WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES
SJIF Impact Factor 7.421
Volume 8, Issue 4, 1779-1784 Research Article ISSN 2278 – 4357

SEASONAL FUNGAL BIODIVERSITY RESOURCE OF DETERIORATION OF SAFDARJUNG'S TOMB, DELHI

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Article Received on
18 Feb. 2019,
Revised on 10 March 2019,
Accepted on 31 March 2019,
DOI: 10.20959/wjpps20194-13582

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ABSTRACT

Safdarjung Tomb was built in 1754 in the late Mughal Empire style for Nawab Safdarjung and also known as Safdarjung ka Maqbara. It was the last monumental tomb garden of the Mughals with the same style of the Humayun tomb. It has spacious ambience with domed and arched red brown and white colored structures. It is situated at the Intersection of Safdarjung road and Aurobindo marg, New Delhi, India. There is a threat of microbial deterioration due to old structure and lack of proper maintenance. Our investigation was conducted on different season of Delhi. The purpose was to evaluate the status of mycobial decay of stone monuments in winter, spring, summer, monsoon and autumn seasons. There were total of 52 fungal species belonging to 31 genera were isolated from the surfaces of monument due to mechanism of biodeterioration. These fungi are human pathogenic causing different respiratory and dermatological diseases The fungi recorded are good source of different organic acids including oxalic acids, citric acids, fumaric acid, acetic acid, gluconic acid and succinic acid and found to be main source of deterioration.

KEYWORDS: Deterioration, Seasonal fungal diversity, Safdarjung tomb, Delhi.

INTRODUCTION

Fungi are the key factors in discoloration and degradation of different type's cultural heritage, museum objects as well as for stone monuments in different seasons. There are various factors including temperature and humidity damaging cultural heritage in different seasons. Fungal.

biodeterioration is a complex process that illustrates the interaction of microorganism with its substratum and environment. There are various physical, chemical and biological factors

damaging monuments in winter, spring, summer, monsoon and autumn seasons. Biological factors are crucial in the decay of monuments such as bacteria, algae, mosses, fungi, insects, birds and human beings. Microbial colonization of stone depends on water availability, pH, climatic conditions and nutrient sources and can cause permanent loss of stone monuments due to staining, cracking, and displacement of building material. Our study investigated the seasonal variation of microbial communities and its effects on stone monuments. Thus, seasonal variation of fungal diversity on monuments is always helpful for the proper preservation of monuments.

MATERIALS AND METHODS

Collection of Samples

Deteriorated stone samples were collected after careful observation, of fungal degraded portion from different localities by Swab, Scrap and Cellophane tape sampling methods.

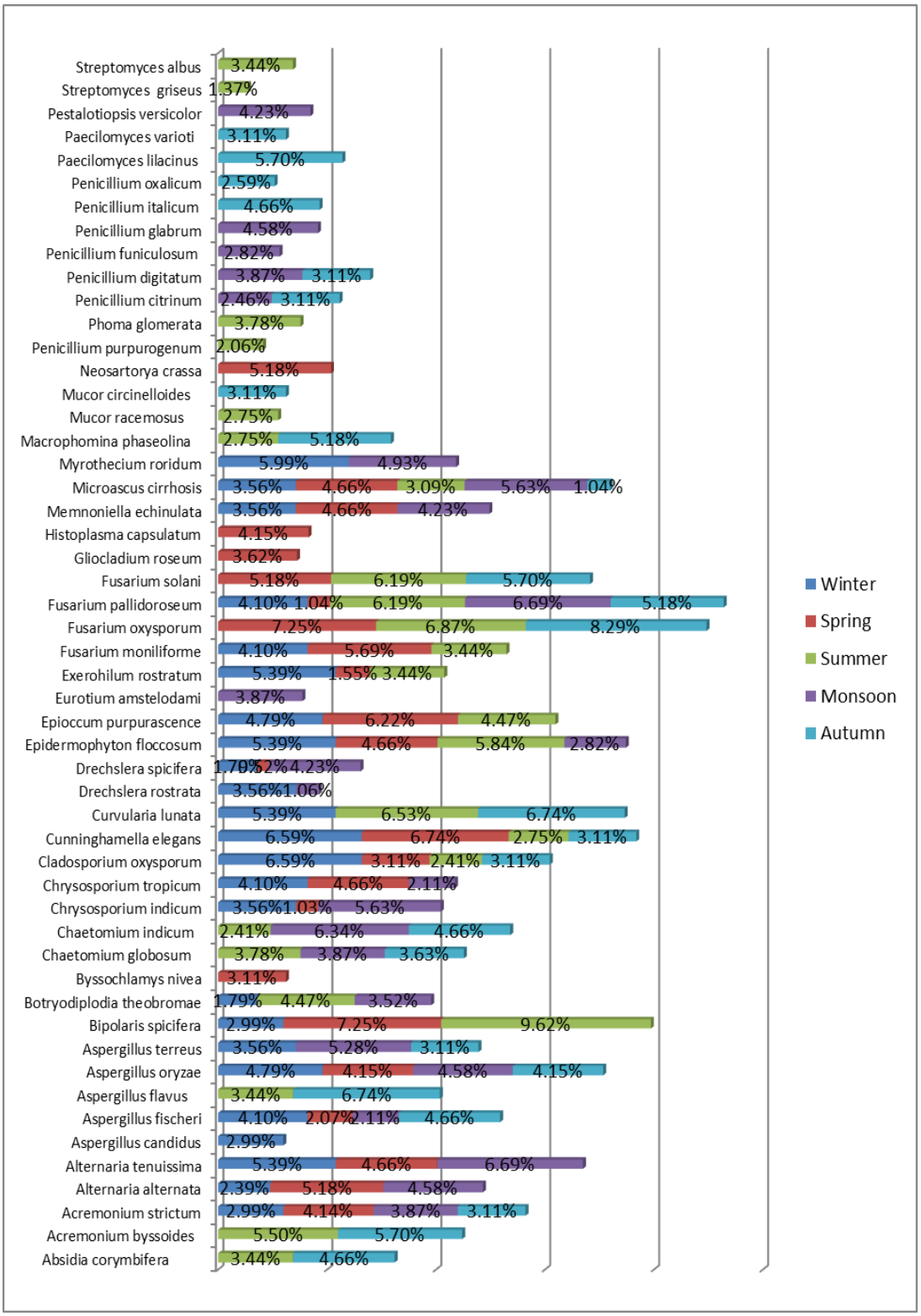
Isolation of Fungi

Dilution plate method was used for isolation of fungi collected through Swabbing, and Scrubbing, while Sterile adhesive tape was used for the isolation of mycoflora from the surface of monuments. The hard and dried stains were removed by etching with the help of sterilized sticking tape and then these small pieces of tape were dispensed into Petri dishes containing culture media. The Petri plates having sampling material were incubated at 25^0 C ± 3^0C for 8-10 days, colonies were counted for CFT(Colony Forming Unit) and their percentage diversity calculated for each fungal species.

RESULT AND DISCUSSION

During the survey and isolation studies of Safdarjung's Tomb, Delhi, seasonal percentage contributions of the mycoflora were observed during the investigation period. Maximum percentage contributions of fungal species were observed in winter, spring, summer, monsoon and autumn seasons. During investigation total 52 fungal species belonging to 31 genera were isolated from Safdarjung tomb, in different seasons such as winter, spring, summer, monsoon and autumn during March 2015 to February 2017. The maximum fungal diversity (5.39%- 6.59%) was recorded in winter season against *Alternaria tenuissima, Curvularia lunata, Epidermophyton floccosum, Exerohilum rostratum, Myrothecium roridum, Cladosporium oxysporum,* and *Cunninghamella elegans.* During spring season maximum fungal diversity (5.18% - 7.25%) was recorded against *Alternaria alternate, Bipolaris spicifera, Epicoccum purpurascens, Cunninghamella elegans, Fusarium oxysporum, Fusarium solani, Neosartoria crassa* and *Fusarium moniliforme.* In summer season maximum fungal diversity (6.19**%** - 9.62%) was recorded against *Curvularia lunata, Fusarium oxysporum, Fusarium solani,* and *Fusarium pallidoroseum.* In monsoon season maximum fungal diversity (4.58% - 6.69%) was recorded against *Alternaria alternata, Alternaria tenuissima, Aspergillus oryzae, Aspergillus terreus, Chrysosporium indicum, Chaetomium indicum, Fusarium pallidoroseum, Microascus cirrhosis* and *Penicillium glabrum.* In autumn season maximum fungal diversity (6.74% - 8.29%) *was* recorded against *Aspergillus flavus, Curvularia lunata and Fusarium oxysporum.*

Percentage of Seasonal Fungal Diversity of Safdarjung Tomb, Delhi, (2015, 2016, 2017)



The fungal diversity recorded in different seasons such as winter, spring, summer, monsoon and autumn during March 2015 to February 2017 is in understanding with the prior investigations.[2,3,5,8.9,13] The distinguished miniaturized scale fungi cause staining just as

mechanical shedding of stone material, It additionally cause mechanical peeling of stone material by hyphae infiltration and generation of various pigments.[6,11] Stone decay is correlated with the type of stone material and surroundings for the monuments, including sunlight, rain, snow and moisture, as well as wind.[14] There are colossal quantities of fungi which have extensive biochemical decay potential. As of late, it has been clear that the capacity of fungi growth to associate with minerals, metals, metalloids and natural mixes through biomechanical and biochemical procedures, makes them in a perfect suited as biological weathering agents of rock and building stone. Biological and mycological investigations are a vital piece of good preservation and can't be overlooked in the cutting edge protection idea, which incorporates close joint effort between Art and Science. This collaboration is the comparative study of the role of microbial colonization on the degradation of historic monuments.[1,4,10,12] as well as to human pathogen.[7]

ACKNOWLEDGEMENTS

We are highly thankful to Dr. P.N.Chowdhry, Director cum Principal Mycologist, National Center of Fungal Taxonomy, New Delhi (www.ncft,in) for confirming and identitifying large number of fungal cultures isolated and related scientific help during above investigations.

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