, Balogun A, Mitchell D, Mühlischlegel FA. Invasive rhino-orbital-cerebral mucormycosis in a diabetic patient—the need for prompt treatment. *Med Mycol Case Rep*, 2015;8:5–9; doi:10.1016/j.mmcr.2014.12.002
 69. Chowdhary A, Tarai B, Singh A, Sharma A. Multidrug-resistant *Candida auris* infections in critically ill coronavirus disease patients, India, April–July 2020. *Emerg Infect Dis* 2020;26(11):2694–6; doi:10.3201/eid2611.203504
 70. Sarkar S, Gokhale T, Choudhury SS, Deb AK. COVID-19, and orbital mucormycosis. *Indian J Ophthalmol* 2021;69(4):1002–4; doi:10.4103/ijo.3763_20
 71. Sen M, Lahane S, Lahane TP, Parekh R, Honavar SG. Mucor in a viral land: a tale of two pathogens. *Indian J Ophthalmol* 2021;69(2):244–52; doi:10.4103/ijo.3774_20
 72. John TM, Jacob CN, Kontoyianis DP. When uncontrolled diabetes mellitus and severe COVID-19 converge: the perfect storm for



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113. Ruuskanen O, Lahti E, Jennings LC, Murdoch DR. Viral pneumonia. *Lancet* 2011;377(9773):1264–75; doi:10.1016/S0140-6736(10)61459-6
114. Medpagetoday.com. Superinfections and coinfections in COVID-19. Available via <http://medpagetoday.com/infectiousdisease/covid19/86192> (Accessed 28 April 2020)
115. Segrelles-Calvo G, Glauber Rde S (1405–1413) ISSN 1746-0913. Araujo 2,3 and Susana Frases, Systemic mycoses: a potential alert for complications in COVID-19 patients *Serviociode Neumologia*. [Hospital Universitario Rey Juan Carlos, Instituto de Investigacion Biomedica Fundaci] on Jim e10.2217/fmb-2020-0156]. *Future Microbiol* 2020;15(14):C2020.
116. Cornely OA, Alastruey-Izquierdo A, Arenz D, Chen SCA, Dannaoui E, Hochhegger B, *et al.* Mucormycosis ECMM MSG global guideline writing group. *Lancet Infect Dis* 2019;19(12):e405–21; doi:10.1016/S1473-3099(19)30312-3
117. Saha O, Rakhi NN, Sultana A, Rahman MM, Rahaman MM. SARS-CoV-2 and COVID-19: a threat to global health. *Discov Rep* 2020;3:e13; doi:10.15190/drep.2020.7
118. Gangneux JP, Bounoux ME, Dannaoui E, Cornet M, Zahar JR. Invasive fungal diseases during COVID-19: we should be prepared. *J Mycol Med*, 2020;30(2):100971; doi:10.1016/j.mycmed.2020.100971
119. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, *et al.* Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *Lancet Respir Med* 2020;8(5):475–81; doi:10.1016/S2213-2600(20)30079-5.
120. Liu J, Li S, Liu J, Liang B, Wang X, Wang H, *et al.* Longitudinal characteristics of lymphocyte responses and cytokine profiles in the peripheral blood of SARS-CoV-2 infected patients. *Ebiomedicine* 2020;55:102763.
121. Pemán J, Ruiz-Gaitán A, García-Vidal C, Salavert M, Ramírez P, Puchades F, *et al.* Fungal co-infection in COVID-19 patients: should we be concerned? *Rev Iberoam Micol* 2020;37(2):41–6; doi:10.1016/j.riam.2020.07.001
122. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, *et al.* Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395(10223):497–506. doi:10.1016/S0140-6736(20)30183-5
123. Tan M, Liu Y, Zhou R, Deng X, Li F, Liang K, *et al.* Immunopathological characteristics of coronavirus disease 2019 cases in Guangzhou, China. *Immunology* 2020;160(3):261–8; doi:10.1101/2020.03.12.20034736
124. Qin C, Zhou L, Hu Z, Zhang S, Yang S, Tao Y, *et al.* (2020) Dysregulation of immune response in patients with COVID-19 in Wuhan, China. *Clin Infect Dis* 2020;71(15):762–8; doi:10.1093/cid/ciaa248
125. Zhang B, Zhou X, Zhu C, Feng F, Song Y, Feng F, Qiu Y, *et al.* Immune phenotyping based on neutrophil-to-lymphocyte ratio and IgG predicts disease severity and outcome for patients with COVID-19. *Front Mol Biosci* 2020;7:157; doi:10.1101/2020.03.12.20035048
126. Peng M, Meng H, Sun Y, Xiao Y, Zhang H, Lv K, *et al.* Clinical features of pulmonary mucormycosis in patients with different immune status. *J Thorac Dis*, 2019;11(12):5042–52; doi:10.21037/jtd.2019.12.53.
127. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, *et al.* Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet*, 2020;395(10229):1054–62; doi:10.1016/S0140-6736(20)30566-3.
128. Onder G, Rezza G, Brusaferro S. Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. *JAMA* 2020;323(18):1775–6; doi:10.1001/jama.2020.4683
129. Kothandaraman N, Rengaraj A, Xue B, Yew WS, Velan SS, Karnani N, *et al.* COVID-19 endocrinopathy with hindsight from SARS. *Am J Physiol Endocrinol Metab*, 2021;320(1):E139–50; doi:10.1152/ajpendo.00480.2020
130. Perricone C, Bartoloni E, Bursi R, Cafaro G, Guidelli GM, Shoenfeld Y, *et al.* COVID-19 as part of the hyperferritinemic syndromes: the role of iron depletion therapy. *Immunol Res* 2020;68(4):213–24; doi:10.1007/s12026-020-09145-5
131. Ibrahim AS, Spellberg B, Walsh TJ, Kontoyiannis DP. Pathogenesis of mucormycosis. *Clin Infect Dis* 2012;54(suppl 1):S16–22; doi:10.1093/cid/cir865
132. Punjabnewsexpress.com. Diabetes is a major risk factor in mucormycosis case. Available via <https://www.punjabnewsexpress.com/health/news/diabetes-is-a-major-risk-factor-in-mucormycosis-cases-balbir-sidhu-138849> (Accessed 2 June 2021)
133. Wionews.com. Black fungus infections on rise in India: Antifungal drug: mucormycosis. Available via <https://www.youtube.com/watch?v=2ykpigRp-c> (Accessed 20 May 2021).
134. Almyroudis NG, Sutton DA, Linden P, Rinaldi MG, Fung J, Kusne S. Zygomycosis in solid organ transplant recipients in a tertiary transplant center and review of the literature. *Am J Transplant* 2006;6(10):2365–74; doi:10.1111/j.1600-6143.2006.01496.x
135. Horby P, Lim WS, Emberson JR, Mafham M, Bell JL, Linsell L, *et al.* Dexamethasone in hospitalized patients with COVID-19—preliminary report. *N Engl J Med* 2021;384(8):693–704; doi:10.1056/NEJMoa2021436
136. Pal R, Banerjee M. COVID-19, and the endocrine system: exploring the unexplored. *J Endocrinol Invest* 2020;3:9.
137. Wood BR, Lacy JM, Johnston C, Weigle DS, Dhanireddy S. Adrenal insufficiency as a result of ritonavir and exogenous steroid exposure: report of 6 cases and recommendation for management. *J Int Assoc Provide Aids Care* 2015;14:300–5; doi:10.1177/2325957414
138. Ferrau F, Ceccato F, Cannavò S, Scaroni C. What we have to know about corticosteroids use during SARS-CoV-2 infection. *J Endocrinol Invest* 2021;44(4):693–701; doi:10.1007/s40618-020-01384-5
139. Berton AM, Principe N, Giordano R, Ghigo E, Grottoli S. Systemic steroids in patients with COVID-19: pros and contras, an endocrinological point of view. *J Endocrinol Invest* 2021;44(4):873–75; doi:10.1007/s40618-020-01325-2
140. Wu C, Chen X, Cai Y, Xia J, Zhou X, Xu S, *et al.* Risk factors associated with acute respiratory distress syndrome and death in patients with corona virus Disease 2019 pneumonia in Wuhan, China. *JAMA Intern Med* 2020;180(7):934–43; doi:10.1001/jamainternmed.2020.0994
141. Gemelli Against COVID-19 Post-Acute Care Study Group. Post-COVID-19 global health strategies: the need for an interdisciplinary approach. *Aging Clin Exp Res* 2020;32(8):1613–20; doi:10.1007/s40520-020-01616-x
142. Timesofindia.indiatimes.com. Mumbai: zinc overuse driving black fungus epidemic within pandemic? Doctors want study. Available via <https://timesofindia.indiatimes.com/city/mumbai/mumbai-zinc-overuse-driving-mucor-epidemic-within-pandemic-docs-want-study/articleshow/82922957.cm> (Accessed 25 May 2021).
143. News18.com. Amid mucormycosis outbreak, doctors seek research on role of zinc supplement. Available via <https://www.news18.com/news/india/mucormycosis-black-fungus-zinc-supplements-covid-19-coronavirus-3781526.html> (Accessed 27 May 2021).
144. Cnbctv18.com. Doctors suspects overuse of zinc and iron increases risk of black fungus infections. Available via <https://www.cnbctv18.com/healthcare/doctors-suspect-overuse-of-zinc-and-iron-increases-risk-of-black-fungus-infection-9440491.htm> (Accessed 26 May 2021).
145. Chougule A, Muthu V, Bal A, Rudramurthy SM, Dhooria S, *et al.* Pulmonary gangrene due to *Rhizopus* spp *Staphylococcus aureus* *Klebsiella pneumoniae* and probable *Sarcina* organisms. *Mycopathologia* 2015;180(1–2):131–6; doi:10.1007/s11046-015-9904-3
146. Muthu V, Dhooria S, Singh Sehgal I, Thurai Prasad K, Agarwal R. The reversed halo sign and the bronchus sign: the eyes see only what the mind knows. *Ann Am Thorac Soc* 2019;16(9):1203; doi:10.1513/AnnalsATS.201905-360LE.
147. Pandey N, Vipin K, Dutt P, Taneja S, Biswal M, Mahajan P, *et al.* Transforming a general hospital to an infectious disease hospital for




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On the cover: The morphology of *S. brachyandra* Diels collected in Lào Cai, Vietnam. (Image credit: Pham et al., 2021)

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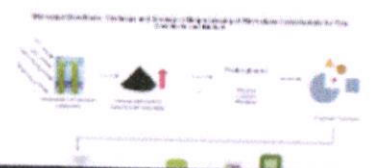
Review Article

10 Nov, 2021

Microalgal biorefinery: Challenge and strategy in bioprocessing of microalgae carbohydrate for fine chemicals and biofuel

Tan Kean Meng, Razif Harun, Ramizah Kamaludin, Mohd Asyraf Kassim

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10 Nov, 2021

The linkage between the second wave of COVID-19 and the severity of mucormycosis in India

Kshama Wamanrao Murarkar, Shilpa Prakash Mankar

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Mini Review

10 Nov, 2021

Applications of bacterial endophytes and their advanced identification

The linkage between the second wave of COVID-19 and the severity of mucormycosis in India

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ABSTRACT

The whole world was fighting the danger of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) since 2019. The SARS-CoV-2 virus was mutating with great speed, and putting new challenges in front of the world. In India, the whole healthcare system was engaged in tackling the second wave of COVID-19 as a result of virus mutation. Additionally, a fungal co-infection, mucormycosis started to invade the COVID-19 patients. Mucormycosis is an acute infection, caused by an opportunistic fungus, mostly attacks the immunosuppressed, diabetic, and neutropenia patients. The other causes of infection include inappropriate use of immunosuppressive drugs, entry of *Mucorales* through open wounds, cancer, acquired immune deficiency syndrome, organ transplant, and malnutrition. In the recent mucormycosis outbreak in India, all the mucormycosis cases included eyesight damage, facial deformities, and even death in critical conditions. These reported mucormycosis cases in India were mostly diabetes, which were treated with immunosuppressive drugs. The mucormycosis fungus was probably invading the recovered, or near to recovery the second wave COVID-19 patients. In this review, we discussed the important risk factors responsible for the sudden outbreak of mucormycosis, and its severity linked to second wave COVID-19 patients in India.

1. INTRODUCTION

In entire India, COVID-19 cases due to double mutant severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) virus were jumping up in an uncontrolled manner, and the country was also imagining the fear of third COVID-19 wave. In inclusion to these calamities, India was also facing the rising cases of COVID-19 linked mysterious infection "mucormycosis" creating significantly more complications in COVID-19 patients [1-7].

In the year 2021, during the second wave of COVID-19 (SWCOVID-19), 10-100 number of the COVID-19 patients in India were getting infected with fungal co-infection mucormycosis, causing eye damage, facial deformities, blindness, and further death in severe conditions like diabetes [8-10]. News media reported the various cases of mucormycosis among the SWCOVID-19 patients from Pune, Gujarat, Ahmedabad, Madhya Pradesh, Odisha, Karnataka, Uttarakhand, Telangana, Madhya

Pradesh, and Bihar [11,12]. With this inclusion, total number of cases was rising continuously in India [13-20] (Table 1).

Mucormycosis is an acute angio-invasive infection [21-23] causing embolism and death of tissues [24,25]. In most of the cases, the infection progresses as a nosocomial infection [26-34]. Mucormycosis fungus enters inside the body through environmental routes by inhalation [35-38] and captures the broad range of immunologically compromised, and immunocompetent traumatic wound patients [39-41]. Mucormycosis is caused by a group of opportunistic mold "mucoromycetes" [42], belonging

Table 1: Rising mucormycosis cases in India during the second wave of COVID-19 diseases.

Date	Number of mucormycosis cases
May-21-2021	8,848
May-26-2021	11,717
May-28-2021	14,872
June-07-2021	28,252

Source of data [16-18,20].

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to the order "Mucorales," subphylum mucoromycotina (formerly known as class zygomycetes) [41,43]. The reported number of genera and species of mucormycosis causing infections to humans are 11 and 27, respectively, of which *Rhizopus* rhizome or, *Mucor* lichtheimia, *Apophysomyces*, *Cunninghamella*, *Saksenaea*, *Cokeromyces*, *Actinomucor*, and *Syncephalastrum* species are usually over the globe [21,22,41,44]. The *Rhizopus* spp were predominant in most mucormycosis infections in India. Although, *Apophysomyces elegans*, *Anabaena variabilis*, and *Rhizopus homothallic* were also increasing along with atypical species like *Mucor irregularis* and *Thamnostylum lucknowense* [45,46]. Mucormycosis is categorized into cerebral, cutaneous, rhino-cerebral, gastrointestinal, pulmonary, and disseminated type based on appeared anatomic localization, and clinical symptoms which are uncommon and rare [21,41,47,48].

The causative agent of mucormycosis is omnipresent fungi predominant in dust, decaying matter which causes infrequent opportunistic communicable disease within a very short time [33]. In mucormycosis, infection macrophages and neutrophils perform an important task in the host defense process [49–52]. When their activity gets diminished, spores germinate inside the host [53]. After the entry of fungus, spore germination gets retarded by phagocytic activity of macrophages by killing the hyphae [49]. In a normal host, during the development of infection, neutrophilic cells are attracted toward hyphae by the chemotaxis process and, attaches to it, and prevents the spread of infection. In diabetic patients, neutrophils activity gets hampered, and the long-term neutropenic condition is responsible for the evolution of disease [49].

During the SWCOVID-19-linked mucormycosis (SWCOVID-19), the mortality rate of mucormycosis patients was nearly 50% [7]. In earlier reports, death percent owing to mucormycosis in India was mentioned between 28% and 52% [22,54–59]. In a computer-model-based study, 14 mucormycosis cases per 100,000 individuals in India were evaluated [59], showing the death percent 38.2 per year [58,60]. The figures provided by this model shown ubiquity of mucormycosis in India was almost 70% greater than the global data per 100,000 persons [58]. Chander *et al.* [61] mentioned the altogether mortality rate of mucormycosis can be diversified by the status of the case, kind of fungal attack, affected part of the body, and adequate antifungal treatment along with surgical intervention [61]. The important reason for the death of mucormycosis-infected patients was late diagnosis [62], and old of age patients. The involvement of the head and trunk increases the number of deaths of mucormycosis [63]. It was reported, altogether death rate can fall up to 40% with antifungal treatment, and surgical debridement [64].

In this paper, we have discussed the most possible causes of mucormycosis co-infection and its severity linked to the second wave of COVID-19 patients in India.

2. RISK FACTORS FOR MUCORMYCOSIS CO-INFECTION

Mucormycosis is an opportunistic fungal infection that is generally non-pathogenic in immunocompetent persons [65,66], except in

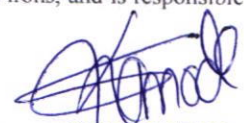
severe diabetes condition [41]. The danger of this infection is more in patients with diabetes mellitus, immunosuppressed [64,67–72], neutropenic condition [68,71,73], cancer, previously open wound *Mucorales* infection [73], renal failure, organ transplant, under immunosuppressive therapy, cirrhosis, acquired immune deficiency syndrome, iron overload patients, and voriconazole treatment [41,21,22,74] (Fig. 1). Some reports also mentioned infection of mucormycosis to some atypical areas of the body like: breast [75], ear [22], heart [76,77], and bone infection [78,79].

2.1. Mucormycosis and Diabetes

In the recent outbreak of mucormycosis in India among the SW-COVID-19 patients, diabetes mellitus was one of the important risk factors responsible for an increased number of cases [19,80–84]. According to the various reports, globally, among the fungal infection cases in COVID-19 recovered patients, 94% was Diabetes mellitus, and of this 71% cases was from India [5,19]. Diabetic mellitus and diabetes ketoacidosis are the frequent cause of rhino-orbital or rhino-cerebral mucormycosis [85–90], whereas the neutropenic condition of the patients is the reason for pulmonary mucormycosis [91,92]. In the Indian diabetic population pulmonary mucormycosis is the second commonest type of invasion [51,91,93], then cutaneous [22,59] and renal mucormycosis [60]. The available reports also shown, uncontrolled diabetic mellitus is the main risk factor responsible for mucormycosis infection [51,59,94–96]. These patients particularly progress into rhino-orbital mucormycosis, and rarely develop pulmonary and disseminated mucormycosis [97–99]. In a diabetic patient, fungal spores enter through the sinus, and process up to the periorbital region, face, and brain [47]. In Rhino-orbital mucormycosis infection, primary symptoms are either sinusitis or periorbital cellulitis [101], which involves trouble in eyes and face, numbness of the face, followed by conjunctival suffusion, blurry eyesight, and swelling on soft tissue [97,102,103], and blindness. Kasper *et al.* [100] reported in diabetes acidosis and non-ketoacidosis patients, there is a direct connection between high sugar concentrations with mucormycosis infection.

Various study reports have been published regarding the mechanism of establishment of mucormycosis infection in diabetes mellitus cases. In these patients, neutrophils activity gets reduced [50], and also patient becomes deficient in CD4 cells [104,105]. Low activity of cytokine and malfunction of polymorphonuclear cells (PMNC) may be linked with deficiency of CD4 cells [104,106]. In an individual with diabetes mellitus, triggering of microbial infection reduces the secretion of interleukin (IL)-1 & IL-6 by mononuclear cells and monocytes, which is linked to an inherent fault in the cells [106,107]. Although, according to other reports, in diabetes mellitus cases, glycation results in inhibition of production of IL-10, gamma interferon, and tumor necrosis factor. In these patients, increased glucose-6-phosphate level boosts the apoptosis of PMNC which results in a reduction in number, and their transfer through endothelial cell [107]. In diabetes ketoacidosis condition, acidosis of patient interrupts transferrin-ion binding-mechanism, which increases the number of unbound irons, and is responsible for the growth of fungi [108,109].




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2.2. The Link between Mucormycosis Infection and SWCOVID-19

COVID-19 is a disease caused by the SARS-CoV-2 virus, showing a broad range of medical complications, which spreads from human-human by respiratory droplets [110]. SARS-CoV-2 virus infects the pulmonary tissues causing alveolar-interstitial lesion, which may be responsible for more susceptibility of COVID-19 patients to mucormycosis co-infection. In such cases, primarily portal of entry of fungus is through nasal route and lung airways [78,111].

During the SWCOVID-19, mucormycosis outbreak in India, all the cases of mucormycosis co-infection were COVID-19 recovered, or near to recovery patients. In COVID-19 disease, immune system of the patient gets weakened on account of virus replication and lung damage, furthermore uncontrolled diabetes mellitus, and use of immunosuppressive drugs [80-83,112], comorbidity, and malnutrition also contribute to it (Fig. 1). Therefore, the vulnerability of mucormycosis co-infection is more in the case of COVID-19 disease [113], which is potentially responsible for further health complications, and also death in many cases [114]. It was found that among the 10%-30% of co-infections in hospitalized and critically ill COVID-19 patients, the fungus was ten times more frequent causative agent [115]. The greater risk factors for mucormycosis fungal co-infection in COVID-19 patients was owing to: use of immunosuppressive medications, lack of a diagnostic specific test for the incidence of fungal infections in COVID-19 patients [116], diabetes, hematologic malignancies, prolonged neutropenia, allogeneic hematopoietic stem cell transplantation, solid organ transplant [117], and long-term lymphopenia [113,118].

In COVID-19 disease, replication of virus triggers plenty of cytokines called "cytokine storm," showing an inflammatory reaction, and extensive damage to the lung [112,119]. Such immunosuppressive state of immune system leads to an uncontrolled reduction in CD4+ and CD8+ cells [19,119-122], B-lymphocytes, and natural killer cells [123,124]. It was also reported that, SARS-CoV-2 infection also decreases the monocytes, eosinophils, and basophils count in patients [125,126]. Such acute lung tissue damage may be prone to secondary infections after the outset of COVID-19 disease [121,127-129].

In COVID-19 in diabetic patients, the mortality can be directly linked with diabetes mellitus. In SARS-CoV-2 infection, there is increased activity of angiotensin-converting enzyme-2-receptors present on pancreatic islet cells, as well as an excess of cytokines secretions generates insulin resistance creating hyperglycemic condition [130].

In COVID-19 patients, iron metabolism is also altered [131]. In severe COVID-19 cases, ferritin level increases, which conducts extra intracellular iron, generating reactive oxygen which damages the tissue. Because of severe infection and diabetic acidoketosis, cytokines particularly IL-6 activate ferritin production, which results in intracellular iron overload [131], and creates an acidic stage, responsible for the risk of mucormycosis [132].

2.3. Mucormycosis and Therapeutic Drug in COVID-19 Disease

During the SWCOVID-19, most of the COVID-19 patients in India were treated with steroids (Tocilizumab), antiviral drugs (Remdesivir), antiparasitic drug (Ivermectin), and antibiotics

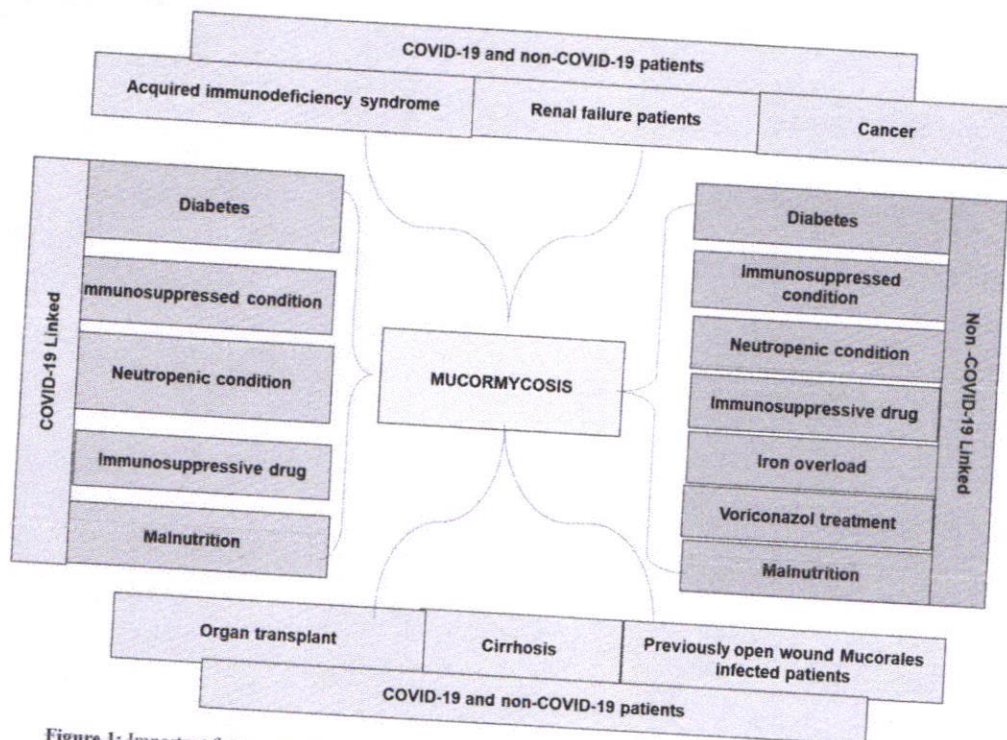
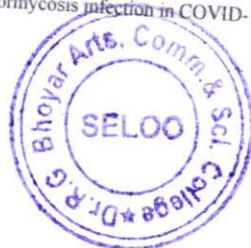


Figure 1: Important factors responsible for mucormycosis infection in COVID-19 and non-COVID-19 patients.



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(Azithromycin, Doxycycline); which were also the important cause of mucormycosis [81,113,133]. The steroidal drug and antiviral drugs suppress the immune system of patients during the treatment. The steroidal drugs increase the susceptibility of patients to mucormycosis infection [134], by reducing the activity of macrophages and neutrophils [86], there upon is an important link between COVID-19 disease and mucormycosis co-infection.

Steroids were broadly used in many COVID-19 pneumonia cases, but their efficacy for this disease has been inconsistent [135]. In case of acute pneumonia, sepsis, or critical illness, the hypothalamic-pituitary-adrenal axis gets activated and gives the inflammatory reaction. Steroidal drugs suppress the hypothalamic-pituitary-adrenal axis and develop a hypercortisolism producing endogenous cortisol [136], which reduces lung damage by controlling the various inflammatory responses [135]. In COVID-19 patients, this drug prevents the damage of the lung by reducing the inflammation but increases the blood sugar in both diabetic and non-diabetic, and immunologically weak patients.

In case the high dose of steroid induces hypercortisolemia condition, which liberates corticotropin-releasing hormone and adrenocorticotropic hormone, causes succeeding hypocortisolemic state [137]. According to one report, the overall mortality rate of mucormycosis was 50%, and this was probably due to the use of the steroidal drug to save critical COVID-19 patients. In the case of COVID-19 diseased patients, therefore appropriate steroid doses are important [114,138].

Antiviral medicines are also used to treat COVID-19 patients. Antiviral medicine like ritonavir inhibits cytochrome P450 3A4 (CYP3A4) strongly, and thereupon during the treatment, there may be chances of incidence of Adrenal insufficiency [139]. Adrenal insufficiency is linked with depleted function of natural killer cells which is important for recognizing infectious agents, and may be responsible for mucormycosis co-infection. During the treatment, sudden termination of steroidal drug which is particularly associated with ritonavir could be dangerous for intensive care unit's cases as it promotes hypocortisolemic state. Even so another blend of treatments like hydroxychloroquine, and antiviral could create a hypocortisolemic state [139].

2.4. Mucormycosis and Malnutrition

Malnutrition is also one of the factors for opportunistic co-infections. Earlier work mentioned in literature suggests that patients who stay longer in an intensive care unit (ICU) develop a loss of appetite. In COVID-19, malnutrition gets provoked during the long-time hospital stay in ICU, responsible for the slow recovery of patients [140]. Therefore, nutritional deficiencies have been noticed over all the stages of COVID-19, especially in serious patients [141].

2.5. Mucormycosis and Other Risk Factors

According to a news report in late May 2021, excessive use of food supplement zinc may also be one of the factors for mucormycosis co-infection in India [142,143]. Zinc is a supplement used to boost immunity in nutrient-deficient patients. But there is no proof that zinc prevents or treats COVID-19 [144]. Further investigation is required to support this data.

3. DISCUSSION

During the SWCOVID-19 in India, COVID-19 patients were started to acquire a deadly opportunistic fungal infection called mucormycosis. The number of mucormycosis cases was increasing with great speed in 28 states of India, of which 86% were history of COVID-19, and 62.3% were history of diabetes [20], exhibiting symptoms of visual changes, nasal stuffiness, facial fullness, headache, blindness, and even death of the patients [10,80].

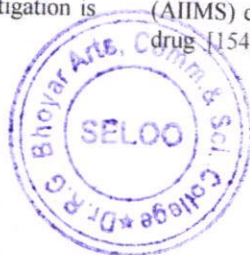
There were several factors that increased the extremity of mucormycosis in COVID-19 patients than non-COVID-19 patients [145-147]. The main factors responsible for this infection in near recovery and recovered COVID-19 patients were diabetes mellitus and diabetes ketoacidosis [20,80-84,148], critical illness, long-term ventilation, hospital stay [135,139], treatment with the immunosuppressive steroidal drug, an antiviral drug, and other drugs [80,112,135,139]. During the COVID-19 infection, increased viral load in patients elevates the activity of cytokines, called "cytokine storm" which comprehend the danger and projection of the disease [149]. This cytokine supplies inflammatory monocytes with the elevated synthesis of inflammatory cytokines like IL-6 [150]. This inflammation-causing cells enter into the lungs and cause lung injury which is responsible for trouble in lung function of COVID-19 cases [151]. In such COVID-19 patients, susceptibility to opportunistic fungal co-infections like mucormycosis increases.

Patients with uncontrolled diabetes, chances of mucormycosis fungal infections are high [5,20]. In case of uncontrolled diabetes, increased sugar level of patients supports the growth of fungus by at least three channels; (1) hyper glycation of iron-sequencing proteins, (2) overexpression of mammalian cell receptor (glucose regulate protein GRP78) which binds to Mucormycosis fungus, (3) evocation of poorly distinguished fault in phagocytosis [100].

During the COVID-19 disease, treatment with immunosuppressive steroidal drugs prevents lung inflammation by hampering the function of macrophages and neutrophils, but these drugs also suppress the natural immune defense mechanism of patients [85,135]. Therefore, diabetes mellitus and inappropriate dose of steroids were the most important link for the risk of mucormycosis in India [81]. During the long-time hospital stay, the condition of ventilators for adequate oxygen supply also increases the susceptibility of COVID-19 patients towards this opportunistic fungal co-infection mucormycosis (Fig. 2).

During the SWCOVID-19, the new variant was more infective [152] than the previous variants of COVID-19. Along with this severe lung damage due to overexpression of immune system, diabetic condition of the patients, use of immunosuppressive drugs (Fig. 2), hospital environment, and condition of a ventilator have increased the rise in susceptibility and mortality of mucormycosis cases in India. The other factors that may also be responsible for mucormycosis in SWCOVID-19 patients were malnutrition, excessive use of zinc supplements (further study is required).

To prevent the outbreak of mucormycosis, the Government of India issued some guidelines for screening, diagnosis, and management of mucormycosis [153]. All India Institute of Medical Science (AIIMS) doctors advised homecare patients not to take antiviral drug [154]. The Union Health Ministry and Family Welfare



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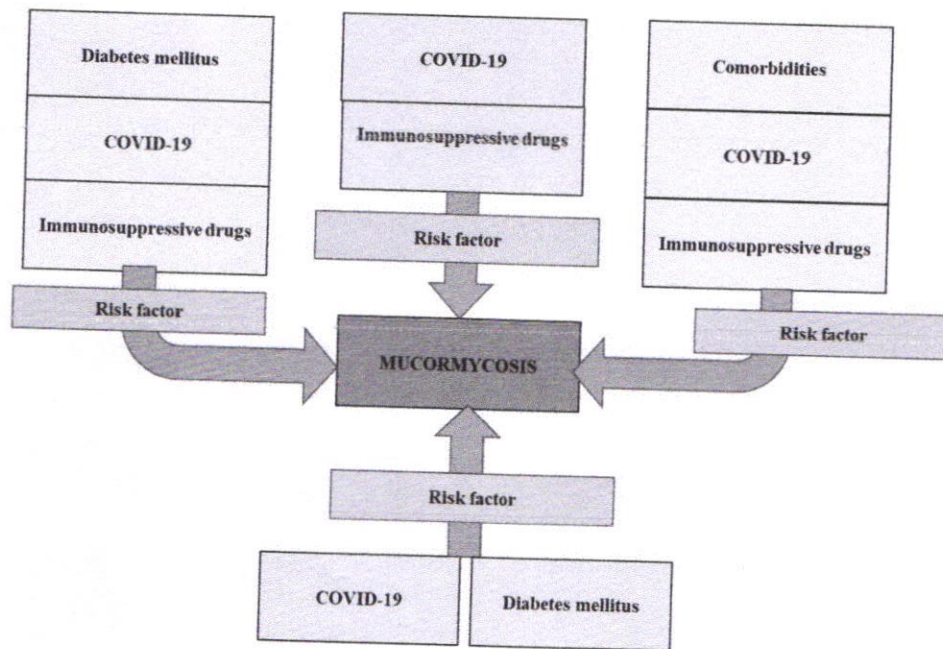


Figure 2: A risk factor in mucormycosis disease.

Directorate General of Health Services (DGHS) had issued the guidelines to stop the use of Ivermectin and doxycycline in COVID-19 patients [155], and also removed Ivermectin, azithromycin, doxycycline, zinc, favipiravir, and plasma therapy from recommendation list [156,157].

4. CONCLUSION

Mucormycosis is an opportunistic fungal infection. The rising cases of COVID-19 linked mucormycosis in many states of India may be related to one or more factors. In SWCOVID-19 disease, severity of infection was more than the earlier COVID-19 disease, which was one of the causes for opportunistic infections like mucormycosis. Secondly, the COVID-19 sufferer who had uncontrolled diabetes mellitus, hypertension, and comorbidity was more prone to mucormycosis infection due to various hyper mechanisms in patients. Thirdly, treatment with immunosuppressive steroidal drugs in critically ill COVID-19, and other COVID-19 patients was one of the reasons for mucormycosis co-infection. To prevent these complications, unnecessary use of steroidal drug should be avoided. In the case of critically ill COVID-19 patients, the right dose and duration of steroidal drug should be used. The other drugs in COVID-19 treatments also contribute to immunosuppressive condition among COVID-19 patients, and mucormycosis infection. The diabetes mellitus COVID-19 patients already suffer from lots of complications due to COVID-19 disease, and treatment with inappropriate steroidal dose and other drugs further suppresses the immune system of patients during the recovery. These were the major links for life-threatening mucormycosis infection in India. Apart from this, malnutrition in under-recovery and recovered COVID-19 patients is very common, which weakens the immune system, can also be the reason for mucormycosis co-infection.

All the above factors are linked with each other for the severity of mucormycosis in SWCOVID-19 patients than non-COVID-19 patients. AIIMS and DGHS have issued various guidelines to prevent the new SWCOVID-19 patients from the danger of mucormycosis co-infection. However, already infected and suspected mucormycosis cases can be protected by: early diagnosis of fungus, an adequate dose of the antifungal drug (Amphotericin B) and other drugs, control over the hyperglycemic condition, maintaining oxygen level of patients, and proper diet.

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6. AUTHOR CONTRIBUTIONS

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work. All the authors are eligible to be an author as per the international committee of medical journal editors (ICMJE) requirements/guidelines.


7. FUNDING

There is no funding to report.

8. CONFLICT OF INTEREST

There is no conflict of interest.



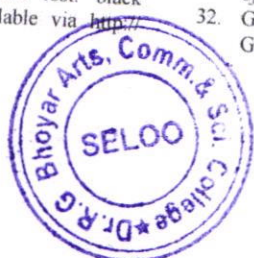

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9. ETHICAL APPROVALS

This study does not involve experiments on animals or human subjects.

REFERENCES

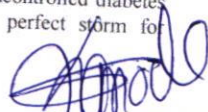
- BBC.com. Mucormycosis: the 'black fungus' maiming Covid patients in India. Available via <https://www.bbc.com/news/world-asia-india-57027829> (Accessed 9 May 2021).
- Dnaindia.com. Deadly black fungus or mucormycosis on rise in India; Rare fungal infection found in COVID-19 patients. Available via <https://www.dnaindia.com/india/video-deadly-black-fungus-or-mucormycosis-on-rise-in-india-rare-fungal-infection-found-in-covid-19-patients-2889852> (Accessed 11 May 2021).
- Timesofindia.indiatimes.com. Mucormycosis symptoms: how to identify signs and symptoms of mucormycosis, Aka black fungus infection in COVID cases? Available via <https://timesofindia.indiatimes.com/life-style/health-fitness/health-news/coronavirus-black-fungus-how-to-identify-signs-and-symptoms-of-mucormycosis-aka-black-fungus-infection-in-covid-cases/photostory/82567426.cms?picid=82567607> (Accessed 12 May 2021).
- Financialexpress.com. Black fungus: cases of post-covid mucormycosis rising. Available via <https://www.financialexpress.com/lifestyle/health/black-fungus-cases-of-post-covid-mucormycosis-rising/2252641/> (Accessed 16 May 2021).
- Indiatoday.in. Covid 19: mucormycosis or black fungus cases reported in several states in India. Available via <https://www.indiatoday.in/india/video/covid-19-mucormycosis-or-black-fungus-cases-reported-in-several-states-of-india-1803076-2021-05-16> (Accessed 16 May 2021).
- Wionews.com. Black fungus infections on the rise in India. Available from: <https://youtu.be/ZykmPigRp-c> (Accessed 20 May 2021).
- Edition.cnn.com. They recovered from Covid, only to die of 'black fungus'. What we know about the disease sweeping India. Available via <https://edition.cnn.com/2021/05/21/india/black-fungus-mucormycosis-covid-explainer-intl-hnk/index.html> (Accessed 24 May 2021).
- Indiatoday.in. New Delhi: black fungus detected in Covid-19 survivors; 8 lose eyesight in Surat. Available via <https://www.indiatoday.in/coronavirus-outbreak/story/black-fungus-mucormycosis-detected-covid-19-survivors-8-lose-eyesight-surat-fungal-infection-symptoms-1799971-2021-05-07> (Accessed 7 May 2021).
- Moneycontrol.com. Mucormycosis fungal infections maiming COVID-19 survivors in India: all you need to know about this 'black fungus'. Available via <https://www.moneycontrol.com/news/india/mucormycosis-fungal-infections-maiming-covid-19-survivors-in-india-all-you-need-to-know-about-this-black-fungus-6871551.html> (Accessed 10 May 2021).
- MyGov India. Mucormycosis. Available via https://youtu.be/eA5FM_2H6_A (Accessed 13 May 2021).
- Timesofindia.indiatimes.com. Explained: mucormycosis aka black fungus in Covid-19 patient Available via <https://timesofindia.indiatimes.com/india/explained-what-is-mucormycosis-aka-black-fungus-affecting-covid-19-patients/articleshow/82517866.cms> (Accessed 11 May 2021).
- Timesofindia.indiatimes.com. AIIMS to develop guidelines to treat black fungus. Available via http://timesofindia.indiatimes.com/articleshow/82731440.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst (Accessed 18 May 2021).
- Zeebiz.com. Mumbai Zeebiz Web Desk: Black fungus alert! Center directs state government to declare mucormycosis as an epidemic. Available via <https://www.zeebiz.com/india/news-black-fungus-alert-centre-directs-state-governments-to-declare-mucormycosis-as-an-epidemic-157041> (Accessed 20 May 2021).
- Timesofindia.indiatimes.com/. 5500 cases, 126 life lost: black fungus stalk states, Maharashtra worst hit. Available via http://timesofindia.indiatimes.com/articleshow/82813528.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst (Accessed 21 May 2021).
- Livemint.com. Black fungus: three states account for nearly 60% of mucormycosis cases in India. Available via <http://livemint.com/news/india/black-fungus-gujarat-maharashtra-andhra-3-states-account-for-nearly-60-of-mucormycosis-cases-in-india-11621664559576.html> (Accessed 22 May 2021).
- Livemint.com. Black fungus: these 5 states account for over 65% of India's 11,717 mucormycosis cases. Available via <https://www.livemint.com/news/india/black-fungus-these-5-states-account-for-60-of-india-s-11-700-mucormycosis-cases-11622018575067.html> (Accessed 26 May 2021).
- Indianexpress.com. Nagpur and Pune account for almost 33% of Maharashtra's mucormycosis cases. Available via <https://indianexpress.com/article/cities/pune/nagpur-pune-account-for-almost-33-of-maharashtras-mucormycosis-cases-7344411> (Accessed 5 June 2021).
- Medicalnewstoday.com. "Black fungus" and COVID-19: Myths and facts. Available via <https://www.medicalnewstoday.com/articles/black-fungus-and-covid-19-myths-and-facts> (Accessed 18 May 2021).
- BBC.com. Black fungus: is diabetes behind India's high number of cases. Available via <https://www.bbc.com/news/world-asia-india-57252077> (Accessed 6 June 2021).
- Livemint.com. Black fungus: these two states account for nearly 42% of India's 28,252 mucormycosis cases. Available via <https://www.livemint.com/news/india/black-fungus-28-states-see-28-252-mucormycosis-cases-maharashtra-gujarat-among-worst-hit-states-11623069135171.html> (Accessed 7 June 2021).
- Jeong W, Keighley C, Wolfe R, Lee WL, Slavin MA, Kong DCM, *et al.* The epidemiology and clinical manifestations of mucormycosis: a systematic review and meta-analysis of case reports. *Clin Microbiol Infect* 2019;25(1):26-34; doi:10.1016/j.cmi.2018.07.011
- Prakash H, Ghosh AK, Rudramurthy SM, Singh P, Xess I, Savio J, *et al.* A prospective multicenter study on mucormycosis in India: epidemiology, diagnosis, and treatment. *Med Mycol* 2019;57(4):395-402; doi:10.1093/mmy/myy060
- Bakshi SS. Rhino-orbital mucormycosis. *Bull Emerg Trauma* 2019;7(1):88-9; doi:10.29252/beat-0701015
- Kohn R, Hepler R. Management of limited rhino-orbital mucormycosis without exenteration. *Ophthalmology* 1985;92(10):1440-4; doi:10.1016/s0161-6420(85)33844-7
- Frater JL, Hall GS, Procop GW. Histologic features of Zygomycosis: emphasis on perineural invasion and fungal morphology. *Arch Pathol Lab Med* 2001;125(3):375-8; doi:10.5858/2001-125-0375-HFOZ
- Cohen-Abbo A, Bozeman PM, Patrick CC. Cunninghamella pneumonia: review and report of two cases of Cunninghamella pneumonia in immunocompromised children. *Clin Infect Dis* 1993;17(2):173-7; doi:10.1093/clinids/17.2.173
- Mooney JE, Wanger A. Mucormycosis of the gastrointestinal tract in children: report of a case and review of the literature. *Pediatr Infect Dis J* 1993;12(10):872-6; doi:10.1097/00006454-199310000-00013
- Craig NM, Lueder FL, Pensler JM, Bean BS, Petrick ML, Thompson RB, *et al.* Disseminated *Rhizopus* infection in a premature infant. *Pediatr Dermatol* 1994;11(4):346-50; doi:10.1111/j.1525-1470
- Lueg EA, Ballagh RH, Forte V. Analysis of a recent cluster of invasive fungal sinusitis at the Toronto Hospital for Sick Children. *J Otolaryngol* 1996;25(6):366-70.
- Gokcil Z, Odabasi Z, Kutukcu Y, Umudum H, Vural O, Yardim M. Rhino-orbital-cerebral mucormycosis. *J Neurol* 1998;245(10):689-90; doi:10.1007/s004150050269
- Darrisaw L, Hanson G, Vesole DH, Kehl SC. Cunninghamella infection post bone marrow transplant: case report and review of the literature. *Bone Marrow Transplant* 2000;25(11):1213-6; doi:10.1038/sj.bmt.1702395
- Gaziev D, Baronciani D, Galimberti M, Polchi P, Angelucci E, Giardini C, *et al.* Mucormycosis after bone marrow transplantation.



Principal
Dr. R. G. Bhojar Arts, Comm. & Science College, SELOO

- report of four cases in thalassemia and review of the literature. *Bone Marrow Transplant* 1996;17(3):409-14.
33. Ribes JA, Vanover-Sams CL, Baker DJ. Zygomycetes in human disease. *Clin Microbiol Rev* 2000;13(2):236-301; doi:10.1128/CMR.13.2.236
 34. Melsom SM, Khangure MS. Craniofacial mucormycosis following assault: an unusual presentation of an unusual disease. *Australas Radiol* 2000;44(1):104-6; doi:10.1046/j.1440-1673.2000.00751.x
 35. Krasinski K, Holzman RS, Hanna B, Greco MA, Graff M, Bhogal M. Nosocomial fungal infection during hospital renovation. *Infect Control* 1985;6(7):278-82; doi:10.1017/s0195941700061750
 36. Kontoyianis DP, Vartivarian S, Anaissie EJ, Samonis G, Bodey GP, Rinaldi M. Infections due to *Cunninghamella bertholletiae* in patients with cancer: report of three cases and review. *Clin Infect Dis* 1994;18(6):925-8; doi:10.1093/clinids/18.6.925
 37. Lee FY, Mossad SB, Adal KA. Pulmonary mucormycosis: the last 30 years. *Arch Intern Med* 1999;159(12):1301-9; doi:10.1001/archinte.159.12.1301
 38. Kontoyiannis DP, Wessel VC, Bodey GP, Rolston KV. Zygomycosis in a tertiary-care cancer center. *Clin Infect Dis* 2000;30(6):851-6; doi:10.1086/313803
 39. Rabin ER, Lundberg GD, Mitchell ET. Mucormycosis in severely burned patients. Report of two cases with extensive destruction of the face and nasal cavity. *N Engl J Med* 1961;264:1286-89; doi:10.1056/NEJM196106222642504
 40. Paparello SF, Parry RL, MacGillivray DC, Brock N, Mayers DL. Hospital-acquired wound mucormycosis. *Clin Infect Dis* 1992;14(1):350-2; doi:10.1093/clinids/14.1.350
 41. Roden MM, Zaoutis TE, Buchanan WL, Knudsen TA, Sarkisova TA, Schaufele RL, et al. Epidemiology and outcome of Zygomycosis: a review of 929 reported cases. *Clin Infect Dis* 2005;41(5):634-53; doi:10.1086/432579
 42. Lin E, Moua T, Limper AH. Pulmonary mucormycosis: clinical features and outcomes. *Infection*, 2017;45(4):443-8; doi:10.1007/s15010-017-0991-6
 43. Kwon-Chung KJ. Taxonomy of fungi causing mucormycosis and entomophthoromycosis (Zygomycosis) and nomenclature of the disease: molecular mycologic perspectives. *Clin Infect Dis*. 2012;54(Suppl 1):S8-15; doi:10.1093/cid/cir864
 44. Patra S, Vij M, Chirila DK, Kumar N, Samal SC. Unsuspected invasive neonatal gastrointestinal mucormycosis: a clinicopathological study of six cases from a tertiary care hospital. *J Indian Assoc Pediatr Surg* 2012;17(4):153-6; doi:10.4103/0971-9261.102329
 45. Chakrabarti A, Singh R. Mucormycosis in India: unique features. *Mycoses* 2014;57(Suppl 3):85-90; doi:10.1111/myc.12243
 - Chander J, Stehigel AM, Alastruey-Izquierdo A et al. Fungal necrotizing fasciitis, an emerging infectious disease caused by *Apophysomyces (Mucorales)*. *Rev Iberoam Micol* 2015;32(2):93-8; doi:10.1016/j.riam.2014.06.005
 47. Sugar AM. Agents of mucormycosis and related species. In: Mandel GL, Bennett JE, Dolin R (eds.). *Principles and practice of infectious diseases*. 5th edition, Churchill Livingstone, Philadelphia, PA, vol 2, pp 2685-95, 2000.
 48. Skiada A, Pavleas I, Drogari-Apiranthitou M. Epidemiology and diagnosis of mucormycosis: an update. *J Fungi (Basel)* 2020;6(4):265; doi:10.3390/jof6040265
 49. Waldorf AR. Pulmonary defense mechanisms against opportunistic fungal pathogens. *Immunol Ser* 1989;47:243-71.
 50. Morace G, Borghi E. Invasive mold Infections: virulence and pathogenesis of Mucorales. *Int J Microbiol* 2012;2012:349278; doi:10.1155/2012/349278
 51. Corzo-León DE, Chora-Hernández LD, Rodríguez-Zulueta AP, Walsh TJ. Diabetes mellitus as the major risk factor for mucormycosis in Mexico: epidemiology, diagnosis, and outcomes of reported cases. *Med Mycol* 2018;56(1):29-43; doi:10.1093/mmy/myx017
 52. Spellberg B, Edwards J Jr, Ibrahim A. Novel perspectives on mucormycosis: pathophysiology, presentation, and management [presentation]. *Clin Microbiol Rev* 2005;18(3):556-69; doi:10.12688/f1000research.15081.1
 53. Pilmis B, Alanio A, Lortholary O, Lanternier F. Recent advances in the understanding and management of mucormycosis. *F1000Res* 2018;7:F1000.
 54. Chakrabarti A, Das A, Sharma A, Panda N, Das S, Gupta KL, et al. Ten years' experience in Zygomycosis at a tertiary care center in India. *J Infect* 2001;42(4):261-6; doi:10.1053/jinf.2001.0831
 55. Chakrabarti A, Das A, Mandal J et al. The rising trend of invasive Zygomycosis in patients with uncontrolled diabetes mellitus. *Med Mycol* 2006;44(4):335-42; doi:10.1080/13693780500464930
 56. Chakrabarti A, Chatterjee SS, Das A, Panda N, Shivaprakash MR, Kaur A, et al. Invasive Zygomycosis in India: experience in a tertiary care hospital. *Postgrad Med J* 2009;85(1009):573-81; doi:10.1136/pgmj.2008.076463
 57. Manesh A, Rupali P, Sullivan MO, Mohanraj P, Rupa V, George B, et al. Mucormycosis-A clinicoepidemiological review of cases over 10 years. *Mycoses*, 2019;62(4):391-8; doi:10.1111/myc.12897
 58. Prakash H, Chakrabarti A. Global epidemiology of mucormycosis. *J Fungi (Basel)* 2019;5(1):26; doi:10.3390/jof5010026
 59. Patel A, Kaur H, Xess I, Michael JS, Savio J, Rudramurthy S, et al. A multi-centre observational study on the epidemiology, risk factors, management and outcomes of mucormycosis in India. *Clin Microbiol Infect* 2020;26(7):944 e9-15; doi:10.1016/j.cmi.2019.11.021
 60. Chakrabarti A, Sood P, Denning D. Estimating fungal infection burden in India: mucormycosis burden as a case study [Internet]. 2021. Available via <https://www.gaffi.org/wp-content/uploads/P1044.pdf>
 61. Chander J, Kaur M, Singla N, Punia RPS, Singhal SK, Attri AK, et al. Mucormycosis: battle with the deadly enemy over a five-year period in India. *J Fungi (Basel)*, 2018;4(2):46; doi:10.3390/jof4020046
 62. Werthman-Ehrenreich A. Mucormycosis with orbital compartment syndrome in a patient with COVID-19. *Am J Emerg Med* 2021;42:264. e5-8; doi:10.1016/j.ajem.2020.09.032
 63. Cocanour CS, Miller-Crotchet P, Reed 2nd RL, Johnson PC, Fischer RP. Mucormycosis in trauma patients. *J Trauma* 1992;32(1):12-5; doi:10.1097/00005373-199201000-00003
 64. Yohai RA, Bullock JD, Aziz AA, Markert RJ. Survival factors in rhino-orbital-cerebral mucormycosis. *Surv Ophthalmol* 1994;39(1):3-22; doi:10.1016/s0039-6257(05)80041-4
 65. Hamdi T, Karthikeyan V, Alangaden GJ. Mucormycosis in a renal transplant recipient: case report and comprehensive review of literature. Alangaden, Hindawi Publishing Corporation. *Int J Nephrol* 2014;2014:950643; doi:10.1155/2014/950643
 66. Hernandez Jorge L, Buckley CJ. Mucormycosis. StatPearls, Treasure Island, FL, 2020.
 67. Bell S, Mahoney L. Mucormycosis: a case study. *Crit Care Nurse* 2000;20(1):18-23; doi:10.4037/ccn2000.20.1.18
 68. Chow V, Khan S, Balogun A, Mitchell D, Mühlshlegel FA. Invasive rhino-orbital-cerebral mucormycosis in a diabetic patient—the need for prompt treatment. *Med Mycol Case Rep*, 2015;8:5-9; doi:10.1016/j.mmc.2014.12.002
 69. Chowdhary A, Tarai B, Singh A, Sharma A. Multidrug-resistant *Candida auris* infections in critically ill coronavirus disease patients, India, April–July 2020. *Emerg Infect Dis* 2020;26(11):2694-6; doi:10.3201/eid2611.203504
 70. Sarkar S, Gokhale T, Choudhury SS, Deb AK. COVID-19, and orbital mucormycosis. *Indian J Ophthalmol* 2021;69(4):1002-4; doi:10.4103/ijo.IJO_3763_20
 71. Sen M, Lahane S, Lahane TP, Parekh R, Honavar SG. Mucor in a viral land: a tale of two pathogens. *Indian J Ophthalmol* 2021;69(2):244-52; doi:10.4103/ijo.IJO_3774_20
 72. John TM, Jacob CN, Kontoyiannis DP. When uncontrolled diabetes mellitus and severe COVID-19 converge: the perfect storm for




PRINCIPAL
Dr. R. G. Bhojar Arts, Comm.
& Science College, SELOO

- mucormycosis. *J Fungi (Basel)* 2021;7(4):298; doi:10.3390/jof7040298
73. Bassetti M, Bouza E. Invasive mold infections in the ICU setting: complexities and solutions. *J Antimicrob Chemother* 2017;72(suppl_1):i39-47; doi:10.1093/jac/dkx032
 74. Reid G, Lynch JP, Fishbein MC, Clark NM. Mucormycosis. *Semin Respir Crit Care Med* 2020;41(1):99-114; doi:10.1055/s-0039-3401992
 75. Kataria SP, Sharma J, Singh G, Kumar S, Malik S, Kumar V. Primary breast mucormycosis: FNAC diagnosis of a rare entity. *Diagn Cytopathol* 2016;44(9):761-3; doi:10.1002/dc.23510
 76. Hadgaonkar S, Shah K, Bhojraj S, Nene A, Shyam A. Isolated mucormycotic spondylodiscitis of lumbar spine-A rare case report. *J Orthop Case Rep* 2015;5(2):55-7; doi:10.13107/jocr.2250-0685.275
 77. Shah K, Nene A. Spinal mucormycosis. *J Glob Infect Dis* 2017;9(4):160-1. doi:10.4103/jgid.jgid_107_16
 78. Bhatt M, Soneja M, Fazal F, Vyas S, Kumar P, Jorwal P, et al. Two cases of osteoarticular mucor menace: a diagnostic and management conundrum. *Drug Discov Ther* 2018;12(6):374-8; doi:10.5582/dtd.2018.01064
 79. Urs AB, Singh H, Mohanty S, Sharma P. Fungal osteomyelitis of maxillofacial bones: rare presentation. *J Oral Maxillofac Pathol* 2016;20(3):546; doi:10.4103/0973-029X.190966
 80. Forbes.com. What is behind the deadly rise in mucormycosis infections in India? Available via <https://www.forbes.com/sites/judystone/2021/06/03/murder-mystery-what-is-behind-the-deadly-rise-in-mucormycosis-infections-in-india> (Accessed 5 June 2021).
 81. Timesofindia.indiatimes.com. Corona virus black fungus symptoms: when and how to check if mucormycosis has been triggered by COVID-19. Available via <http://timesofindia.indiatimes.com/life-style/health-fitness/health-news/coronavirus-black-fungus-symptoms-when-and-how-to-check-if-mucormycosis-has-been-triggered-by-covid-19-photostory/83169411.cms?picid=83169634> (Accessed 2 June 2021).
 82. Tribuneindia.com. Chandigarh: India witnessed two-fold increase in mucormycosis cases: CDC study Available from: <http://tribuneindia.com/news/nation/india-witnessed-two-fold-increase-in-mucormycosis-cases-cdc-study-263891>. (Accessed 6 June 2021).
 83. Raut A, Huy NT. Rising incidence of mucormycosis in patients with COVID-19: another challenge for India amidst the second wave? *Lancet Respir Med* 2021;9(8):e77. [https://doi.org/10.1016/S2213-2600\(21\)00265-4](https://doi.org/10.1016/S2213-2600(21)00265-4)
 84. thehindu.com [Internet]. Chennai: India is home to 77 million diabetics, the second highest in the world [Updated 2019, November 15]. Available via <https://www.thehindu.com/sci-tech/health/india-has-second-largest-number-of-people-with-diabetes/article29975027.ece>
 85. McNulty JS. Rhinocerebral mucormycosis: predisposing factors. *Laryngoscope* 1982;92(10 Pt 1):1140-3; doi:10.1288/00005537-98210000-00007
 86. Kwon-Chung KJ, Bennett JE. Medical mycology. *Rev Inst Med Trop S Paulo* 1992;34(6):504; doi:10.1590/S0036-46651992000600018
 87. Lanternier F, Dannaoui E, Morizot G, Elie C, Garcia-Hermoso D, Huerre M, et al. A global analysis of mucormycosis in France: the RetroZygo study. *Clin Infect Dis*, 2012;54(suppl 1):S35-43; doi:10.1093/cid/cir880
 88. Ibrahim AS, Edwards JEJ, Filler SG. Zygomycosis 241-251 in. In: Dismukes WE, Pappas PG, Sobel JD (eds.). *Clinical mycology*. Oxford University Press, New York, NY, 2003.
 89. Farmakiotis D, Kontoyiannis DP. Mucormycosis. *Infect Dis Clin North Am* 2016;30(1):143-63; doi:10.1016/j.idc.2015.10.011
 90. Maini A, Tomar G, Khanna D, Kini Y, Mehta H, Bhagyasree V. Sinus orbital mucormycosis in a COVID-19 patient: a case report. *Int J Surg Case Rep* 2021;82:105957.
 91. Tedder M, Spratt JA, Anstadt MP, Hegde SS, Tedder SD, Lowe JE. Pulmonary mucormycosis: results of medical and surgical therapy. *Ann Thorac Surg* 1994;57(4):1044-50; doi:10.1016/0003-4975(94)90243-7
 92. Jacobs S, Gonzalez CE, Walsh TJ. *Mucormycosis and Entomophthoromycosis*. 2nd edition, 2002. Available via <http://www.antimicrobe.org/fl3.asp>
 93. Deepak G, Muthu V, Sehgal I, Ramachandran R, Kaur H, Bhalla A, et al. Coronavirus disease (Covid-19) associated mucormycosis (CAM): case report and systematic review of literature. *Mycopathologia* 2021;186(2):289-98; doi:10.1007/s11046-021-00528-2.
 94. Ghafur A, Shareek PS, Senthur NP, Vidyalakshmi PR, Ramasubramanian V, Parameswaran A, et al. Mucormycosis in patients without cancer: A case series from a tertiary care hospital in South India. *J Assoc Physicians India* 2013;61(5):305-8.
 95. Bala K, Chander J, Handa U, Punia RS, Attri AK. A prospective study of mucormycosis in north India: experience from a tertiary care hospital. *Med Mycol* 2015;53(3):248-257. doi:10.1093/mmy/myu086
 96. Vaezi A, Moazeni M, Rahimi MT et al. Mucormycosis in Iran: A systematic review. *Mycoses* 2016;59(7):402-15. doi:10.1111/myc.12474
 97. Khor BS, Lee MH, Leu HS, Liu JW. Rhinocerebral mucormycosis in Taiwan. *J Microbiol Immunol Infect* 2003;36(4):266-9.
 98. Nithyanandam S, Jacob MS, Battu RR, Thomas RK, Correa MA, D'Souza O. Rhino-orbito-cerebral mucormycosis. A retrospective analysis of clinical features and treatment outcomes. *Indian J Ophthalmol* 2003;51(3):231-6.
 99. O'Brien TJ, McKelvie P. Rhinocerebral mucormycosis presenting as periorbital cellulitis with blindness: report of 2 cases. *Clin Exp Neurol* 1994; 31:68-78.
 100. Kasper D, Fauci A, Hauser S, Longo D, Jameson JL, Loscalzo J. *Harrison's principles of internal medicine*. McGraw-Hill Education, New York, NY, p 19e, 1994.
 101. Dhiwakar M, Thakar A, Bahadur S. Improving outcomes in rhinocerebral mucormycosis—early diagnostic pointers and prognostic factors. *J Laryngol Otol* 2003;117(11):861-5.
 102. Peterson KL, Wang M, Canalis RF, Abemayor E. Rhinocerebral mucormycosis: evolution of the disease and treatment options. *Laryngoscope* 1997;107(7):855-62.
 103. Thajeb P, Thajeb T, Dai D. Fatal strokes in patients with rhino-orbito-cerebral mucormycosis and associated vasculopathy. *Sc J Infect Dis* 2004;36(9):643-8; doi:10.1080/00365540410020794
 104. Stoeckle M, Kaech C, Trampuz A, Zimmerli W. The role of diabetes mellitus in patients with bloodstream infections. *Swiss Med Wkly* 2008;138(35-36):512-9.
 105. Flyvbjerg A. Diabetic angiopathy, the complement system, and the tumor necrosis factor superfamily. *Nat Rev Endocrinol* 2010;6(2):94-101; doi:10.1038/nrendo.2009.266
 106. Geerlings SE, Hoepelman AI. Immune dysfunction in patients with diabetes mellitus (DM). *FEMS Immunol Med Microbiol* 1999;26(3-4):259-65; doi:10.1111/j.1574-695X.1999.tb01397.x
 107. Peleg AY, Weeraratna T, McCarthy JS, Davis TM. Common infections in diabetes: pathogenesis, management, and relationship to glycaemic control. *Diabetes Metab Res Rev* 2007;23(1):3-13; doi:10.1002/dmrr.682
 108. Sheldon WH, Bauer H. The development of the acute inflammatory response to experimental cutaneous mucormycosis in normal and diabetic rabbits. *J Exp Med* 1959;110:845-52; doi:10.1084/jem.110.6.845
 109. Waldorf AR, Ruderman N, Diamond RD. Specific susceptibility to mucormycosis in murine diabetes and bronchoalveolar macrophage defense against *Rhizopus*. *J Clin Invest* 1984;74(1):150-60; doi:10.1172/JCI111395
 110. Khan M, Adil SF, Alkhatlan HZ, Tahir MN, Saif S, Khan M, et al. COVID-19: a global challenge with old history, epidemiology, and progress so far. *Molecules* 2020;26(1):39; doi:10.3390/molecules26010039
 111. Mehta S, Pandey A. Rhino-orbital mucormycosis associated with COVID-19. *Cureus* 2020;12(9):e10726; doi:10.7759/cureus.10726
 112. Monte Junior ESD, Santos MELD, Ribeiro IB, Luz GDO, Baba ER, Hirsch BS, et al. Rare and fatal gastrointestinal mucormycosis (Zygomycosis) in a COVID-19 patient: a case report. *Clin Endosc* 2020;53(6):746-9; doi:10.5946/ce.2020.180



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Dr. R. G. Bhojar Arts, Comm. & Science College, SELOO

113. Ruuskanen O, Lahti E, Jennings LC, Murdoch DR. Viral pneumonia. *Lancet* 2011;377(9773):1264–75; doi:10.1016/S0140-6736(10)61459-6
114. Medpagetoday.com. Superinfections and coinfections in COVID-19. Available via <http://medpagetoday.com/infectiousdisease/covid19/86192> (Accessed 28 April 2020)
115. Segrelles-Calvo G, Glauber Rde S (1405–1413) ISSN 1746-0913 Araujo 2,3 and Susana Frases, Systemic mycoses: a potential alert for complications in COVID-19 patients *Serviciode Neumologia. [Hospital Universitario Rey Juan Carlos, Instituto de Investigacion Biomedica Fundaci] on Jim' e10.2217/fmb-2020-0156]. Future Microbiol* 2020;15(14):C2020.
116. Cornely OA, Alastruey-Izquierdo A, Arenz D, Chen SCA, Dannaoui E, Hochhegger B, *et al.* Mucormycosis ECMM MSG global guideline writing group. *Lancet Infect Dis* 2019;19(12):e405–21; doi:10.1016/S1473-3099(19)30312-3
117. Saha O, Rakhi NN, Sultana A, Rahman MM, Rahaman MM. SARS-CoV-2 and COVID-19: a threat to global health. *Discov Rep* 2020;3:e13; doi:10.15190/drep.2020.7
118. Gangneux JP, Bougnoux ME, Dannaoui E, Cornet M, Zahar JR. Invasive fungal diseases during COVID-19: we should be prepared. *J Mycol Med*, 2020;30(2):100971; doi:10.1016/j.mycmed.2020.100971
119. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, *et al.* Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *Lancet Respir Med* 2020;8(5):475–81; doi:10.1016/S2213-2600(20)30079-5.
120. Liu J, Li S, Liu J, Liang B, Wang X, Wang H, *et al.* Longitudinal characteristics of lymphocyte responses and cytokine profiles in the peripheral blood of SARS-CoV-2 infected patients. *EBiomedicine* 2020;55:102763.
121. Pemán J, Ruiz-Gaitán A, Garcia-Vidal C, Salavert M, Ramirez P, Puchades F, *et al.* Fungal co-infection in COVID-19 patients: should we be concerned? *Rev Iberoam Micol* 2020;37(2):41–6; doi:10.1016/j.riam.2020.07.001
122. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, *et al.* Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395(10223):497–506. doi:10.1016/S0140-6736(20)30183-5
123. Tan M, Liu Y, Zhou R, Deng X, Li F, Liang K, *et al.* Immunopathological characteristics of coronavirus disease 2019 cases in Guangzhou, China. *Immunology* 2020;160(3):261–8; doi:10.1101/2020.03.12.20034736
124. Qin C, Zhou L, Hu Z, Zhang S, Yang S, Tao Y, *et al.* (2020) Dysregulation of immune response in patients with COVID-19 in Wuhan, China. *Clin Infect Dis* 2020;71(15):762–8; doi:10.1093/cid/ciaa248
125. Zhang B, Zhou X, Zhu C, Feng F, Song Y, Feng F, Qiu Y, *et al.* Immune phenotyping based on neutrophil-to-lymphocyte ratio and IgG predicts disease severity and outcome for patients with COVID-19. *Front Mol Biosci* 2020;7:157; doi:10.1101/2020.03.12.20035048
126. Peng M, Meng H, Sun Y, Xiao Y, Zhang H, Lv K, *et al.* Clinical features of pulmonary mucormycosis in patients with different immune status. *J Thorac Dis*, 2019;11(12):5042–52; doi:10.21037/jtd.2019.12.53.
127. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, *et al.* Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet*, 2020;395(10229):1054–62; doi:10.1016/S0140-6736(20)30566-3.
128. Onder G, Rezza G, Brusaferro S. Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. *JAMA* 2020;323(18):1775–6; doi:10.1001/jama.2020.4683
129. Kothandaraman N, Rengaraj A, Xue B, Yew WS, Velan SS, Karnani N, *et al.* COVID-19 endocrinopathy with hindsight from SARS. *Am J Physiol Endocrinol Metab*, 2021;320(1):E139–50; doi:10.1152/ajpendo.00480.2020
130. Perricone C, Bartoloni E, Bursi R, Cafaro G, Guidelli GM, Shoenfeld Y, *et al.* COVID-19 as part of the hyperferritinemic syndromes: the role of iron depletion therapy. *Immunol Res* 2020;68(4):213–24; doi:10.1007/s12026-020-09145-5
131. Ibrahim AS, Spellberg B, Walsh TJ, Kontoyiannis DP. Pathogenesis of mucormycosis. *Clin Infect Dis* 2012;54(suppl 1):S16–22; doi:10.1093/cid/cir865
132. Punjabnewsexpress.com. Diabetes is a major risk factor in mucormycosis case. Available via <https://www.punjabnewsexpress.com/health/news/diabetes-is-a-major-risk-factor-in-mucormycosis-cases-balbir-sidhu-138849> (Accessed 2 June 2021)
133. Wionews.com. Black fungus infections on rise in India: Antifungal drug: mucormycosis. Available via <https://www.youtube.com/watch?v=2ykmpigRp-c> (Accessed 20 May 2021).
134. Almyroudis NG, Sutton DA, Linden P, Rinaldi MG, Fung J, Kusne S. Zygomycosis in solid organ transplant recipients in a tertiary transplant center and review of the literature. *Am J Transplant* 2006;6(10):2365–74; doi:10.1111/j.1600-6143.2006.01496.x
135. Horby P, Lim WS, Emberson JR, Mafham M, Bell JL, Linsell L, *et al.* Dexamethasone in hospitalized patients with COVID-19—preliminary report. *N Engl J Med* 2021;384(8):693–704; doi:10.1056/NEJMoa2021436
136. Pal R, Banerjee M. COVID-19, and the endocrine system: exploring the unexplored. *J Endocrinol Invest* 2020;3:9.
137. Wood BR, Lacy JM, Johnston C, Weigle DS, Dhanireddy S. Adrenal insufficiency as a result of ritonavir and exogenous steroid exposure: report of 6 cases and recommendation for management. *J Int Assoc Provide Aids Care* 2015;14:300–5; doi:10.1177/2325957414
138. Ferrau F, Ceccato F, Cannavò S, Scaroni C. What we have to know about corticosteroids use during SARS-CoV-2 infection. *J Endocrinol Invest* 2021;44(4):693–701; doi:10.1007/s40618-020-01384-5
139. Berton AM, Prencipe N, Giordano R, Ghigo E, Grottoli S. Systemic steroids in patients with COVID-19: pros and contras, an endocrinological point of view. *J Endocrinol Invest* 2021;44(4):873–75; doi:10.1007/s40618-020-01325-2
140. Wu C, Chen X, Cai Y, Xia J, Zhou X, Xu S, *et al.* Risk factors associated with acute respiratory distress syndrome and death in patients with corona virus Disease 2019 pneumonia in Wuhan, China. *JAMA Intern Med* 2020;180(7):934–43; doi:10.1001/jamainternmed.2020.0994
141. Gemelli Against COVID-19 Post-Acute Care Study Group. Post-COVID-19 global health strategies: the need for an interdisciplinary approach. *Aging Clin Exp Res* 2020;32(8):1613–20; doi:10.1007/s40520-020-01616-x
142. Timesofindia.indiatimes.com. Mumbai: zinc overuse driving black fungus epidemic within pandemic? Doctors want study. Available via <https://timesofindia.indiatimes.com/city/mumbai/mumbai-zinc-overuse-driving-mucor-epidemic-within-pandemic-docs-want-study/articleshow/82922957.cm> (Accessed 25 May 2021).
143. News18.com. Amid mucormycosis outbreak, doctors seek research on role of zinc supplement. Available via <https://www.news18.com/news/india/mucormycosis-black-fungus-zinc-supplements-covid-19-coronavirus-3781526.html> (Accessed 27 May 2021).
144. Cnbctv18.com. Doctors suspects overuse of zinc and iron increases risk of black fungus infections. Available via <https://www.cnbctv18.com/healthcare/doctors-suspect-overuse-of-zinc-and-iron-increases-risk-of-black-fungus-infection-9440491.htm> (Accessed 26 May 2021).
145. Chougule A, Muthu V, Bal A, Rudramurthy SM, Dhooria S, *et al.* Pulmonary gangrene due to *Rhizopus* spp *Staphylococcus aureus* *Klebsiella pneumoniae* and probable *Sarcina* organisms. *Mycopathologia* 2015;180(1–2):131–6; doi:10.1007/s11046-015-9904-3
146. Muthu V, Dhooria S, Singh Sehgal I, Thurai Prasad K, Agarwal R. The reversed halo sign and the bronchus sign: the eyes see only what the mind knows. *Ann Am Thorac Soc* 2019;16(9):1203; doi:10.1513/AnnalsATS.201905-360LE.
147. Pandey N, Vipin K, Dutt P, Taneja S, Biswal M, Mahajan P, *et al.* Transforming a general hospital to an infectious disease hospital for



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Dr. R. G. Bhojar Arts, Comm. & Science College, SELOO

- COVID for COVID-19 over 2 weeks. *Front Public Health* 2020;8:382; doi:10.3389/fpubh.2020.00382
148. Economictimes.indiatimes.com. Covid infection, diabetes and misuse of steroids during treatment responsible for increase in mucormycosis cases: Randeep Guleria, AIIMS Director. Available via <https://economictimes.indiatimes.com/news/india/covid-infection-diabetes-and-misuse-of-steroids-during-treatment-responsible-for-increase-in-mucormycosis-cases-randeep-guleria-aiims-director/videoshw/82658230.cms> (Accessed 15 May 2021).
149. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, *et al.* Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395(10223):497-506; doi:10.1016/S0140-6736(20)30183-5
150. Zhou Y, Fu B, Zheng X, Wang D, Zhao C, Qi Y, *et al.* Pathogenic T cells and inflammatory monocytes incite inflammatory storm in severe COVID-19 patients. *Natl Sci Rev* 2020;7(6):998-1002; doi:10.1093/nsr/nwaa041
151. Tian S, Hu W, Niu L, Liu H, Xu H, Xiao SY. Pulmonary pathology of early phase 2019 novel coronavirus (COVID-19) pneumonia in two patients with lung cancer. *J Thorac Oncol* 2020;15(5):700-4; doi:10.1016/j.jtho.2020.02.010
152. Chen J, Wang R, Wang M, Wei GW. Mutations strengthened SARS-CoV-2 infectivity. *J Mol Biol* 2020;432(19):5212-26; doi:10.1016/j.jmb.2020.07.009
153. Icmr.gov.in. Evidence based advisory in the time of COVID-19 (Screening, diagnosis, and management of mucormycosis). Available via https://www.icmr.gov.in/pdf/covid/techdoc/Mucormycosis_ADVISORY_FROM_ICMR_In_COVID19_time.pdf
154. Indiatoday.com. New Delhi: Covid-19 patients on home care should not take remdesivir: AIIMS. Available via <https://www.indiatoday.in/coronavirus-outbreak/story/covid-19-patients-on-home-care-should-not-take-remdesivir-aiims-doctors-1802999-2021-05-15> [Accessed 15 May 2021].
155. Indiatoday.in. New Delhi: DGHS drops Ivermectin, Doxycycline from Covid-19 treatment; ICMR rules unchanged. Available via <https://www.indiatoday.in/coronavirus-outbreak/story/revised-health-ministry-guidelines-stop-usage-of-ivermectin-doxycycline-in-covid-treatment-1811809-2021-06-07>. (Accessed 7 June 2021).
156. Firstpost.com. DGHS issue COVID-19 treatment guidelines: here is what document recommends on Remdesivir, Tocilizumab. Available via <https://www.firstpost.com/health/dghs-issues-covid-19-treatment-guidelines-here-is-what-document-recommends-on-remdesivir-tocilizumab-9695581.html> (Accessed 8 June 2021).
157. Livemint.com. Drugs including ivermectin removed from approved covid treatment list. Available via <https://www.livemint.com/news/india/govt-removes-ivermectin-other-popular-drugs-from-covid-19-treatment-list-check-revised-guidelines-11623074154396.html> (Accessed 9 June 2021).

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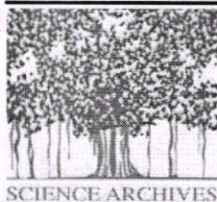
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Research Article



An initial checklist of the ants (Hymenoptera: Formicidae) and their specific distribution from district Wardha, Maharashtra, India

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Abstract

Biodiversity of life forms is incredible in India. In the present study, the comprehensive list of ant species and their distribution in district wardha from 2019 to 2021 have been studied. The habitat selected to study the impressive diversity of ants is agricultural field, domestic habitats, tree plantations, and surrounding water bodies. This is the first checklist of ant recorded in eight tehsil places (Seloo, Wardha, Deoli, Arvi, Ashti, Karanja, Hinganghat, Samudrapur) of district Wardha. The total ant species recorded belong to six subfamilies i.e. Formicinae, Myrmicinae, Ponerinae, Dorylinae, Dolichoderinae, and Pseudomyrmecinae. A total of 57 species belonging to the 30 genera are listed in the district. The species diversity index is more in agricultural fields followed by domestic habitats. The generic richness recorded for *Componotus* and *Crematogaster*.

Keywords Ants, Checklist, Distribution, Habitat, Wardha.

Introduction

The Vidarbha region is well known for its varied habitat and niche, seasonal environment, and interesting biodiversity. Wardha district is part of vidarbha. The ant behaviour is eusocial (Gadagkar et al., 1993). Ants are cosmopolitan, an important part of animal biomass, and present at almost all levels of the terrestrial food web (Holldobler and Wilson 1990; Andersen, 1997; Pfeiffer et al., 2013). There are 12 known subfamilies of Indian ants i.e. Dolichoderinae, Dorylinae, Myrmicinae, Ponerinae, Formicinae, Pseudomyrmecinae, Aenictinae, Amblyoponinae, Cerapachyinae, Ectatomminae, Proceratiinae, and Leptanillinae. With predatory behavior, ants also perform the role of scavengers, pollinators, and nutrient cyclers (Del et al., 2012; Guenard 2013) and contribute to the dispersal behavior of plants (Lach et al., 2010).

The first checklist of Indian ants was published by Chapman and Capco, (1951). However, Jerdon (1851, 1854) published the catalog of Southern Indian ants. His list was extended by Forel (1900, 1901) and added 267 species to the previous list. The latter compilation of the checklist was done and recorded 652 valid species (Bharti, H. 2011). The diversity of Indian ants and their state-wise distribution is given and recorded in 828 species and 100 genera grouped in 10 subfamilies (Bharti et al., 2016). However, number of species for invertebrate groups have to be documented in catalogue. Distribution of ant species in and around Amravati city of Maharashtra recorded 34 species in 20 genera (Chavan and Pawar, 2011). Distribution of ant fauna in and around Nagpur city. Maharashtra recorded 25 genera belonging to five subfamilies (Meshram et al., 2015). Distribution and diversity of ants around Gautala Autramghat Sanctuary, Aurangabad Maharashtra recorded total of 17 species of ants belonging to 13 genera and 6 subfamilies (Sonune and Chavan, 2016).



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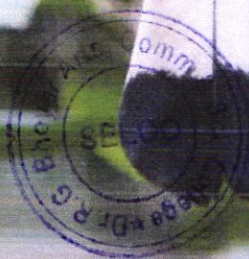
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Dragonflies and damselflies (Insecta: Odonata) of Jabalpur, Madhya Pradesh, India

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Abstract: The present study was carried out to reveal the odonate diversity in Jabalpur city and its surrounding area in Madhya Pradesh, central India. During the study period of 2008–2019 a total of 75 species of odonates belonging to two suborders and nine families were recorded. Twenty-one new species were recorded for Jabalpur district and four for Madhya Pradesh; 37% (28) species were abundant or very common, 19% (14) were common, 16% (12) were frequent, 24% (18) rare, and 4% (3) very rare. The maximum number of odonates were found in family Libellulidae (n= 32), followed by Coenagrionidae (n= 17), Gomphidae (n= 09), Platycenemididae (n= 06), Aeshnidae (n= 05), Lestidae (n= 03), Macromiidae (n= 02), and Chlorocyphidae (n= 01). Of 75 species recorded from Jabalpur city, 72 come under the IUCN Red List. Among them, *Indothemis carnatica* come under Near Threatened (NT) category, 65 species come under Least Concern (LC) Category, six species under Data Deficient (DD), and three species remain not assessed. The study supports the value of the city area in providing habitat for Odonata.

Keywords: Central India, checklist, conservation, distributional gaps, diversity, habitat, IUCN Red List, new records, Odonata.

वर्तमान अध्ययन मध्य भारत के मध्य प्रदेश में जबलपुर शहर और इसके आसपास के क्षेत्र में ओडोनेट विविधता को फ़क़्त करने के लिए किया गया था। 2008-2019 की अध्ययन अवधि के दौरान दो उपसमूहों और नौ परिवारों से संबंधित ओडोनेट्स की कुल 75 प्रजातियों को दर्ज किया गया था। जबलपुर जिले के लिए इक्कीस और मध्य प्रदेश के लिए चार नई प्रजातियाँ दर्ज की गईं; 37% (28) प्रजातियाँ प्रचुर या बहुत आम थीं, 19% (14) आम थीं, 16% (12) अक्सर दिखाई देने वाली, 24% (18) दुर्लभ और 4% (3) अति दुर्लभ थीं। लिबेलुलिडे (संख्या=32) परिवार में ओडोनेट्स की अधिकतम संख्या पाई गई, उसके बाद अन्य परिवार जिनमें प्रजातियाँ दर्ज की गईं वे संख्या के क्रमिक में इस प्रकार हैं- कोएनाग्रियोनिडे (संख्या=17), गोम्फिडे (संख्या=09), प्लैटिसेनेमिडिडे (संख्या=06), एशनिडे (संख्या=05), लेस्टिडे (संख्या=03), मैक्रोमिडिडे (संख्या=02), और क्लोरोसाइफ़िडे (संख्या=01)। जबलपुर शहर से दर्ज 75 प्रजातियों में से 72 आईयूसीएन रेड लिस्ट में आती हैं। उनमें से, इंडोथेमिस कार्नाटिका निज़र थ्रेटेंड (एनटी) श्रेणी के अंतर्गत आती है, 65 प्रजातियाँ लीस्ट कंसर्न (एलसी) श्रेणी के अंतर्गत आती हैं, छह प्रजातियाँ डेटा डेफिसिएंट (डीडी) के अंतर्गत आती हैं, और तीन प्रजातियाँ का मूल्यांकन नहीं किया जात है। प्रस्तुत अध्ययन ओडोनाटा के लिए आवास प्रदान करने में शहर के क्षेत्र के महत्व का समर्थन करता है।

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Author contributions: ADT and SVP designed the study, carried out the fieldwork, analyzed the data and prepared a draft; VS carried out the fieldwork and revised the final draft. ADT, SVP and VS helped with the preparation of the manuscript and revised the draft.

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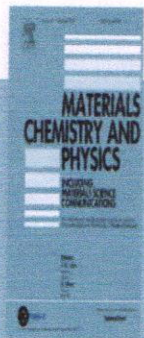


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Lead free single – double perovskite composite towards room temperature multiferroicity

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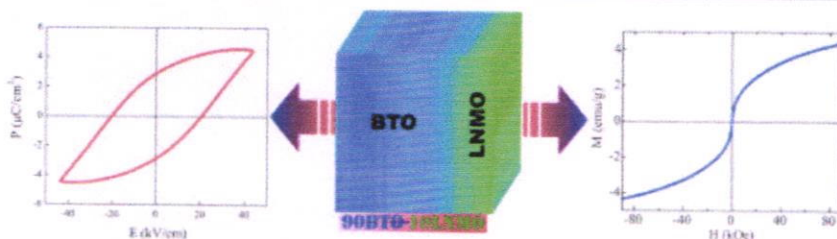
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Abstract

Lead free BaTiO₃-La₂NiMnO₆ (BTO-LNMO) composite sample was prepared via solid-state sintering route. Structural studies based on X-ray diffraction (XRD) patterns indicate BTO and LNMO each retain their respective structure in composite form. Raman spectra of composite inferred no structural modulation after mixing of individual phases of BTO and LNMO. The change in microstructure is observed for composite due to the difference in thermal expansion coefficient as well as the different rate of grain growth of BTO and LNMO phases. BTO-LNMO composite sample is found to be ferromagnetic with non saturation of magnetic moments. Temperature-dependent zero-field cooled (ZFC) and field cooled (FC) curves show large irreversibility (94%) for composite than the pure LNMO phase. The magnetic Curie temperature (T_c) of the composite was observed near room temperature. The dielectric and ferroelectric features of BTO is well maintained in composite at room temperature. This study is an attempt to bring in the multiferroicity (magnetic and ferroelectric order simultaneously) in the proximity of room temperature by incorporating the small percentage of magnetic phase (LNMO) in the ferroelectric (BTO) matrix.

Graphical abstract



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Optimizing first-, second- and third-order optical traits of zinc tris-thiourea sulphate (ZTS) crystal by L-tyrosine for photonic device applications

[Mohd Anis](#) , [G. G. Muley](#), ... [Ehab El Sayed](#)


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Optimizing first-, second- and third-order optical traits of zinc tris-thiourea sulphate (ZTS) crystal by L-tyrosine for photonic device applications

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Abstract: Up-gradation of modern era photonic devices encourages modelling of nonlinear optical crystal that embraces excellent linear–nonlinear optical properties. Hence, this is the first effort in the literature to improve the optical performance of zinc tris-thiourea sulphate (ZTS) crystal using L-tyrosine (Ty). The energy-dispersive spectroscopy is used to determine the incorporation of Ty. Single-crystal XRD analysis is employed to determine the structural parameters. The 5% increase in transmittance of ZTS crystal due to Ty has been evaluated by UV–visible study. Kurtz–Perry test confirmed that frequency doubling ability of Ty-ZTS crystal is 1.71 times higher than ZTS. The occurrence of photoluminescence nature has been investigated within visible region. The noticeable change in third-order nonlinear optical refraction (from negative to positive) and absorption (from reverse saturable absorption to saturable absorption) profile of ZTS crystal facilitated due to Ty has been explored. The Z-scan data has been accessed for comparative evaluation of n_2 , β and χ^3 of pure and Ty-ZTS crystal. The n_2 , β and χ^3 of Ty-ZTS crystal is of order 10^{-8} , 10^{-4} , 10^{-3} while that of ZTS is 10^{-12} , 10^{-4} , 10^{-4} , respectively.

Keywords: Crystal growth; Optical materials; Properties

1. Introduction

The nonlinear optical (NLO) crystals have exclusive demand in optoelectronics, photonics, lasers and optical modulation devices that controls the functioning (partially or wholly) of new technological systems [1]. In the regime of NLO crystals, the thiourea metal complex holds potential statuette as semiorganic crystals contributing unique structural, optical, electrical, mechanical and thermal diversity. Among the numerous crystals, the zinc tris-thiourea sulphate (ZTS) crystal outstands owing to its

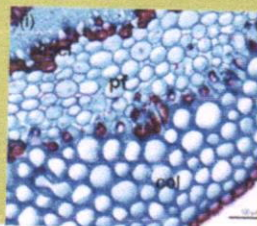
unique ability to withstand high laser power, superior optical, microscopic and electrical properties [2]. Since ZTS is reported [3] it has been constantly reinvestigated by optimizing growth parameters [4] and doping (organic and inorganic) [5, 6]. The thorough literature analysis on ZTS crystal reveals that the idea of doping an additive paves constructive result [7]. As the primary aim is to develop crystal for photonic devices, we intentionally search for such dopants which can optimize the optical characteristics of ZTS crystals to a large extent. In such a scenario amino acids are realized to have high hyperpolarizabilities. Chiral centres with large donor–acceptor moieties (to facilitate the charge transfer) which empower the NLO attributes of crystal [8]. The appealing factors of this scripted work are

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Ehretia laevis leaves: Potential herbal remedy for mouth microflora

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The advantages and uses of folklore herbs have been acclaimed and executed from ancient times in India. The use of these Folklore remedial herbs for therapeutic applications is contributing to maintenance of human health. The ancient literature, i.e., Ayurveda and Unani, also describes the global usage of herbal medicine for treatment, and its formulation's concoction for prevention of various diseases. *Ehretia laevis* is a conventional therapeutic herb from ancient times, frequently designated as Khandu Chakka by local people in Maharashtra. *E. laevis* leaves are used in the treatment of skin infections, fungal infections, mouth blisters, eczema, cuts and wounds, diabetes, asthma, fever and joint pain etc. The leaf of this plant contains abundant therapeutically beneficial secondary metabolites besides primary metabolites.

This paper describes antimicrobial sensitivity of *E. laevis* leaf (fresh and dried) acetone and ethyl alcohol (95%) soxhlet extract and dried leaf dimethyl sulphoxide (DMSO) extract (prepared after from evaporation of acetone in dried leaf acetone extract) against isolated oral microbial flora i.e., *Streptococcus* spp, *Staphylococcus aureus* and *Candida* spp. Amoxicillin in dimethyl sulphoxide was also tested for antimicrobial sensitivity. The result revealed that *E. laevis* fresh leaf ethyl alcohol and acetone extract and dried leaf acetone and DMSO extract was efficacious against isolated oral microbial flora. The extracts showed positive results for flavonoids and tannins. The results showed the antibacterial and antifungal potential of this folklore plant, particularly against *S. aureus* and *Candida* spp., which are microorganisms that are becoming resistant against most therapeutic drugs. This use of this folklore herb requires further study on pharmacological drug formulations. And it can also be used in herbal products i.e., toothpastes, mouthwash etc.

Keywords: Antimicrobial activity, *Candida* spp, *Ehretia laevis*, Phytochemical, *Streptococcus* spp, *Staphylococcus aureus*
IPC Code: Int. Cl.²²: A61K 36/00, A61K 36/30, C12R 1/445

For thousands of years folklore therapies have been comprehensive healing preventive traditional system used for nurturing the health of human beings¹. In India, conventional remedial treatment is the basis of several methodologies i.e., Ayurveda, Siddha and Unani². To encourage the correct use of herbal therapy, and to find out their prospective for sources of new medicine, it is crucial to investigate medicinal plants which have folklore recognition in a more intensified way³⁻⁸.

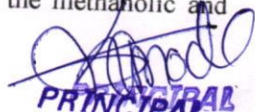
Ehretia laevis is a medium height flourishing herb belonging to the family Boraginaceae that includes approximately 150 species⁹. This herb is primarily dispersed all around tropical and subtropical regions of Asia, Africa and Australia¹⁰. This plant is used from ancient period and has many medicinally useful chemicals components¹¹. In India, in Wardha taluka (District Maharashtra), *Ehretia laevis* Roxb. herb is used by tribals to heal injuries and fractures, often known as Khandu Chakka¹¹. In ancient literature of

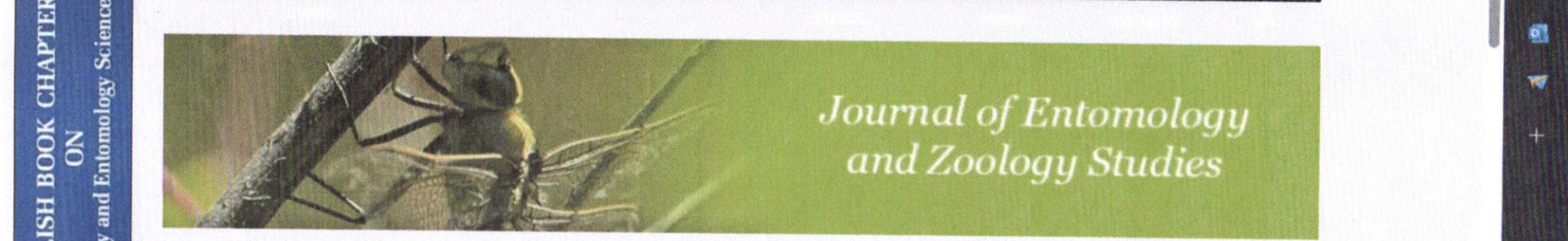
Ayurveda and Unani, this herb is reported for its medicinal value to treat respiratory ailment, as well as to treat jaundice, ulcers, liver diseases, diabetes mellitus, and microbial infections i.e., syphilis, toothache, stomach and venereal diseases¹². Li *et al.* reported the presence of phenolic acids, flavonoids, triterpenoids, steroids etc. in the genus *Ehretia* with antimicrobial, antidiabetic and anti-inflammatory activities¹³.

Salivary microorganisms are mainly responsible for oral health problems i.e., caries¹⁴, which disturbs the normal microflora in the mouth cavities¹⁵. In the remote areas of Pakistan and Rajasthan, *E. laevis* are used for dental caries and mouth ulcers, respectively^{16,17}. There are reports regarding antimicrobial activity of *E. laevis* extracts against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Bacillus subtilis* and *Escherichia coli* using ethanol, chloroform and water-based solvents¹⁸⁻²¹. In one of the studies on *E. laevis* leaves, acetone extract was studied against *P. aeruginosa*, *E. coli* and *S. aureus*^{22,23}. It is reported that the methanolic and

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Effect of locally generated food waste on bioconversion and nutrient parameters of black soldier fly larvae, *Hermetia illucens* L.

AUTHOR(S)
Ganvir KP, Darvekar AN, Raut VD and Thorat RK

ABSTRACT

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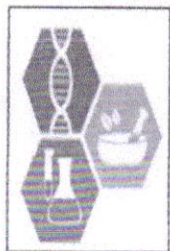
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Effect of locally generated food waste on bioconversion and nutrient parameters of black soldier fly larvae, *Hermetia illucens* L.

Ganvir KP, Darvekar AN, Raut VD and Thorat RK

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Abstract

Black soldier fly larvae (BSFL) are well known for its high digestibility to reduce any type of organic waste, including fruits, vegetables, farm waste, municipal wastes etc. Appropriate BSF farming methodology not only can generate enough income to the farmers, but reduces environmental pollution which leads to sustainable development. In developing countries, in urban as well as rural areas early perishable fruits like banana, papaya, muskmelon, watermelon and vegetables undergo wastes if not properly handled and stored. In these areas expired floor and bakery wastes are also common. For this study BSF larvae were fed on waste separately to explore the effect of locally available organic wastes as feed for the production of black soldier fly larvae. BSF larvae were fed separately on Waste Summer Fruits (WSF), Waste Papaya (WP), Waste Banana (WB), Waste Vegetables (WV), Bakery Waste (BW) and on Kitchen waste (KW). The efficiency of BSF larvae to consume these locally generated wastes and therefore reduce the waste loads of different substrates was studied. Various bioconversion parameters were evaluated, like feed consumed, Total larval yield, survival%, larval growth %, total waste reduction %, bioconversion % and feed conversion rate (FCR). BSF converts waste into biomass so the nutrient parameters like crude protein, lipid and amino acid composition were also analysed. From this study BSF larvae are proved to be a potential insect to reduce these organic wastes efficiently, but may be because of BSF larvae were fed continuously on the same type of food waste, the nutrients like protein, fats and amino acids in BSF found to be very low. This study concluded that for commercialization, it is essential to feed BSF larvae on mixed types of food waste rather than only on single type of waste.

Keywords: Organic waste management, feed conversion rate, waste reduction, biomass, larval growth percent

Introduction

Today number of developing countries are facing waste disposal and dumping problems as the landfills are already occupied with garbage, reaching their capacity, reducing the available space for future waste disposal, which will create a need to occupy the new lands. It was estimated that approximately one third of the food produced for human consumption get lost as wastage globally each year (FAO, 2019) (Gustavsson *et al.*, 2020) [17]. Food waste harms the environment in multiple ways and leads to loss of finite resources such as land, water and fuel utilised during food production and distribution. Not only this but food waste in landfills is contributor to climate change, contributes 4.4 gigatons of carbon dioxide (CO₂) in the atmosphere annually as well as emits Green House Gas (methane) (Scialabba *et al.*, 2013) [33]. Sustainable methods for recycling wastes can reduce this problem as the valuable components of the wastes will be utilised.

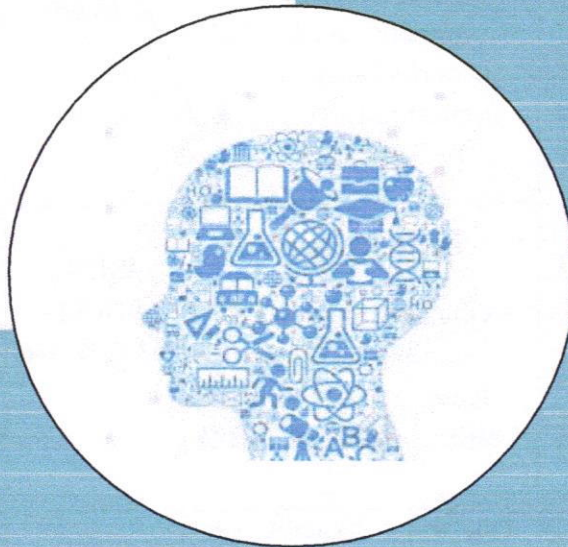
World will face hunger when the population will increase at its extreme and the natural resources will be limited for the production of food. To reduce, recycle and reuse will be the motive for our survival in future. Now it's time to use each and every part of our food, produced by our hard work in limited natural resources. Food and other organic wastes are a valuable resource that everyone should not waste as it contains a lot of nutrients and energy value that could be beneficial to both humans and the environment if reintegrated into the value chain (Blomkounon *et al.*, 2017) [4].

Black soldier fly (BSF) organic waste management technology is the key to reduce the organic waste generated by us which will be consumed by these insects, so the nutrients present in the



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Sustainable Development Through Decent Jobs for Youth

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Abstract:

This paper discusses that it is time for environmental economists to convey the service impressions of justifiable progress strategies to the front position of the investigation programme. Significant management determinations endure to organizer because of their apparent service possessions. The paper studies the evidence on the employment impressions of sustainable development policies and contends that preserving or even cumulative employment be subject to critical policies design and consideration to the political budget of application of policies. The paper accomplishes that a recovered thoughtfulness of these questions, reasonable labor marketplace and organizational modification programs, and particularly frontward development to expect problematic extents, must substitute the disconnected, 'knee-jerk' responses to ecological issues.

Keywords: Sustainable Development, management, marketplace, unemployment

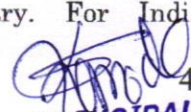
Introduction:

At present, India is the second fastest growing economy in the world and the second most populous country in the world. The specialty of Indian population is that the world's youngest population is in India. Today the same youth power is forced to wander from door to door for a job. The bitter truth is that due to rising unemployment, the stigma of most suicides is also on the forehead of our country. According to the latest figures of the National Crime Records Bureau, every day 26 youths are Suicide them self & end their life. Today India is making rapid progress in all fields. Unemployment is increasing in India and there are a large number of educated youth in it and this problem is increasing day by day. The important reason for the increase in the number of educated unemployed is that government jobs are not available in the number of educated people coming out with their degrees. Due to this the number of educated unemployed is increasing day

by day. According to a report by the Center for Monitoring Indian Economy, (CMIE) India's unemployment rate has risen to 6.23 percent by the end of March 2016. Unemployment is also relatively high in urban areas. Presently, there are about 31 million youth unemployed in the country and the number of job creation in the country is more than 6 lakh per annum and the number of graduates leaving the country at the end of the academic year is increasing every year. The main objective of this observation is to observe the problem of increasing unemployment in India.

The rising unemployment of educated people in India has become the hallmark of the Indian economy. As a result of decades is all types, of unemployment growth, (highly skilled and unskilled) is increasing rapidly today. In this situation there are not only unemployment problem of highly educated youth, but less educated and unskilled youth also. Rising unemployment is a serious problem for every country. For India,




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Case Report

Young patient's chronic fever

¹Kshama Murarkar, ²Shilpa Mankar, ³Shahsank Warthi, ⁴Yugal Kapse, ⁵K. Kataria, ⁶Jaychand Moon, ⁷Karuna Ganvir

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Typhoid fever is an infectious serious infection marked by intestinal inflammation and ulceration. This is an important public health problem in developing countries caused by the bacterium *Salmonella typhimurium* and *Salmonella paratyphi* [1]. First, bacteria enter the intestinal tissue without symptoms for 2 weeks. Then, these, soon invade the bloodstream, often taking 10 days and causing a high fever. Finally, the bacteria are localized in the gallbladder and surrounding organs and cause lesions. The major symptoms of typhoid are fever, rash, weakness, abdominal pain, constipation, and headaches. Typhoid fever is particularly high; gradually increasing over several days up to 39 to 40 °C. Now, it's a typical appearance is seen in the tropics. In this case

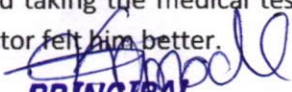
Abstract

Typhoid is one of the important diseases that are responsible for human suffering. The presented case report includes a health issue story of a boy who confronted various stages of his life in relation with a disease. He takes the treatment to his typhoid disease but not completes it and ignores the prescription by the medical officer. He takes the medicines as per his own decision and suffers more. Ultimately, the study suggests that the medicines against the concerned disease should be preferred by the patients as per the instructions by doctors and not by their own preventing health hazards.

report, a case of 21 years male suffered from typhoid fever has been reported.

A twenty-one years old male student in B.Sc. final year from Taluka Girad (Samudrapur), District Wardha, Maharashtra, India came to the Wardha district to complete his Diploma course in Medical Laboratory Technology in 2018. At that time, his health was good in condition. After near about one and half years, he suffered from mild fever for up to 4-5 months. He went to Dr. Jaychand Moon, Medical Officer and family physician in Wardha for treatment. The doctor prescribed Cefuroxime and cough medicines and some blood tests. The fees of the doctor were not affordable to the patient, so he avoided taking the medical test. The medication from the doctor felt him better.




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Nevertheless, he did not visit the doctor again due to financial problems. In May 2020, he suffered from high fever during the fifth semester of his Diploma examination. He didn't take any advice from a medical practitioner and used to take paracetamol without concerning the doctor to recover from the fever. This antipyretic drug helped him feel better but not completely recovered him.

He ignored the mild fever during that period and avoided visiting the physiologist. After seven months, he went to his hometown in June 2020 due to the Covid-19 lockdown in India. During that time, he started to work on his farmland to help his parents, and once he drank well water. And again, his health started to deteriorating. For about 10 days, he took home remedies using Ayurvedic medicines Paripathadikadha and Amrutrishta without concerning the doctor. Shockingly, there was no improvement in his health. After ten days, he visited the hospital. According to the doctor's (name not disclosed) preliminary examination, the fever could be viral or malarial. The doctor prescribed drugs Laringo DS, Amoxicillin, and Deriphyline which made the patient to feel better. In contrast, after 4 to 5 hours, high fever was reported. This fever condition continued up to one month. During this situation, he lost his appetite and got weakness, and he was unable to stand properly. He had the experience of dizziness. He had given up hope

of survival. Later, he went to another doctor in Katariya hospital, Hinganghat, Maharashtra, India. He proceeded through a Complete Blood Count (CBC) test, urine test, and Widal test, in which the Widal test showed a positive report. He was diagnosed with *S. typhi*. During this period, he lost weight up to 7 kg. He was treated for typhoid fever and recovered. After recovery, he performed biochemical tests and CBC tests. Typhoid fever disappeared completely within 3 weeks.

Since 2020, the frequent mild fever (reasons unknown) up to 4-5 months and high fever during his examination was reported. Due to unawareness and ignorance of health and self-medication, the fever was not completely recovered because the infection persisted. In addition, during the lockdown period, he started working on farms and also took the well water. The reason for his ill health might be earlier typhoid infection. During the lockdown period, the unavailability of doctors and the use of self-medications, home remedies, and Ayurvedic treatment without knowing the real cause increased typhoid infection.

Author contributions: RD: Developed an idea and wrote the manuscript. AS: Verified the data. SB: Improved the manuscript. SW: Corrected the manuscript.

Conflict of interest: Authors declare that no conflict of interest exists regarding the writing of this article.

References:

Parry CM, Hien 88. Dougan G et al. Typhoid Fever. *N Engl J Med.* 2002;347(1770):82.

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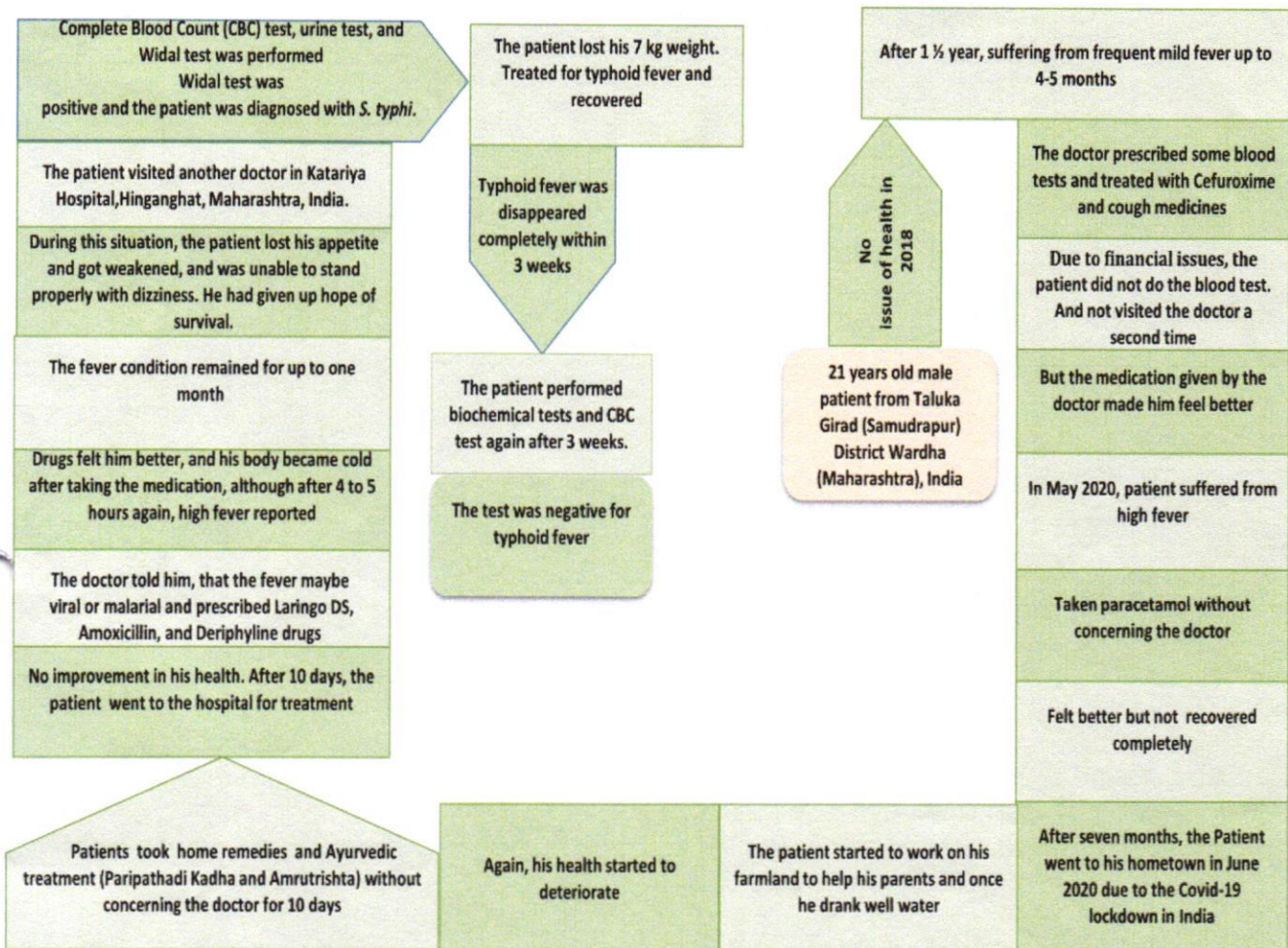


Figure 1: Events occurred in the life of young patient under study.



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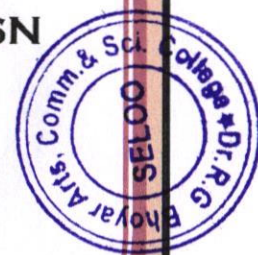
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2. Murarkar K, Mankar S, Warthi S, Kapse Y, Kataria K, Moon J, et al. Young patient's chronic fever. International Journal of Microbial Science [Internet]. 2022;3(1). Available from: <http://dx.doi.org/10.55347/theijms.v3i1.1>
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3. Pawar KR, Mali GV. Biodegradation Study of an Organophosphorus Insecticide - Quinalphos by Novel Spingobacterium mizutaii strain DSM 11724. International Journal of Microbial Science [Internet]. 2022;3(1). Available from: <http://dx.doi.org/10.55347/theijms.v3i1.2>




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¹Kshama Murarkar, ²Shilpa Mankar, ³Shahsank Warthi, ⁴Yugal Kapse, ⁵K. Kataria, ⁶Jaychand Moon, ⁷Karuna Ganvir

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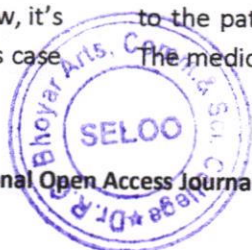
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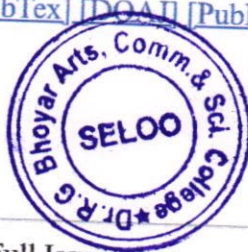
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Article

Dragonflies and damselflies (Odonata: Insecta) of the Seloo city, Wardha, Maharashtra, Central India

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Abstract

Dragonflies and damselflies (Odonata) species diversity was studied in the Seloo city from 2011 to 2021. Its geographical location is 20°08'37.73"N; 78°07'07.70"E; 265 m. A total of 62 species of odonates belonging to 2 Suborders and 8 families were recorded. The highest number of odonates belong to the family Libellulidae (30 species) followed by Coenagrionidae (13 species), Aeshnidae (5 species), Gomphidae (4 species), Platycnemididae (3 species) and Lestidae (4 species), Macromiidae (2 species) and Chlorocyphidae (1 species). Of the total, 30 species were abundant or very common, 16 were common, 6 were not rare, 7 rare and 3 very rare. Among all, 3 species were Data Deficient, *Indothemis carnatica* (Fabricius, 1798) are listed as Near Threatened and 57 were least concern in IUCN red-list of threatened species. The observations support the value of the Seloo city area in providing valuable resources for Odonata.

Keywords Odonata; diversity; Seloo city; Wardha; Maharashtra; India.

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1 Introduction

Odonata (damselflies and dragonflies) are very interesting and diverse insects. Odonata are paleopterous, exopterygote aquatic insects, probably more closely related to the Ephemeroptera (mayflies) than any other living insect group. They instantly attract attention with their amazing flight skills and beautiful colours. Odonate is prominent freshwater insects and plays an important role in wetland and terrestrial food chains as predators. The adults are generally predacious insects, while the larvae are carnivores and voracious feeders. They are also actively used in controlling causative agent of malaria and filaria throughout the world (Tiple et al., 2008). Even though species are usually highly specific to a habitat, some have adapted to urbanization and use man-made water bodies. They probably mark the first time that evolution experimented with the ability to hover in air over an object of interest. Being primarily aquatic, their life history is closely linked to specific aquatic habitats. Naturally, these insects become a marker, an indicator of wetland health (Andrew et al., 2008).

Dragonflies mostly occur in the vicinity of different fresh water habitats like rivers, streams, marshes, lakes

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