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1. Detection of Mycotoxins from the Wheat Grains (Triticum Vulgare) Linn

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Abstract

Food is the basic necessity of life after air and water. Consumption of the food is very essential to acquire energy for day to day life activities. Availability of food in various parts of the world is dependent upon several factors such as geographical and environmental parameters. Whatever may be the diversity of the food, it is invaded by various microorganisms, especially food borne pathogens in which fungal organisms are at the topmost position. When food is invaded by the fungal organisms, it does not only get spoiled and becomes stale but loses its nutritional value and also shows accumulation of secondary metabolites. The secondary metabolites can be of different types but chiefly known are the mycotoxins. Mycotoxins are present in the food material especially seeds and grains but cannot be detected easily. Hence, they are usually consumed and is the main cause of various diseases, eventually proving to be toxic and even lethal in extreme conditions. India is a developing country, where temperature and moisture is ideal for growth of any fungal organism. Hence, the seeds and grains show presence of various seed borne fungal pathogens, which produce different types of mycotoxins. When such grains are consumed by the people, they suffer from various diseases such as vomiting. Loose motions, food poisoning etc. but the exact reason remains unknown. Hence, it becomes essential to detect mycotoxins from the seeds and investigate various parameters associated with that.

Keywords: Mycotoxins, Fungal Pathogens, Secondary Metabolites

Introduction

Wheat Triticum vulgare grains are consuming by many of the people in the Maharashtra Even today, 67% population in the state prefers consumption of grains of jowar and bajra over wheat and rice. Wheat grains are produced in various part of the state but are not

essentially consumed locally. Instead, they are transported to the other places, where they are stored in unhealthy and unhygienic conditions till further use. The moisture content of such places is usually high with warm temperature along with infestation by the insects. These are ideal conditions for invasion of the grains by the seed borne pathogens and production of mycotoxins.

Indian farmers still continue to store food grains and fodder in primitive silos which are ideal places for mycotoxins production due to high moisture level, internal heat and profuse insect infestation. Mycotoxins are fungal elaborated toxins comprising of structurally diverse, naturally occurring compounds. They are the chemical precursors of toxicity in human beings and animals causing risk to human and animal life. Various types of fungi can produce different types of mycotoxins depending upon conditions of moisture, pH and temperature. Hence, most of the food harvested is prone to invasion by fungi during post-harvest processing, transport and storage. Presence of fungal propagules does not essentially mean presence of mycotoxins but potential for production of the mycotoxins with favourable conditions, at any point of time, exists. Absence of fungal propagules does not indicate absence of the mycotoxins as mycotoxins often persist in the stuff even after the fungal pathogens have lost their viability.

Mycotoxicosis is a disease of the animals and human beings due to consumption of feeds and food invaded by the fungi producing mycotoxins (Agrios, 1978; Moss, 1989). Mycotoxin producing fungi have been isolated from diverse food and commodities (Chauhan and Tiwari, 1986, 1991; Chauhan and Agarwal, 1991; Chauhan and Saxena, 2000). The crops usually affected are corn, peanuts, cotton, sunflower, sorghum, rice, pearl millet, sesame and soya bean (Chauhan, 2004). Aspergillus and Penicillium produce toxins mostly in storage although many a times, infection of seeds takes place in the field. Adams (1977) has reported that storage fungi especially Aspergillus, Penicillium, Rhizopus and Mucor spp. infect grains after harvest and their amount is increased in storage. Amadi (2002) has reported fungi 11 including Alternaria, Aspergillus, Fusarium, Rhizopus, Penicillium and Mucor spp. in the seeds of Saccharum officinarum.

Council for Agricultural Science and Technology, in 1989 published a report on "Mycotoxins - economics and health risks" to make people in the world aware of the hazards of mycotoxins and American Society of Paediatrics highlighted it by publishing a manual on "Toxins produced by indoor moulds" in 1998. Beardall and Miller (1994) gave detailed

account of mycotoxins as the potent toxic substances to cause various diseases in human. Bennett (1987) gave in depth report on mycotoxins, mycotoxicosis, mycotoxicology and mycopathology.

Contamination occurs through small quantities of spore contaminating the grain as it is going into storage from the harvest during handling and through storage equipments or from spores already present in the storage structures (IRRI, 2006). Under high temperature and moisture, this small amount of innoculum can increased rapidly. Stresses of water, high temperature and insect damage are responsible for growth of moulds and mycotoxins production (Diener et.al. 1987; Lacey, 1986; Tuite, 1979). Toxin production is also influenced by the presence of other moulds on the host and their interaction with each other (Trucksess et.al., 1988; Mislivec et.al., 1988). If average moisture content of the commodity is less than 12% and temperature is low i.e. about 15^0c, then most of the fungi are incapable of growth and thus mycotoxin production is adversely affected (Smith, 2005).

Major classes of mycotoxins include Aflatoxins, Sterigmatocystin, Trichothecenes, Zearalenones, Ochratoxins, Citrinin, Citreoviridin, Cyclopiazonic Acid, Fuminosins etc. Aflatoxin is the most common mycotoxins produced by various Species of Aspergillus and Penicillium (Agrios, 1978). Aflatoxin interacts with DNA and interferes with RNA Synthesis. Ochratoxin is potent renal toxin produced by the fungal pathogens (Smith, 2005). Zearalenone and Fuminosin are very common mycotoxins produced by species of Fusarium while Penicillium is responsible for production of Tremorgens, especially penitreme A (Neergaard, 1977). Mycotoxins are causative agents of different human and animal health disorders (Ciegler and Bennett, 1980). The toxinogenic fungi and the mycotoxins cause potential problems pertaining to health and economic perspectives. Fumes from burning moulded grains or hay may also affect animals and human beings. Handling of such material by farm workers causes in them toxic dermatitis, conjunctivitis etc. (Amadi and Adeniyi, 2009). Detoxification of these mycotoxins can be obtained by methods of physical separation, thermal inactivation, irradiation, microbial degradation and treatment with various chemicals (Bilgrami et.al., 1984).

The ultimate aim of studying mycotoxins is to provide safe food supply. It is certain that 100% safe food and feed supply is not possible but we need to make people aware of the presence of mycotoxins in the food and their effects on animal and human life (Bilgrami, 1987).

Hence, in the present studies, isolation and identification of mycotoxins produced by the fungal pathogens from infected grains of wheat was carried out.

Collection and screening of the seeds samples

Wheat (Triticum vulgare) is the staple food in the state of Maharashtra as it is grown in the soil of the state. Even, 67% population in the state prefer consumption of grains of wheat.

There is significant advancement in post-harvest technology in the world but they are not yet reached to common Indian farmers, who still continue to store the cereal grains in primitive silos. The grains are grown in various parts of the state but essentially, they are not consumed at same place. They are transported to various parts of the state. These grains are stored in unhealthy and unhygienic places with high moisture level, internal heat and insect infection (Holman, 1957; Bailey, 1967). These are ideal conditions for fungal invasions in the grains and mycotoxins production. Hence, the grains are infected deteriorated which is going to affect their nutritional value adversely (D.K. Jha, 1993)

The chances of invasion of the infection is there from the embryonic level up to the storage but seed borne fungi invade the grains during storage, if there are poor preservation technique with unclean storage condition. Such grains are toxic and fatal to human life. As the grains are staple food in the state, they are consumed in bulk, causing hazards to human life on large scale. The infected grains can be identified on the basis of primary observations in terms of morphological characters such as holes in the grains, shrivelled grains or reduction in the size of the grains etc. (Neergaard, 1977). The healthy grains are not going to show any of these characters. Hence, primarily healthy and infected grains can be categorized based upon visual observations.

The temperature was 29 ° C and humidity was 80% were there on that day.

Material and Methods

Samples of wheat grains were collected from provisional stores in Mahim Matunga and Dadar where the grains are stored in very insanitary conditions. There were 5 samples of wheat each collected from Janta provision stores, Mahim; Hari om enterprise Matunga east; Om sai ram store Matunga west; Shah Jadhav ji store Dadar east; Patel store Dadar west; randomly to represent cross section of the city and obtain variety of pathogens, if present.

The samples were collected in monsoon season in the year 2018. The growth of fungal pathogens prevailing in the monsoon and winter. The collected samples were stored in 5" x 4" lock system polythene bags pre-sterilized with alcohol. All the samples were stored in the

refrigerator till further use at about 15° C to minimize physiological and biochemical activities of the grains as well as the fungal pathogens, if present.

Result and discussion

It is evident from the table 2 that screen samples of wheat from Janta Provision Store at Mahim showed presence of 62% healthy grains 6% grains with partial black lesions, 12% grains with complete black lesions, 5% grains with holes, 4% grains reduced size were observed. 42% healthy grains, 6% grains with partial black lesions, 5% grains with complete black lesions, 3% grains with holes, and 8% reduced grains were observed in the samples collected from Hariom enterprise at Matunga.49% healthy grains, 7% grains with partial black lesions, 3% grains with complete black lesions, 2% grains with holes, and 10% grains with reduced size were observed from Patel Store at Dadar. 79% healthy grains, 3% grains with partial black lesions, 4% grains with complete black lesions, 10% grains with holes, and 9% reduced size were observed from Shah Jadhav ji store at Dadar. 53% healthy grains, 8% grains with partial black lesions, 3% grains with complete black lesions, 5% grains with holes, and 3% reduced size were observed from Omsai Ram Store at Matunga.

Table 1: Collection of the samples

Sr. No.	Location	Name of the shop	Code No.
1	Mahim (E)	Janta Provision Store	WMJ
2	Matunga (E)	Hariom enterprise	WMH
3	Dadar (E)	Patel Store	WDP
4	Dadar (W)	Shah Jadhav ji	WDS
5	Matunga (W)	Omsai Ram Store	WMO

Table 2: Morphological Categorization of the Wheat Grains

Sr.no	Code no	Morphological characters				
		Healthy grains	Partial black lesions	Complete black lesions	Grains with holes	Reduced grains
1	WMJ	62	6	12	5	4
2	WMH	42	3	5	3	8
3	WDP	49	7	3	2	10
4	WDS	79	3	4	10	9
5	WMO	53	8	3	5	3

Plate 1

Plate 2

Plate 3

Plate 4

Plate 5

Plate 6

Table 3: Sample name

Plate no	Particulars
1	Plant of wheat (Triticum vulgare Linn.)
2	WDP
3	WDS
4	WMH
5	WMJ
6	WMO

Isolation and Identification of Seed borne Fungal of the Pathogens

It has been observed that commercial life span of the seed is always shorter than its biological life span. Good storage conditions can increase the longevity of the seed as well as that of the pathogens associated with them. Christensen kaufmann (1969) published their work on conditions of storage of the seeds and their association with the seed borne pathogens. Hence, it is clear that seed weakened due to unfavorable conditions become sensitive to any kind of infection.

There are various pathogens such viruses, bacteria and fungi, which infect the seeds or grains of most of the economically important crop. Most of the pathogens those invade the seeds or grains are fungi. The fungi along with their hosts are distributed according to their geographic distribution and climatic conditions.

Some occur very frequently while some occur occasionally. The extent of fungi to occur in the seed is dependent upon their capability to survive in the seed under extreme conditions, basically in case of dehydration. Physiology and anatomy of a seed is responsible to influence the longevity of the fungi in the storage. Many of fungal pathogens are so persistent in the seed that they are capable of totally destroying their hosts. Some of them can be easily detected by conventional method. Hence, it becomes necessary to advocate method of the storage fungi.

Materials and Method

Isolation of fungal pathogens from the grains of wheat was carried out by agar plate method, blotters method

1. Agar Plate Method

Preparation of Potato Dextrose Agar Medium (PDA) –

Peeled potatoes – 200 gms.

Dextrose - 20 gms.

Agar Agar - 20 gms.

Distilled Water - 1000 ml.

200 gms of peeled potatoes were boiled in 500 ml of distilled water till the solution becomes sticky by dissolution of the potato pieces. The solution was filtered and 20 gms of dextrose was added in it. 500 ml of distilled water was taken in the other beaker, it was boiled and 20 gms of agar agar powder was dissolved in it. Both the solutions were mixed and final volume was made to 1000 ml.

Sterilization of the glass ware – Required glass wares i.e. Petri plates, conical flasks; beakers etc. with PDA Medium were sterilized in an autoclave at 120°Cat pressure of 15 lbs (pounds) for about 30 minutes. The glass ware and medium were preserved for the further use.

Seed treatment – The seeds were pretreated with 0.001% solution of Mercuric Chloride to get rid of saprophytes on the surface. They were treated for about 2 to 3 minutes and then thoroughly washed with distilled water to remove the traces of Mercuric Chloride. The seeds were inoculated on the PDA medium plates at the rate of 5 seeds per plate.

Incubation – The plates were incubated at 28° C in the incubator.

2. Blotters Method

This method is combination of in vitro and in vivo principles. The seeds were sown in a petri plate on moisten absorbent papers in sterilized distilled water. 5 seeds were kept

equidistant, per plate. The seeds were incubated at 28° C for 5 days. The method was first implemented by Doyer (1938).

Result and Discussion

Different method followed for the isolation of pathogens showed very interesting results. It is evident from table 3 and 4 that there were eight different species of the seed borne pathogens isolated from wheat grains

It is evident from table 3 and 4 that infected grains of wheat showed presence of seven fungal pathogens i.e. Alternaria alternata, Aspergillus flavus, Aspergillus niger, Aspergillus nidulans, Curvularia geniculata, Rhizopus stolonifer Trichoderma viridae and Chaetomium sp. Some of the fungi like Aspergillus niger and Aspergillus flavus showed very good sporulation

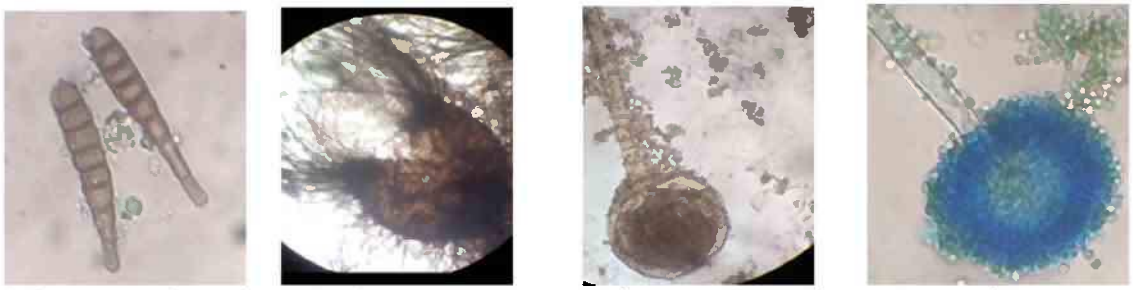
Table 4: Presence of isolated fungal pathogens in the grains of Wheat in PDA

Sr.no	Code no.	Fungal pathogens isolated from wheat grains
1	WMJ	Aspergillus niger, & Trichoderma viridae
2	WMH	Rhizopus stolonifer
3	WDP	Rhizopus stolonifer
4	WDS	Alternaria alternata
5	WMO	Aspergillus flavus, & Alternaria alternata,.

Table 5: Presence of isolated fungal pathogens in the grains of Wheat in blotters method

Sr.no	Code no.	Fungal pathogens isolated from wheat grains
1	WMJ	Aspergillus niger, & Rhizopus stolonifer
2	WMH	Trichoderma viridae, Alternaria alternata & Rhizopus stolonifer
3	WDP	Aspergillus flavus, Curvularia geniculate & Alternaria alternata
4	WDS	Alternaria alternata, Aspergillu flavus
5	WMO	Aspergillus flavus, Chaetomium sp., Aspergillus niger & Aspergillus nidulans

Plate 7



Alternaria alternata Chaetomium sp Rhizopus stolonifer Aspergillus flavus


Trichoderma viridae


Aspergillus nidulans


Aspergillus niger

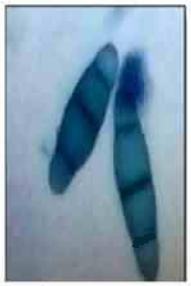

Curvularia geniculata

Plate 8


Aspergillus flavus


Curvularia sp


Aspergilllus niger


Pure culture in broth

Table 6: Cultures Prepared in Broth

Sr.no	Cultures prepared in broth
1	Aspergilllus niger
2	Aspergillus flavus
3	Curvularia sp
4	Aspergilllus nidulance
5	Rhizopus stolonifer

Preparation of pure culture of the fungi in broth

200 gms of peeled potatoes were boiled in 500 ml of distilled water till the solution becomes sticky by dissolution of the potato pieces. The solution was filtered and 20 gms of dextrose was added in it. 500 ml of distilled water was taken in the other beaker, it was boiled and made to 1000 ml. Sterilization of the glass ware – Required glass wares i.e. Petri plates, conical flasks; beakers etc. with PDB Medium were sterilized in an autoclave at 120°Cat pressure of 15 lbs (pounds) for about 30 minutes. The glass ware and medium were preserved for the further use. The fungi which are were present in the seed they have been grown on the PDA and PDB to get the pure cultures of fungi. On PDB the fungi are grown for the secondary metabolites and the mycotoxins.

Incubation – The plates were incubated at 28° C in the incubator.

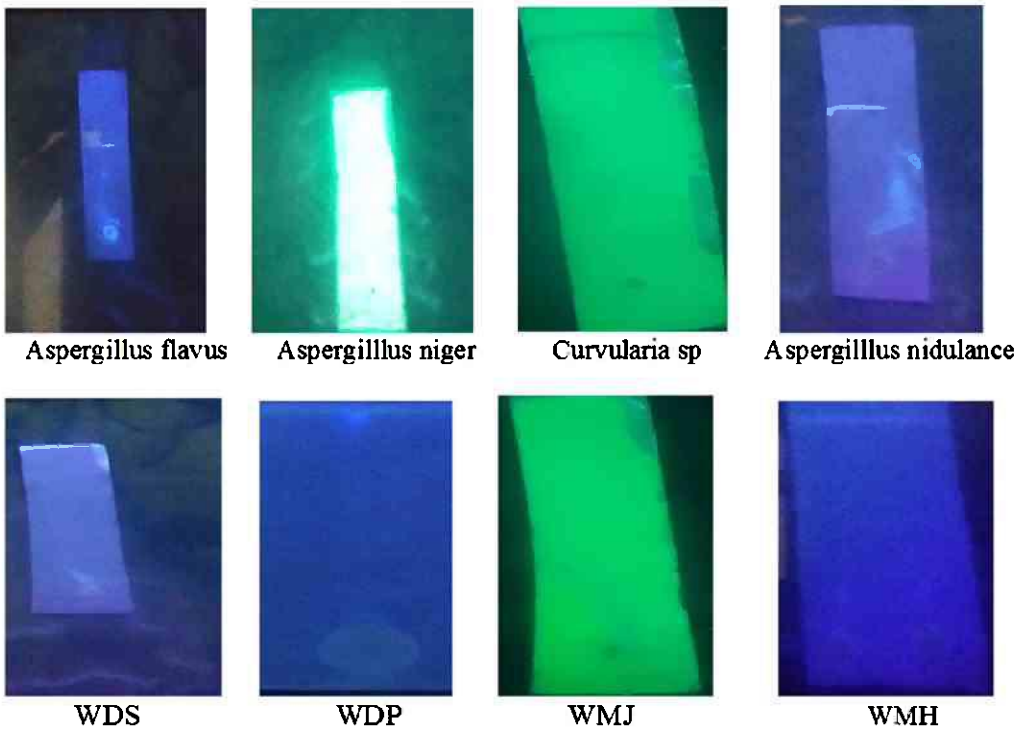
Estimation of mycotoxins

For isolation of mycotoxins from the infected grains of wheat, 50 gm infected grains were blended in a grinder for 15 seconds and 150 ml methanol was added to it. The grains were blended again at high speed for 2 minutes. The extract was filtered through Whatman No. 1 filter paper and the filtrate was collected. The filtrate was the methanol extract of the grains.

30 ml of methanol extract was mixed with 60 ml 20% warm ammonium sulphate along with 30 ml hexane in a separating funnel. The contents were shaken vigorously for 20 seconds. The lower layer in the separating funnel was collected and 5 ml of methyl chloride was added. The mixture was again taken in a separating funnel and shaken vigorously for 20 seconds. The methyl chloride extract was collected separately and evaporated to dryness on a water bath. The residue obtained was dissolved in 0.5 ml mixture of benzene and acetonitrile in a ratio of 98:2 v/v. This extract was used for chromatographic separation of the mycotoxins.

The extract was spotted on the TLC plates coated with silica gel prepared in acetone and the plates were developed in a solvent system containing mixture of acetone and chloroform in a ratio of 12:88 v/v. The plates were examined under UV light (254 nm) to observe fluorescent blue, purple and green spots. Their Rf values were calculated.

Plate no 9



Result and Discussion

Table No: 7 Results of mycotoxins

Sr.no	Name of the sample	R.F value of mycotoxins
1	Aspergillus flavus	0.22
2	Aspergilllus niger	0.64
3	Curvularia sp	0.90
4	Aspergilllus nidulance	0.13
5	WDS	0.11
6	WDP	0.21
7	WMJ	0.66
8	WMH	0.31

In case of qualitative estimation of mycotoxins from the infected grains of Wheat (Triticum vulgare) and isolated fungi from the Wheat grains it is evident from Table no 7 and Plate 9 there were 8 different mycotoxins isolated from various fungal pathogens. They were with Rf values 0.69, 0.64, 0.90, 0.54, 0.11, 0.21, 0.66 and 0.31. some mycotoxins identified were Rodirin A, Patulin, T_2 toxin, Aflatoxin B1 and Penitreme A.

Wheat Grains infected with Alternaria alternata showed presence of (T_2 toxins) with the Rf value 0.22 and unidentified mycotoxin with Rf value 0.64. Grains infected with Aspergillus flavus showed presences of (T_2 toxins) with Rf value 0.22 and unidentified mycotoxins with Rf value 0.90. 0.21 mycotoxins is (Aflatoxins B1). Aspergilllus nidulance showed presence of mycotoxins with Rf value 0.13 (Rodirin A).

It was very interesting that grains which infected Rhizopus stolonifer, dos not showed any mycotoins in the chromatographic analysis.

As discussed earlier, mycotoxins are poisonous chemicals produced my certain fungal pathogen in the plants either when they are on the field or when they are harvested as a crop. They are regularly found in the seed grains (Payne,1992). The storage produce different types of mycotoxins in the grains depending ipon the species of the fungal pathogen, availability of ecological conditions for their development on terms of temperature and humidity and specificity of the food gains on which they are growing (Neergard,1977).

A fungus may produce a particular mycotoxin in different quantities on different typesod grains or when in association with some other organism (Diener & Davis, 1969).

Conclusion

Today in the world, there are various advanced techniques available for seed storage and preservation but in developing country like India, where 65% population is dependent upon agriculture as the main source of livelihood, still farmers continue to store and preserve seed in primitive silos and unhealthy and unhygienic conditions due to lack of required knowledge and facilities. As a result, major part of the persevered seed is invaded by different seed borne fungi to deteriorate nutritional contents of the seeds which cause morphological deformities and production of mycotoins in the seeds making them fatal to animals and human life.

In metropolitan cities like Mumbai, seeds are preserved in various provisional stores, till further usages by the people, in very unhealthy conditions where there is warmth and high amount moisture. These conditions seeds are vulnerable to fungal infections due to various seed borne fungi and ultimately cause nutritional damage of the seeds and make them poor in quality. When samples of wheat grains were collected from five different places i.e form Dadar, Matunga, and Mahim there were eight different fungi were isolated like, Alternaria alternata, Aspergillus flavus, Aspergillus niger, Aspergillus nidulans, Curvularia geniculata, Rhizopus stolonifer Trichoderma viridae and Chaetomium sp.

Hence, we need to protect those Wheat grains from the fungal infection by using various post harvested techniques. We need to make people aware about that grains are infected and unhygienic.

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2. Checklist of Tiger Beetles (Cicindelidae, Coleoptera) Around Wani City, Dist. Yavatmal, (M. S.)

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Abstract

Cicindelidae is one of the important families of Coleoptera and beetles are commonly called as tiger beetles. The members of this family are natural predator at larval as well as adult stages. The study area, Wani is situated at eastern side of Yavatmal district (M.S.), located at co-ordinates 20007' N latitudes and 78095' E longitude. Many coal-mines are located around Wani. These mines impart their effect on the environment which may affect the coleopteran diversity. With this view the tiger beetle diversity is studied during January2011to December 2015. During the study period five different species of five different genus of family Cicindelidae are found which varies in body length from 10mm to 15.5mm and are identified with key characters.

Key Words: Coleoptera, Cicindelidae, Tiger beetle, Diversity, Wani.

Introduction

Tiger beetles as by their name are known for their aggressive predatory habits and ability to run fast to catch prey. They usually have large eyes for spotting and tracking prey, long, slender legs for fast running and large curved mandibles to catch and hold prey. They are predatory, both as adults and as larvae. Many species of tiger beetles are in decline and several are listed as endangered or threatened. They are vulnerable because they are often restricted to open sandy habitat in which they can catch prey and areas with sand in which their larvae can dig borrows. Habitat loss is the most serious issue for these species and one of the biggest threats to tiger beetles are off-road vehicles that drive over sand dunes and crush larval borrows. Pajni et al. (1984) recorded the Cicindelid fauna of Punjab State. The study by Pearson and Ghorpade (1987, 1989) reveals Tiger beetles of Siliguri-Darjeeling area and

geographical distribution and ecological history of Tiger beetles of the Indian sub-continent. Singh (1991) reported some Cicindelidae fauna of India with reference to external genitalia, while Uniyal and Mathur (2000) studied the altitudinal distribution of Tiger beetles in the Great Himalayan National Park conservation area of Western Himalayas.

A total of 2,300 species of tiger beetles were recorded all over the world till year 2000 out of which India reported 208 species of tiger beetles and holds third position among the countries having their habitat. Of these, 51.9% species are endemic to India only (Cassola & Pearson 2000). Further studies shows that there are over 2,600 species of Tiger beetles worldwide (Sinu et al, 2006), 220 in India (with 114 or 51.8% endemics). The Indian sub-continent has one of the most diverse Tiger beetles fauna of the world (Bhardwaj et al. 2008). Sinu et al. (2006) reported the feeding fauna and foraging habits of Tiger beetles found in agroecosystems in the Western Ghats. Uniyal and Bhargav (2007) have studied the Tiger beetle fauna of Himachal Pradesh. Bhargav et al. (2008) studied the species diversity and habitat preference of Tiger beetles in Chilla Wildlife Sanctuary of Rajaji National Park, Uttarakhad. Total 10 species of 6 genera Cylindera, Calomera, Calochroa, Cicindela, Heptodonta and Jansenia have been observed from riverine habitats at Champhai district of Mizoram state, North East India by Harit (2013). Choudhury et al. (2020) reported a total of 15 species of tiger beetles belonging to seven genera in Chakrashila Wildlife Sanctuary and riverine ecosystem of Gaurang.

Material and Methods

i. Study Area

Wani town is situated in the south- east corner of the Maharashtra state. It is at south-east border of the Yavatmal district. The study area about 13 sq. km. and fairly linear in shape along north to south direction. It lies between the Latitudes: 200 03' to 200 06'N and Longitudes: 790 01' to 790 03'E. The city has hot and dry tropical climate with moderate rainfall of 950 mm per annum.

ii. Surveying

Intensive search for beetles is performed from September 2011 to August 2015 in the vicinity of the Wani, District- Yavatmal of Maharashtra. The study was performed each month throughout the year and the observations are confirmed for the successive years.

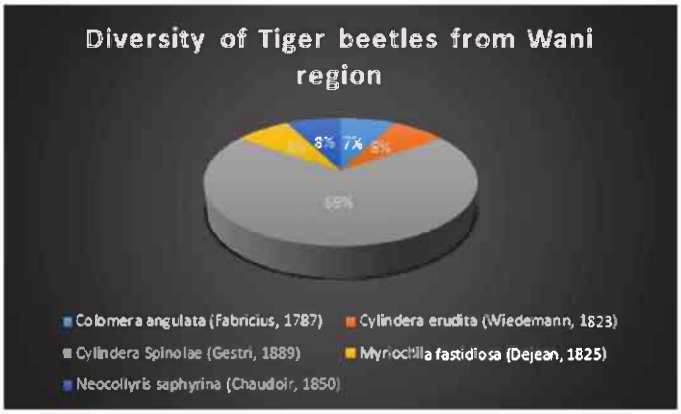
i. Sample collection: Collection was done by hand picking of beetles attracted towards light. Samples after collection were preserved in 70% alcohol in glass vials and brought to laboratory.

Result

The collection from survey consist of 13 examples of family Cicindelidae including 5 species belonging to 4 genera. Of these species, Cylindera spinolae (69%) is found to be dominant over other species reported.

Table-1: Diversity of Tiger beetles recorded from Wani region of Yavatmal district.

Familiy	Generic name	No. of individuals	Length	Width
Cicindelidae	Colomera angulata (Fabricius, 1787)	1	10.5 mm	4 mm
	Cylindera erudita (Wiedemann, 1823)	1	10 mm	3.5 mm
	Cylindera Spinolae (Gestri, 1889)	9	12.5 mm	4 mm
	Myriochila fastidiosa (Dejean, 1825)	1	10 mm	4 mm
	Neocollyris saphyrina (Chaudoir, 1850)	1	15 mm	3.5 mm



Conclusion

This is the first report of tiger beetles from Wani Tehsil, district Yavatmal (M.S.). A total of 13 specimens of 4 genera and 5 species are recorded including – Colomera angulate, Cylindera erudita, Cylindera spinolae, Myriochila fastidiosa and Neocollyris saphyrina. The maximum number of species were recored from genus Cylindera (76.92%) while other genera contribute (7.69%) each of the total genera. Tiger beetles (Cicindelidae) are proposed as a good indicator group for identifying area for biodiversity monitoring. Though the species reported are few in number, the findings have high significance for understanding insect biodiversity in the region and provides a baseline data for further research programmes.

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3. A Revew: "Effect of Andrographis Panicultata on Covid (Used in Treatment of Respiratory Infection and Disease)"

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Abstract

In December of this year, the world was struck by a catastrophic global epidemic that claimed the lives of millions of people around the world.

Because there was no treatment that could be used to cure the corona-virus disease at the time, ayurvedic herbs and medicine were valued for their ability to alleviate the symptoms of the covid, as the covid is a disease that affects the respiratory system or can be described as a respiratory infection.

There were numerous herbs that were used to treat this ailment, and one of them was Andrographis panicultata, which can be employed because different portions of the plant can be used to treat this disease.

Keywords: Andrographis paniculata; COVID-19; SARS-CoV-2, Uses, Taxonomical Classiication

Introduction

A new coronavirus was found to be the source of a Pneumonia outbreak in Wuhan, China in December 2019. Severe Acute Respiratory Syndrome Coronavirus 2 was the name given to it (SARS - CoV- 2). Up of April 16, 2020, the epidemic had spread to 185 nations, with over 2.06 million confirmed cases and over 1,34,354 deaths. After the United States,

Brazil, and Russia, India became the fourth worst-affected country in the world owing to Covid-19 by July 2020. Ayurveda is regarded as a traditional medicine system because it takes a holistic approach to mind and body care. [Public Health Emergency Publications by Elsevier].

Ayurveda, often known as 'The Science of Life,' is a comprehensive life, health, and healing system that has been practised in India since ancient times. While there are no specific therapies for Covid-19, India's AYUSH administration recommends boosting immunity. The Ayurvedic book presents a collection of rejuvenation techniques that provide biological nourishment to the body's tissues.

Green chiretta is the scientific name for Andrographis Paniculata. Coronavirus disease 2019 (COVID-19), which is caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV2), has risen to the top of the worldwide pandemic priority list (World Health Organization, 2021). The disease's clinical spectrum is divided into asymptomatic, mild, moderate, severe, and critical illness. Around 80% of cases are classed as asymptomatic and mild (fever or upper respiratory tract symptoms, malaise, headache, muscle pain, nausea, vomiting, diarrhoea, loss of taste or smell, but not pneumonia) or moderate (pneumonia, oxygen saturation >94% on room air). COVID-19 infection can progress from mild to moderate to severe, and lower respiratory tract involvement, which manifests as pneumonia, is the key sign of more serious diseases, aside from multi-organ dysfunction or failure (Wu and McGoogan, 2020; National Institute of Health USA, 2021). Host factors (e.g., gender, age, co-morbidities), illness features (Wu and McGoogan, 2020; National Institute of Health USA, 2021), and laboratory measures such as C-reactive protein (CRP), an inflammatory marker, are all predictors of a worse outcome in COVID-19 patients (Mueller et al., 2020).

CRP levels in the blood are reported to be fewer than 10 g/mL in typical healthy people (World Health Organization, 2014; Wang, 2020). Intracellular viral multiplication, which causes cell lysis or death, and immune response hyperactivation, which contributes to widespread hyperinflammation, are the key mechanisms of disease progression in COVID-19 (van Eijk et al., 2021). A therapeutic medication that would limit the course of infection is urgently needed, in addition to symptomatic care of individuals with mild COVID-19.

Andrographis paniculata is a plant native to India that has been widely introduced, naturalised, and cultivated throughout Southeast Asia and China (Plant of the World Online,

2019). It is one of the most widely used medicinal plants in Indian Ayurvedic medicine, Chinese medicine, and Thai traditional medicine for the treatment of acute upper respiratory tract infection and diarrhoea (National Drug Committee, Thailand 2000; State Pharmacopoeia Commission of the People's Republic of China, 2015; Banerjee et al., 2021). FaThalaiChon is the Thai name for it. Andrographolide, a bioactive diterpene lactone, is the primary ingredient of A. paniculata.

Headache, exhaustion, allergic responses, nausea, and diarrhoea are frequent side effects; more serious side effects, such as urticaria or anaphylaxis, are extremely rare (Thamlikitkul et al., 1991). A. paniculata's medicinal efficacy is attributable to a variety of pharmacological actions, including antiviral, anti-inflammatory, antipyretic, and immune-regulating properties (Dai et al., 2019). In silico investigations found that andrographolide inhibits SARS-primary CoV-2's protease (Murugan et al., 2020). Furthermore, an in vitro investigation revealed that it works against SAR-Cov-2 by blocking viral multiplication in cells (Phumiamorn S. et. al 2020). We investigated its therapeutic effects on mild COVID-19 participants in a small group (n=6) due to its in vitro anti-SARS-CoV-2 activity as well as the prospective benefits of its different pharmacological activities, including anti-inflammation, and the results were highly encouraging. In volunteers, there was a significant reduction in viral replication. A randomised, double-blind, placebo-controlled trial was done to determine the efficacy and safety of oral A. paniculata extract in persons with mildly symptomatic SARS-CoV-2 infection. We also looked into the significance of serum CRP in predicting disease progression in mild COVID-19 patients.

Taxonomical Classification

Domain: Eukaryota

Kingdom: Plantae

Subkingdom: Tracheobionta

Division: Angiosperma

Class: Dicotyledonae,

Subclass: Gamopetalae

Series: Bicarpellatae

Order: Personales

Family:Acanthaceae

Subfamily: Acanthoideae

Tribe: Justiciae

Genus: Andrographis

Species: A. paniculata

Discussion

The study suggests that the APE treatment programme (oral sixty mg of andrographolide, t.i.d., for five days) should be started early in adults with mild COVID-19 who are not at risk for severe COVID-19 due to host factors, in order to prevent illness progression to severe COVID-19 by using respiratory illness as an indicator. Furthermore, side effects from the treatment are uncommon and minor. Although the APE-treatment cluster had a higher rate of quick SARSCoV-2 clearance than the placebocontrol cluster, the difference did not reach a statistically significant level, which was likely due to the small sample size. A recent comprehensive review on antimicrobial medicine, clinical safety, and effectiveness of Andrographis paniculata, incontestable its high potential for effective and safe COVID-19 treatment, and there was a desire for clinical information. (Hossain and colleagues, 2021). The findings of this study on serum CRP levels in mild COVID-19 patients agree with the previous retrospective study in 27 adults in the early stage of COVID-19 that CRP levels were low in mild disease and increased with disease progression (Wang, 2020).

Rising CRP levels within the first 48 to 72 hours after admission were thought to be a better predictor of metabolic process worsening than initial CRP levels, whereas stable CRP levels were discovered in patients with stable health (Mueller et al., 2020). According to the findings, APE therapy can help to delay the evolution of COVID-19 and possibly lower the amount of infective agent shedding. The benefit of the treatment will most likely be due to andrographolideand its derivatives' anti-SARS-CoV-2 activity, which involves early inhibition of animate creature infective agent multiplication, which causes cell injury and inflammation. The treatment must adhere to the prescribed schedule and daily dose. The effectiveness of an associate APE treatment programme in fragile COVID-19 individuals was assessed using a rigorous clinical analysis approach, such as a double-blind RCT. Due to the ever-changing scenario of COVID-19 pandemic waves, the study was limited by the small sample size.

Uses

The leaves and roots of AP have been used ethnobotanically in various nations across Asia and Europe to treat a variety of diseases. However, the entire plant is employed for a few

specific uses. It is indicated to be taken to relieve body heat in fevers and to remove toxins from the body due to its "cool property" activity. Because of its great "blood purifying" capabilities, the plants are used to treat leprosy, gonorrhoea, scabies, boils, skin eruptions, and chronic and seasonal fever. Traditional applications of AP in several traditional medical systems (TMS). It is also frequently utilised as a folklore remedy for therapeutic purposes by traditional practitioners, tribes, or communities in several nations (Md. Sanower Hossain.et.al)

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4. A Review: "Covid-19 and Tourism"

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Abstract

Tourism is the activity that allows a person or a group of to travel and stay in the places outside their usual living environment. Tourism allows people to come together for social and cultural interaction with people residing to the people visiting. Tourism helps with the economic development of the country. The main objective of tourism is to maintain competitiveness of a country with the other in the form of tourist destination, improve the tourism products to ensure employment to the people residing near the destination and economic growth the country. Tourism is the one industry that suffers with a great loss mostly due to some the pandemic (COVID-19). It has not only affected the economic growth of the country but also the employment of people residing near the tourist destinations. COVID-19 is the situation that has forced to stop each and every activity around the globe. In this global crisis, the tourism and hospitality sector has collapsed in each and every country around the globe, and India is sadly from one of them. Therefore, the paper aims to investigate the impact of Covid-19 on the Indian tourism industry. Tourism industry also helps in other sectors like lodging, transportation, catering etc. Due the country going under the stages of lockdown, social distancing ,stay at home, work from home and the ban on travelling from one country to the other like strict rules implemented the government on the people leads to lack of various social, economic, and loss of various employment opportunity for the people.

Covid-19 Impact in India

Bereavement, isolation, loss of income and fear are triggering mental health conditions or exacerbating existing ones. Many people may be facing increased levels of alcohol and drug use, insomnia, and anxiety Meanwhile, COVID-19 itself can lead to neurological and mental complications, such as delirium, agitation, and stroke. People with pre-existing mental,

neurological or substance use disorders are also more. Vulnerable to SARS-CoV-2 infection-they may stand a higher risk of severe outcomes and even death.

Impacts

Massive Impacts on Livelihoods

As many as 100 million direct tourism jobs are at risk, in addition to sectors associated with tourism such as labor-intensive accommodation and food services industries that provide employment for 144 million workers worldwide. Small businesses (which shoulder 80% of global tourism) are particularly vulnerable. Women, who make up 54% of the tourism workforce, youth and workers in the informal economy are among the most at-risk categories nation will be unaffected. Destinations most reliant on tourism for jobs and economic growth are likely to be hit hardest: SIDS, Least Developed Countries.

Mitigating Impacts on Nature and Culture

The sudden fall in tourism cuts off funding for biodiversity conservation. Some 7% of world tourism relates to wildlife, a segment growing by 3% annually. This places jobs at risk and has already led to a rise in poaching, looting and in consumption of bush meat, partly due to the decreased presence of tourists and staff. Several examples of community involvement in nature tourism show how communities, including indigenous peoples, have been able to protect their cultural and natural heritage while creating wealth and improve their wellbeing. The impact of COVID-19 on tourism places further pressure on heritage conservation as well as on the cultural and social fabric of communities, particularly for indigenous people and ethnic groups.

Impact of Covid-19 on Tourism Economy

The foreign exchange earnings (FEE) from tourism is one of the major revenue source for the Government of India. The FEE is the revenue generated by inbound foreign tourists, and decrease in foreign tourists' number leads to reduce FEE. The entire world is affected by COVID-19, including India. Following the border closure, cancellation of international flights, and a series of lockdowns, the tourist's arrival rate in India has been highly affected. To show the impact of COVID-19 on FEE, a comparative analysis has been done. Here, it has assumed that the effect of COVID-19 will remain until next year. The FEE depends on the arrival of the number of tourists and exchange rate. To analyse the impact, the monthly data related to number of tourists, FEE from tourism and exchange rate are collected from 31st January 1993 to 31st March 2020.

Travel Restrictions

As a result of the pandemic, many countries and regions have imposed quarantines, entry bans, or other restrictions for citizens of or recent travelers to the most affected areas. Other countries and regions have imposed global restrictions that apply to all foreign countries and territories, or prevent their own citizens from travelling overseas. Together with a decreased willingness to travel, the restrictions have had a negative economic impact on the travel sector in those regions. A possible long-term impact has been a decline of business travel and international conferencing, and the rise of their virtual, online equivalents. Concerns have been raised over the effectiveness of travel restrictions to contain the spread of COVID-19.

Post Pandemic Situation on Tourism and Their Priorities

With quarantines easing and flight schedules reforming, tourism is showing signs of returning. But for the industry to return as a force for good for both the economy and the environment, we cannot return to business as usual. Here are four key recovery priorities for the tourism sector:

Local Tourism

When tourism resumes, domestic travel will be the focus, putting destinations under the dangers of mass tourism, in which the number of incoming tourists exceeds a destination's capacity to hold them. Viet Nam will be the first country in South East Asia to resume domestic travel, with discounted packages and promotions aimed at building demand. Other countries are also focusing on a few prime locations for attracting tourists. Rebuilding the tourism sector and providing tourists with rewarding experiences must be done by exploring alternatives to mass tourism, such as sustainable rural tourism, nature tourism, and theme-based circuit tourism.

Ecological Protection

Unguarded protected areas and the diverted attention of governments has led to a rise in nature-based crime. With the decline in wildlife tourism, revenue streams for conservation have also dried up. Stringent laws for biodiversity protection and illegal activities are needed. To protect the ecological balance from tourism, governments can consider: increased focus and investment in capacity building and training; inclusion of sustainability taxes for tourists; protecting sensitive community and Indigenous People's areas from exploitation; and including scientific frameworks for policy formulation.

Improved Infrastructure

Infrastructure for waste management needs to be improved and all public places must have provisions for the safe disposal of bio-medical waste. Increasing access to clean water and sanitation services, along with the promotion of good hygiene practices like hand washing, would also help to stop the spread of communicable diseases. Incentives must also be made to internet service providers to improve connectivity in tourist destinations.

Rethinking Flying

Tax reforms must be done, with consideration of tax levies for frequent flyers. Many aviation companies are nearing bankruptcy, leading to an increased demand for government bailouts. However, this funding must come with conditions prioritizing environmental improvements. Other steps can include retiring inefficient aircraft, reducing the number of flights while demand is low, and providing carbon efficiency information for flyers. Taken together, these strategies can help ensure that policy decisions are informed by careful and scientific formulations. Protecting the key assets of a region—the very reason for tourist arrivals is a fundamental pillar of any recovery, ensuring we don't solve one problem by creating another. When planned and implemented strategically, tourism as a sector can match up to its potential of being a driver of social, economic, and environmental welfare.

Policy Priorities

The survival of businesses throughout the tourism ecosystem is at risk without continued government support and although governments have taken impressive action to cushion the blow to tourism, to minimise job losses and to build recovery in 2021 and beyond, more needs to be done, and in a more co-ordinated way. Key policy priorities include:

- Restoring traveller confidence.
- Supporting tourism businesses to adapt and survive
- Promoting domestic tourism and supporting safe return of international tourism
- Providing clear information to travellers and businesses, and limiting uncertainty (to the extent possible)
- Evolving response measures to maintain capacity in the sector and address gaps in supports
- Strengthening co-operation within and between countries
- Building more resilient, sustainable tourism.

While flexible policy solutions are needed to enable the tourism economy to live alongside the virus in the short to medium term, it is important to look beyond this and take steps to learn from the crisis, which has revealed gaps in government and industry preparedness and response capacity. Co-ordinated action across governments at all levels and the private sector is essential. The crisis is an opportunity to rethink tourism for the future. Tourism is at a crossroads and the measures put in place today will shape the tourism of tomorrow. Governments need to consider the longer-term implications of the crisis, while capitalising on digitalisation, supporting the low carbon transition, and promoting the structural transformation needed to build a stronger, more sustainable and resilient tourism economy.

Measures and Policies Imposed

The COVID-19 crisis has been a huge shock to the tourism economy, severely impacting people's livelihoods, neighbourhoods and businesses. As the pandemic continues to evolve, the full consequences are not yet clear. However, a return to 'business as usual' is unlikely. Policy makers will need to learn from the crisis to build a stronger, more resilient tourism economy for the future. While it is still too early to say with any certainty what these will be, a number of initial lessons are outlined:

- Crisis has been a call to action to governments, at all levels, to respond in a co-ordinated way, and has highlighted the importance of integrated tourism policy approaches to support recovery. Delivering well-targeted and accessible supports as quickly and efficiently as possible to vulnerable tourism businesses, workers and tourists has and continues to be crucial.
- Strengthened multi-lateral co-operation and robust support is essential to reactivate tourism. Countries need to work together, as the actions taken by one government have implications for travellers and businesses in other countries, and for the global tourism system. Countries need to develop collaborative systems across borders to safety resume travel, restore traveller and business confidence, stimulate demand and accelerate tourism recovery.
- Sector-specific supports are needed to address the particular needs of tourism workers, businesses and destinations, and support wider economic recovery. Tourism has benefited significantly from general economic stimulus measures. However, it is

one of the most heavily impacted sectors, and will have an impact on wider macroeconomic recovery in many countries.

- Continued government support should already start to build toward more sustainable and resilient tourism economy. Destinations and tourism businesses need help to be ready to provide tourism services to meet demand when the recovery comes. It will be important to work with tourism businesses so they are sustainable beyond the end of the supports, and already starting to address the long term implications of the crisis. Measures should be increasingly conditioned on broader environmental, economic and social objectives.
- Providing policy clarity and taking steps to limit uncertainty (to the extent possible) will be crucial to support tourism recovery. The outlook for the tourism economy remains extraordinarily uncertain, and business and travel confidence has taken a big hit. Clear communication, well-designed information policy and clarity on the epidemiological criteria will be particularly important where there is a need to change travel restrictions and containment measures in response to virus outbreaks and the shifting sanitary situation.
- Improving the evidence base to inform policy and business decisions will be key, through information gathering, research and data analysis. The crisis has highlighted shortcomings in the availability of timely, comparable, granular data in quickly evolving situations. Reliable and consistent indicators are needed to evaluate the effectiveness of programmes and initiatives, and monitor progress on tourism recovery and resilience. Risk-based solutions to safely lift travel restrictions and get the international tourism ecosystem back up and running must be based on sound scientific evidence.
- Crisis is a once in a lifetime opportunity to move toward fairer, more sustainable and resilient models of tourism development. The pandemic has once again exposed structural shortcomings in the tourism system and the vulnerability to external shocks. There is an urgent need to diversify and strengthen the resilience of the tourism economy, to better prepare for future shocks, to address long standing structural weaknesses, and encourage the digital, low carbon transformations that will be

essential to shift to stronger, fairer and more sustainable models of tourism development.

Safety Guidelines for Tourists

As the world is facing an unprecedented global health emergency with the COVID-19 pandemic, the tourism sector is among the most affected sectors. Thus, it has become important for the Government to consider the health and safety of tourists. The government is taking necessary measures to ensure utmost safety and control the spread of coronavirus. The Department of Tourism, Karnataka has drafted a comprehensive guide with safety protocols that need to be implemented to ensure safe travel. These measures will create a safe environment for tourists to travel across the state. Additionally, with the execution of these protocols, the government is aiming towards the prevention of new cases and reducing the mass impact of the pandemic. The state is ready to rebuild trust and inspire confidence in the tourists to revive the tourism industry amidst the unrivalled global health and economic pandemic. With districts opening up, it is the duty of both the government and the citizens to take appropriate measures to prevent the pandemic. After all, we can fight this situation together.

Conclusion

Tourism has always been a major contributor to job growth and a major source of foreign income for the country. This sector not only supports urban workers but also offers livelihoods for people through social strata in rural areas. It is a mediator of the aviation sector, automobile sector, hospitality, commercial, etc. It is one of the primary drivers to generate revenue for Rajasthan. Due to COVID-19, Tourism has become the most adversely affected sector. It has been found that the national and international arrival trends are highly affected at large scale, which is not good for the Tourism industry. The closure of hotels, dharamshala, resorts etc., and airport flights have been halted after the start and spread of the COVID-19 pandemic has already resulted in a projected revenue loss of 1.25 trillion rupees for the Indian tourism industry by 2020. A CARE ratings agency research says that the amount corresponds to a 40 percent downfall in total revenue over the fiscal year 2019. The study predicts the impact of the epidemic on tourism between January and February 2020 which shows downfall of 50 percent, and it may be getting stronger by 70 percent downfall in March alone, since the termination of numerous global flights. In April–June, the Indian tourism sector is forecast to

make a projected loss of revenue approx. Rs. 69,400 crosses, describing a year-on-year downfall of 30 percent.

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5. Effect of Zingiber Officinale (Ginger) and Azadirachta Indica (Neem) on Covid-19

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Abstract

The outspread of coronavirus i.e. COVID-19 globally led to numerous deaths and hospitalizations. It results in respiratory tract diseases/infections and also leads to lung diseases in humans which are fatal. The strength of the global health system and poor health system in Enugu Nigeria in particular leading to over 8,24,000 deaths across the world and 21 deaths in Enugu State Nigeria itself. While the global healthcare community has been looking for the cure of COVID-19, the Enugu people while sticking to World Health Organization, Nigerian Center for Disease Control and Enugu State Ministry of Health guidelines resorted to home/ domestic remedies using ginger (Zingiber officinale) alone or ginger in combination with other helpful agents. Based on phytochemical constituents and other analysis, ginger consists of certain essential oils like curcumene; and macronutrients like carbohydrates, fibers and proteins (with amino acids), lipids (including omega 3, 6 and 9 fatty acids); micronutrients like zinc, calcium, vitamins A and vitamin C with other vital components of which studies have suggested their anti-COVID-19 properties.

Ginger consists of antioxidant effects by inhibiting superoxide production, anti-inflammatory or healing and analgesic activities with better effects against swine flu (H1N1), and human respiratory syncytial virus in human respiratory tract cell lines thereby showing antiretroviral nature as well as shows bronchodilatory effect that prevents severe damage to the lungs due to inflammation which is also applicable in COVID-19. So again there is need of safe, secure and natural remedies which can help in sustaining the health of the present world and can be used without potential hazards. The current pandemic of Covid-19 is one of the

examples of a global crisis emerged by SARS-CoV-2 virus. It is resulting in much acute as well as silent chronic damage to various systems in the human body.

Neem is found to have following properties as per various studies- It has Broad spectrum antibacterial, antifungal, antimalarial, antiviral and antiretroviral effects. It has proinflammatory cytokine inhibitor and immunomodulator effect. It also bears hepatoprotective and antioxidant effects along with thrombolytic properties. It has ACE inhibitor action. As per its docking study, it has high inhibition against COVID-19 Main Protease. As Covid-19 is responsible for severe cytokine storm induced difficulties and coagulopathies, Neem can be useful as a single Silver bullet in Covid-19 in both curative and prophylactic aspect. It can even be helpful in post Covid-19 complications too.

Keywords:- COVID-19, SARS- CoV-2 , Ginger , Neem , Immunomodulation , Anti-viral, Anti-inflammatory , Anti-oxidative.

1. Introduction

Viral infections are one of the serious problems faced globally, as it affects the health of the individual and also results in economic implications. Regardless, the availability of vaccines or antiviral drugs, maintaining personal hygiene is a very effective way to fight against viral infections. The spread of coronavirus (COVID-19) resulted in pandemic which lead to numerous deaths and hospitalizations. There are various vaccinations available for this virus until now such as Pfizer, Sputnik V, Moderna, Covishield, Covaxin etc. and they cause some side effects that exists, so, this review article aimed to illustrate some of natural antiviral compounds that might help in overcoming this pandemic virus. Viruses are composed of proteins and are enclosed by a lipid membrane, the diameter of viruses ranges from 16 nm to 300 nm, the small size of the viruses makes them ultra-filterable, Viruses have developed through long time duration and can adapt to definite organisms or their host cells. Viruses contain only one type of nucleic acid, DNA or RNA. Viruses do not replicate by division method, but they propagate in the living cells host. They can develop their genomic activity and reproduce the components from which they are synthesized. They are not capable of encoding their ribosomes or energy-generating metabolic pathways. So, viruses are considered intracellular parasites. They can re-route and adjust cellular processes for their optimal execution reproduction. The genetic reference for any viruses is independent of encoding structural components only but they have many genes that code various regulatory active proteins as transactivators and enzymes like proteases and polymerases.

1.1 Ginger (Zingiber officinale)

Ginger has been reported to show antibacterial, antifungal, and antiviral activities. It is used to warm the body for promoting circulation and decreasing high blood pressure. The warming effect of ginger makes it a potent antiviral for the treatment of common cold and flu. Ginger can suppress plaque formation induced by a human respiratory syncytial virus in the respiratory tract in vitro. Ginger was said to have a potential role in blocking viral attachment and internalization. Ginger was supplemented to the patient with the hepatitis C virus in Egypt; it resulted in lowering α-fetoprotein level, both liver enzymatic marker aspartate aminotransferase (AST) and alanine aminotransferase (ALT)

1.2 Neem (Azadiracta indica)

Neem or the scientific name is Azadirachta indica (Malay : semambu) has been used widely as an oral and topical formulation for many different medicinal purposes based on its antiviral, antimicrobial, anti-inflammatory, antiulcer, anticancer, antipyretic, antifungal and antihyperglycaemic properties. The most common form of extract from the plant is neem oil. Turmeric or the scientific name Curcuma longa (Malay : kunyit) is also known to have been used for centuries in India and China for the medical treatments of illnesses such as dermatologic diseases, infection, stress, and depression. Turmeric's effects on health are generally centered upon an orange-yellow colored, lipophilic polyphenol substance called "curcumin," which is acquired from the rhizomes of the herb. There is a claim of a healing effect from COVID-19 infection after ingestion of boiled water with neem leaves or neem leaves and turmeric mixture circulating in the social media. In addition, a request was also received from the office of the Minister of Health Malaysia to review the effectiveness of the treatment.

Benefits of Ginger in COVID-19

Since the onset of the COVID-19, people have shifted to healthier, nutritional options to fight the virus and boost immunity. Health has become a top priority.

Ginger bears anti-inflammatory properties that help in removal of toxins from the respiratory tract. It contains many vitamins and minerals including zinc, magnesium, potassium and beta-carotene. It also has antioxidants that support the immune system. Neem is a natural herb that comes from the neem tree; the extract comes from the seeds of the tree and has many different traditional uses. Neem is known for its pesticidal and insecticidal properties, but people also use it in hair and dental products. Neem is a strong antioxidant, neutralizing free

radicals that may influence the development of some conditions. It is also a strong anti-inflammatory agent. Neem has antimicrobial effects and may be effective against several types of bacteria, viruses, and fungi. Be it cough, cold, fever or other diseases or disorders, many times we turn to 'Dr. Google' rather than going to our trusted doctor. And, with the second wave of COVID-19 causing havoc, the habit of doing a Google search for every small symptom, and looking for alternative 'gharelu' treatments has seen a rise. Over the last one year, many have resorted to kitchen ingredients to boost immunity. Turmeric, pepper, ginger, honey, ayurvedic concoctions suddenly found a few fan bases world over. And now, there's a new entrant in the 'immunity boosting' category... it's none other than Neem!

Neem is said to possess antiviral, antibacterial, antifungal and antimalarial properties and as far as COVID-19 is concerned, it also has proinflammatory cytokine inhibitor and immunomodulator effect. This means it may help stop cytokine storms in severe Covid patients. Cytokine storms is a condition where the body starts to attack its own cells and tissues rather than fighting the virus. Along with that, neem also has hepatoprotective elements, and prevents harmful chemicals from damaging the liver. Neem is also one of the most popular antioxidants, which prevents cell damage. Neem also has an ACE inhibitor, meaning it contains Angiotensin-converting-enzyme inhibitors that are a class of medication used primarily for the treatment of high blood pressure and heart failure. A research study, published in International Journal of Research in Pharmaceutical Sciences (IJRPS), shows that neem has high inhibition against COVID-19 Main Protease, which is the central enzyme that allows the virus to replicate and infect other human cells. IJRPS is a quarterly publishing online peer reviewed scientific journal sponsored by JK Welfare & Pharmascope Foundation (pharmascope.org/ijrps). A Molecular Docking study showed that neem has 20+ compounds that show high inhibition against COVID-19 Main Protease (6LU7). Since the research was conducted on a small scale, there is a need to expand the horizon of the study being conducted on a mass level to further expand the findings of the study. Another research article by IAR Journal of Agriculture Research and Life Sciences published on Research Gate, says, "Neem and its parts can be used as antibacterial, Antifungal, antiviral, anti-inflammatory, cure many other diseases. It is therefore suggested that Neem and its extracts can be used as an intervention to reduce the risk of COVID-19 among more susceptible populations."

To conclude, according to the studies, neem can be a potential silver bullet against COVID-19. But, the studies need nod from key medical bodies and health experts.

3. Conclusion

The chemical constituents from pepper such as Piperdardiine, Piperanine, and from ginger like 8-Gingerol, 10-Gingerol are significantly active against COVID-19 which are useful for further development. The study also found a reduced risk of covid-19 infection in participants receiving neem capsules which demonstrates its potential as a prophylactic treatment for the prevention of covid-19 infection. The findings warrant further investigation in clinical trials.

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6. Effects of Covid-19 on the Environment: A Review Article

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Introduction

The irruption of COVID-19 was initially occurred one of the city in China at December 2019 end, and after some week latter the World Health Organization announce it an international public health emergency (WHO, 2020a). and from then on words , the disease has spread worldwide, resulting in a pandemic. The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) causes COVID-19, an infectious illness (Islam et al., 2020;Nghiem et al., 2020;Wang et al., 2020).Bats are thought to be the principal source of COVID-19, according to several health professionals (Chakraborty and Maity, 2020). But the source of disease and how it transmitted to among the human being is unknown; many health professionals believe bats may be the primary source (Chakraborty and Maity, 2020).

The virus has primarily transferred from person to person by direct touch, sneezing, coughing, and talking (Islam et al., 2020;Li et al., 2020;Wang et al., 2020).The corona virus has rapidly spread around the world. the world health organization announce in the month of march 2019 COVID-19 was a pandemic disease as it spread all over the world .As of October 22, 2021, the virus had spread to 223 countries, areas, or territories, killing 4,946,037 people out of 243,312,149 verified cases. The geographical distribution is a key factor to consider. the most common symptoms of COVID -19 was Fever, cough, headache, myalgia or weariness, chills, sore throat, breathing trouble, nausea, vomiting, and diarrhea (Huang et al., 2020;Wang et al., 2020). these symptoms may be appeared from one to fourteen days after being exposed to the virus or by came across in the contact with viral infected person .However, some persons who are sick do not show any signs or symptoms. Patients are those who develop symptoms that are noticeable enough; the majority (81%) develop mild to moderate symptoms like mild pneumonia, while 14% develop severe symptoms like dyspnea, hypoxia, in some people cardiac injury, respiratory failure, acute respiratory distress syndrome may be occurred and this

ultimately lead to death of the person (Holshue, 2020;Wang et al., 2020) or in 50% patients may developed lung damage, and 5% patients develop critical symptoms like respiratory failure, shock, or multi-organ failure .People over the age of 65, as well as those with other underlying medical issues, are at a higher risk of death (Chen, 2020).Although no major progress has been made in the creation of a viable treatment, many COVID -19 vaccines have been approved and disseminated in a number of nations that have begun mass vaccination efforts. Other preventive measures suggested by national and international authorities and experts include physical or social distancing ,quarantining of the patients or the infected person , ventilation of indoor spaces, and the use of non-pharmaceutical measures such as face masks and hand gloves, hand sensitization with soap, antiseptic solution or with sanitizers (Hui et al., 2020;Sajed and Amgain, 2020;WHO, 2020b).

To regulate COVID-19 and lower death rates, most of the afflicted countries implement various measures, such as restricting people's movement except for emergency services. In India, as a COVID-19 preventive step, the largest numbers of people's movements are restricted by lock-down, which start from March 24, 2020. (Somani et al., 2020). By excluding only emergency services such as medical, fire, police, and food distribution, other businesses and educational institutions are closed to urge people to stay at home. Except for the conveyance of vital commodities and emergency services, all public transportation such as bus, truck, train, airplane, etc were restricted for time being (Tripathi,2020).

The normally lively pubs, restaurants, and theatres in London have been shut down, and residents have been told to stay at home. Acoording to world economic forum report to control spread of COVID -19 near about 3 billion people were put under lockdown (April 7,2020), and the mobility of these peoples was restricted by individual governments (WEF, 2020).so, this overall restriction in the daily activity of human being all over the world has responsible for the global socioeconomic upheaval,which has ultimately effect the environment directly or indirectly, such as it responsible for improvement in air and water quality, noise pollution reduction, and revival and restore of ecology (Chakraborty and Maity, 2020;Somani et al., 2020;Saadat et al., 2020). However along with this positive impact lockdown also came with some negatives such as increase medical waste due to excessive use of disposable PPE,face masks, hand gloves, gowns, goggles, face shield and so on and their harmful disposal places in the environment enhance the load on the environment (Fadare and Okoffo, 2020;Nghiem et al., 2020;Singh et al., 2020). Hence, it pretty clear from above argument that COVID-19

pandemic impacted environment positively as well as negatively. After assessing each effect, the subject's objective conclusions are offered.

COVID-19's effects on the environment

Nearly every city and town in the affected countries was under partial or entire lock down for a particular time period, ranging from a few weeks to a few months,due to health emergency created by the COVID-19 , a large number of people have loss their life .The entire globe was under lock down since the health experts suggested quarantine and social distancing policies as a tool to deal with pandemics. It has had a number of environmental and climate-related consequences. Due to such measures quality of air and water improved drastically as movement of people and economic goods was restricted. However, due to ample use of face mask , hand gloves, many disposable medical equipment and there haphazard disposal lead to huge amount of medical waste which have dangerous environmental consequences.Thus, Covid-19 has both beneficial and harmful indirect effects on the environment and climate, as evidenced by several studies and research. COVID-19 has both positive and negative impact on environment, as seen in Figure 1.

COVID-19 has both positive and negative impact on environment.

The COVID-19 has mixed effect on the environment. Despite the fact that the epidemic improved environmental circumstances, it had beneficial and bad consequences, some of which are visible and others less so.

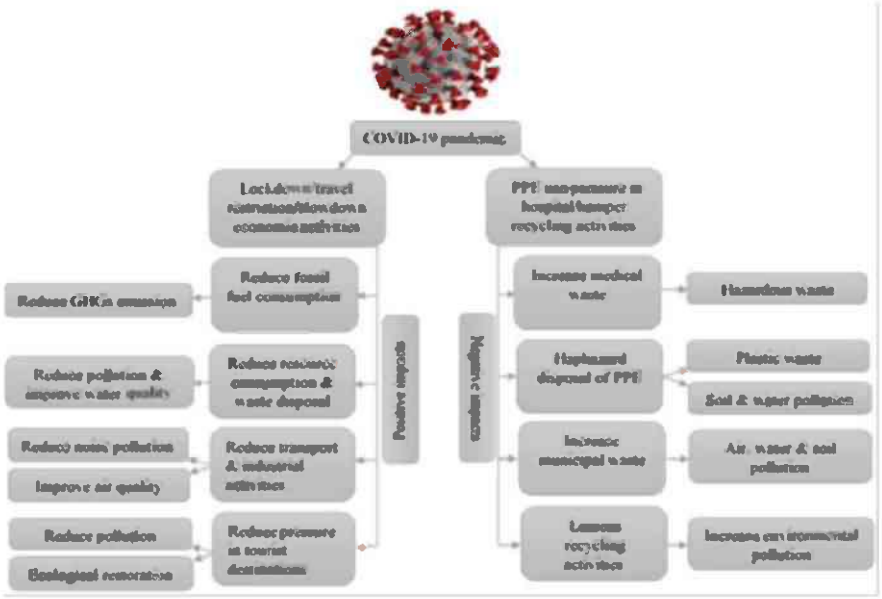

Figure 1.Positive and negative impact of COVID-19 pandemic on environment.

1. Positive effects on the Environment

1.1. Air Pollution and GHG Emissions Reduction

Due to a worldwide lockdown during the COVID-19 epidemic, all industries, transportation, and businesses have shut down. Industrial waste emissions have fallen significantly as a result of non-operational enterprises. As a result, there is decrease in the amount of greenhouse gas (GHG) emissions. Because of steps intended to restrict virus spread, air pollution levels in New York have decreased by roughly 50% this year compared to last year during lockdown (Henriques, 2020).The suspension of heavy industries in China was predicted to have resulted in a roughly 50% reduction in N2O and CO (Caine, 2020).

1.1. a. Emissions of NO2: NO2 emissions were one of the primary markers of global economic activity, and several countries (e.g., the United States, Canada, China,India, Italy, Brazil, and others) have seen a decline as a result of the recent shutdown (Biswal et al., 2020;Ghosh, 2020;Saadat et al., 2020;Somani et al., 2020).The combustion of fossil fuels is usually responsible for NO2 emissions, with motor vehicle exhaust accounting for 80% of the total (USEPA, 2016).The COVID-19 lockdown, according to the European Environmental Agency (EEA), reduced NO2 emissions by 30-60% in numerous European cities (EEA, 2020). During the COVID-19 period, NO2 emissions in the United States decreased by 25.5 percent compared to previous years (Berman and Edisu, 2020). In the Sao Paul one of the city in Brazilian there is decrease in NO2 levels up to 54.3 percent (Nakada and Urban, 2020).The levels of NO2 and PM2.5 in Delhi, India's capital, have been decreased by about 70%,according to reports (Thiessen, 2020).During the nationwide lockdown in India, it was claimed that PM2.5 and PM10 levels decreased by 46 percent and 50 percent, respectively (IEP, 2020). The main sources which are responsible for emmission of green house gases are vehicles and airplanes, they emitted near about 72 % and 11 % of the green house gases respectively (Henriques, 2020).

1.1. b. CO_2 Emission: Measures adopted around the world to combat viral transmission are also having a significant impact on the aviation industry. Many countries governments put restrictions on entry and exit of international travelers. Due to the pandemic, China cuts its leaving aircraft capacity by about 50–90% and domestic flight capacity by 70%, which result in a lower the amount of CO2 emissions near about 17% along the nation CO2 in January 20, 2020. (Zogopoulos, 2020). Last year, the COVID-19 pandemic caused a 96% decrease in global air travel, which had long-term environmental consequences (Wallace, 2020).This is

possible due to lower fossil fuel consumption, which reduces GHG emissions and, as a result, helps to change the global climate. According to the International Energy Agency (IEA), demand oil around the world decrease 435,000 barrels in the first three months of this year, compared to the last year (IEA, 2020). Consumption of coal is also decrease during the lockdown period due to decrease in energy demand. According to reports, coal-based power generation in India was decreased by 26%, resulting in a 19% reduction in total power generation following the shutdown (CREA,2020).China, the world's largest coal consumer, saw a 36 percent reduction in consumption over the same period the previous year (early February to mid-March) (CREA,2020;Ghosh, 2020).According to Carbon Brief, a climate science and policy website located in the United Kingdom, China's recent COVID-19 crisis reduced CO2 emissions by 25%, due to lockdown it help to keep them below the normal limit near about two months (Evans, 2020).They also predicted that the epidemic would save 1,600 metric tones of CO2, or almost 4% of world CO2 emissions in 2019. (Evans, 2020).

1.2. Water pollution reduction

Water pollution is one of the most prevalent issues in India, as well as the rest of the world. there are gallons of untreated sewage was daily released into rivers in India, which can only treat 38 percent of the sewage created due to poor sewage treatment capacity (CPCB, 2015).Domestic and industrial pollutants are dumped into rivers without treatment in poor countries like India and Bangladesh, polluting the rivers further (Islam and Azam, 2015; Islam and Huda, 2016; Bodrud-Doza et al., 2020; Yunus et al., 2020). Industrial effluents alone account for around twelve-tone of the overall volume of effluents within the Ganga stream. Many industries, large and small, were closed from March 22, 2020, to September 30, 2020, due to the statewide lockdown imposed for COVID-19 in India. throughout the lockdown period, the biggest industrial sources of pollution reduce or entirely stopped, that contributed to decrease the pollution load (Yunus et al., 2020).Water quality and quantity in numerous rivers have improved in a short amount of time as a result of the lockout, particularly in the Ganga (a big perennial river in northern India that runs 2,575 kilometers and traverses a wide range of topography) (Jain, 2015;Dutta et al., 2020;Shukla et al., 2021).Due to the lack of industrial contamination during India's lockdown, the rivers Ganga and Yamuna acquired a tremendous level of purity. It was discovered that water from 27 of the 36 real-time monitoring sites along the Ganga met the legal level (Singhal and Matto, 2020). the amount of Dissolved oxygen gas levels have enhance , amount of biological oxygen demand has reduce and nitrate

concentrations have dropped in the Ganga, resulting in an improvement in overall water quality in just two months of lockdown (Dutta et al.,2020).The study of water samples gathered from several locations along the Ganga's upper, middle, and lower reaches demonstrated a dramatic improvement in water quality, owing largely to the closure of most of the businesses and agricultural activities. The water quality in Haridwar and Rishikesh improved as a result of a dramatic decrease in tourer numbers and a five hundred p.c decrease in waste product and industrial effluents (Singhal and Matto,2020;Somani et al., 2020). moreover, as a result of the prohibition on public gatherings, the quantity of tourists and water activities have faded in varied areas (Cripps, 2020;Zambrano- Monserrate et al., 2020).The Grand Canal of Italy has reportedly gone clear as a result of COVID-19's lockout, with various aquatic species reappearing (Clifford, 2020).pollution has conjointly faded within the beach areas of Bangladesh, Malaysia, Thailand, the Maldives, and Republic of Indonesia (Kundu, 2020;Rahman, 2020).). Per Jribi et al. (2020), the COVID-19 conclusion has reduced waste matter in Tunisia that has resulted in less soil and pollution. However, industrial water use has faded, significantly within the textile sector round the glove (Cooper, 2020). Typically, large amounts of solid waste area unit generated throughout the development and production processes, leading to water and soil pollution that should be reduced. Moreover, as a results of the reduced export-import trade, the worldwide movement of bourgeois ships and different vessels is reduced, reducing emissions and marine pollution.

1.3. Noise pollution reduction

Noise pollution refers to high levels of sound created by numerous human activities (e.g., machines, cars, building work) that may have negative impacts on humans and different living species (Goines and Hagler, 2007;Zambrano-Monserrate et al., 2020).Noise pollution has a significant impact on human physiological health, including cardiovascular problems, hypertension, and sleep deprivation (Kerns et al., 2018).According to a survey, noise pollution causes hearing damage in roughly 360 million people worldwide (Sims, 2020).According to the World Health Organization, approximately 100 million individuals in Europe are exposed to noise levels that exceed the recommended limit (WHO, 2012).Noise pollution has a negative influence on wildlife as well as invertebrates, which serve to manage environmental processes that are essential for ecosystem equilibrium (Solan et al., 2016).However, because of the lockdown and quarantine procedures, individuals were forced to stay at home, which hindered economic activity and communication worldwide, decease in sound pollution in various places

(Zambrano-Monserrate et al., 2020).As a result of the lockdown, the noise level in Delhi, India's capital, has dropped by 40–50 percent in the recent lockdown period (Somani et al., 2020).thanks to restricted vehicle activity throughout the internment amount, noise levels at Govindpuri railway line station (Delhi) are reduced to 50–60 decibels, down from one hundred decibels (Gandhiok and Ibra, 2020). As per India's Central Pollution Control Board (CPCB, 2020), noise levels in Delhi's residential areas are faded from fifty five decibels (daytime) and forty five decibels (night) to forty decibels (daytime) and thirty decibels (night). As a result, town dwellers will currently relish the chirping of birds that is usually between forty and fifty decibels (Gandhiok and Ibra, 2020). Moreover, thanks to travel restrictions, the quantity of craft and automobile movements have faded dramatically round the world, lowering sound pollution levels. In Germany, as an example, traveler traveling has been reduced by quite ninetieth, automobile traffic has down by quite five hundredth, and railways area unit running at a twenty fifth slower pace than usual (Sims, 2020). Overall, the COVID-19 internment and a discount in economic activity down sound pollution all round the world.

1.4. Ecological restoration and tourism assimilation

Because of technology developments and improved transportation networks, the tourist sector has seen tremendous expansion in recent years, contributing significantly to global gross domestic product (GDP) (Lenzen et al., 2018).The traveller business is believed to be chargeable for V-day of worldwide GHG emissions (Lenzen et al., 2018). However, commercial enterprise destinations with natural beauty (such as beaches, islands, national parks, mountains, deserts, and mangroves) tend to draw an oversized range of holiday makers. .Many hotels, motels, restaurants, bars, and markets are created to assist and accommodate them, consuming a lot of energy and other natural resources (Pereira et al., 2017).For example, Puig et al.(2017) evaluated the carbon footprint of Spain's coastland hotel services and found that energy and fuel usage play a significant influence, with 2-star hotels emitting the most carbon. Furthermore, visitors discard a variety of trash, which detract from the natural beauty of the area and cause an ecological imbalance (Islam and Bhuiyan, 2018).The number of tourists visiting tourist destinations around the world has decreased as a result of the COVID-19 epidemic and local limitations (Zambrano-Monserrate et al., 2020). as an example, Phuket, Thailand's preferred vacation destination, are going to be closed on April 9, 2020, as a result of to the Covid-19 pandemic, which will see an average of 5,452 tourists per day (Cripps, 2020).Similarly, at Cox's Bazar ocean beach, the world's longest unbroken natural sand ocean

beach, native authorities enforced a prohibition on public gatherings and traveller arrivals. The colour of the sea water changes as a result of the limitation, which is usually muddy due to swimming, bathing, playing, and riding motorised boats (Rahman, 2020).Nature incorporates a probability to method human vexation, and dolphins are rumored returning to the coast of the Bay of Bengal region (Bangladesh) and also the canals, waterways, and ports of Venezia (Italy) when a decade because of pollution decrease (Rahman, 2020; Kundu, 2020).

2. Negative effects on the environmen

2.1. Increased production of biomedical waste

Organic and inorganic waste generation is coupled to a slew of environmental challenges, as well as wearing away, deforestation, air, and water pollution (Mourad, 2016; Schanes et al., 2018). (Mourad, 2016; Schanes et al., 2018).Medical waste creation has surged significantly since the advent of COVID-19, posing a serious hazard to human health and the environment. Several infectious and biological wastes generated from hospitals for sample assortment of suspected COVID-19 patients, diagnosis, treatment of an oversized range of patients, and medical care functions (Somani et al., 2020; Zambrano-Monserrate et al., 2020). As an example, throughout the happening, Wuhan, China, made over 240 metric tonnes of medical waste per day (Saadat et al., 2020), that is over a hundred ninety metric tonnes over average. Again, throughout the primary part of the imprisonment, the number of medical waste generated in Ahmedabad, India, redoubled from 550-600 kg/day to around one thousand kg/day (Somani et al., 2020). Around 206 m tonnes of medical waste square measure generated per day in capital of Bangladesh, the capital of People's Republic of Bangladesh as a result of COVID-19 (Rahman et al., 2020). (Rahman et al., 2020). different cities, like as Manila, Kuala Lumpur, Hanoi, and port, had comparable will increase, making 154–280 mtonnes of medical waste per day over they did before the pandemic (ADB, 2020).The local waste management authorities are facing a tremendous problem as a result of the unexpected increase in hazardous trash and its effective management. The SARS-CoV-2 virus might survive for on a daily basis on cardboard and up to a few days on plastics and stainless-steel, in step with recent printed literature (Van-Doremalen et al., 2020). As a result,medical waste (such as needles,syringes, bandages, masks, gloves,used tissue, and wasted pharmaceuticals) should be carefully managed to prevent future infection and environmental contamination,which is now a global concern.

2.2. Safety Equipment use and Haphazard Disposal

People are currently wearing face masks, hand gloves, and other safety equipment to protect themselves from viral infection, which adds to the amount of healthcare waste.According to reports, the amount of waste produced in the United States has been increasing as a result of greater personal protective equipment (PPE) use at home (Calma, 2020).Since the emergence of COVID-19, the production and use of plastic-based personal protecting instrumentation (PPE) has redoubled globally (Singh et al., 2020). as an example, from Gregorian calendar month 2020, China has boosted daily medical mask production to fourteen.8 million, a big rise over previous levels (Fadare and Okoffo, 2020). .For example, from February 2020, China has boosted daily medical mask production to 14.8 million, a significant rise over previous levels (Fadare and Okoffo, 2020).For example, from February 2020, China has boosted daily medical mask production to 14.8 million, a significant rise over previous levels (Fadare and Okoffo, 2020).Most people, however, dump them (e.g.,face masks, hand gloves, etc.) in open places and in certain cases with domestic garbage due to a lack of information regarding infectious waste management (Rahman et al.,2020).The careless dumping of these wastes clogs waterways and worsens pollution in the environment (Singh et al., 2020;Zambrano- Monserrate et al., 2020). Face masks and different plastic-based protection instrumentation are known as a possible supply of microplastic fibres within the environment (Fadare and Okoffo, 2020). N-95 masks are usually made of Polypropylene, while Tyvek is used for protective suits, gloves, and medical face shields, each of which might last a protracted time and leak hydrocarbon and harmful substances into the environment (Singh et al., 2020). though consultants and accountable authorities suggest that domestic organic waste and plastic-based protecting instrumentation (hazardous medical waste) be properly disposed of and quarantined, combination these wastes will increase the danger of illness transmission and trash workers' exposure to the virus ((Ma et al., 2020; Somani et al., 2020; Singh et al., 2020).

2.3. Municipal solid waste generation, and reduction of recycling

Increased urban trash creation (both organic and inorganic) has direct and indirect repercussions on the environment, such as pollution of the air, water, and soil (Islam et al., 2016).Waste re-usage has perpetually been an enormous environmental issue that has piqued everyone's curiosity (Liu et al., 2020). Re-usage may be a standard and self-made technique of reducing pollution, protective energy, and protective natural resources (Varotto and Spagnolli,

2017; Ma et al., 2019). Quarantine policies enforced in several countries as a result of the pandemic have resulted in a rise within the demand for on-line buying home delivery that has resulted in a rise within the quantity of social unit waste generated from shipped package materials (Somani et al., 2020; Zambrano-Monserrate et al., 2020). Waste usage, on the opposite hand, is an economical approach to scale back pollution, save energy, and defend natural resources (Ma et al., 2019).However, due to the pandemic, many governments postponed garbage recycling initiatives in order to prevent viral infection transmission.For example, the US government limited recycling activities in numerous places (almost 46%) due to concerns about the spread of COVID-19 in recycling facilities (Somani et al., 2020).Infected residents within the uk, Italy, and different European countries were likewise barred from sorting their trash (Zambrano-Monserrate et al., 2020). Infected people in European country, as an example, aren't allowed to type their trash. Moreover, the business has confiscated the chance to overturn limits on single-use plastic baggage, despite the very fact that single-use plastic will still retain viruses and microorganism (Bir, 2020). Overall, disruptions in standard municipal waste management, trash recovery, and usage activities have resulted in redoubled land filling and pollution round the world.

2.4. Other effects on the environment

To eradicate the SARS-CoV-2 virus, an oversized quantity of disinfectants has recently been applied to roads, business areas, and residential areas. The widespread use of disinfectants might end in the extinction of non-targeted useful species, leading to ecological imbalance. what is more, the SARS-CoV-2 virus was found within the dejection of COVID-19 patients still as in municipal sewer water in an exceedingly range of nations, together with Australia, India, Sweden, Netherlands, and also the u. s. (Ahmed et al., 2020; Nghiem et al., 2020; Mallapaty, 2020). As a result, further sewer water treatment ways square measure needed, that is troublesome in underdeveloped nations like Bangladesh, wherever town sewer water is discharged untreated into neighbour aquatic bodies and rivers (Islam and Azam, 2015; Rahman and Islam, 2016). to forestall the SARS-CoV-2 virus from spreading through sewer water, China has already intense the medical care method (increased Cl use). However, excessive Cl use in water might end in cytotoxic by-products (Zambrano-Monserrateet al., 2020).

Conclusion

The pandemic has a sway on human life and also the world economy, which successively has a sway on the atmosphere and climate. It is a reminder of however we've got

neglected environmental factors whereas imposing human-caused temperature change. Covid-19 and its associated imprisonment have provided US with a once-in-a-lifetime chance to require stock of our environmental footprint. However, because human activities are restricted in most areas, the country's natural ecology has begun to repair itself. Factories, transportation, cars, and airplanes have all come to a complete standstill. Carbon emissions have decreased, and air quality has improved to never-before-seen levels. Different metrics like PM10, NO2, and CO have considerably reduced as a result of fewer act and mechanical movements. A satellite image of the Indian atmosphere shows the similar trend of reduced pollution following the COVID-19 happening. Not solely the air, however conjointly India's rivers, like the Ganga, Yamuna, and Cauvery, became clean and clear, with marine life evident. After analyzing the different studies stated previously, it can be concluded that while COVID-19 has surely brought a terrifying and destructive scourge to humans, it has also shown to be a blessing for the natural environment, providing it with a "healing time." We've also discovered that human-caused environmental damage isn't completely irreversible. The "healing of nature" is being witnessed by everyone in just 1–2 months. The message here is that once countries have figured out how to deal with the corona virus, greater implementation of environmental, transportation, and industry rules should be prioritized in order to reduce the negative effects of human activities on the environment. Furthermore, COVID-19's global response encourages us to work together to resist the threat to humanity. Although the environmental effects of COVID-19 square measure temporary, a combined and suggested time-oriented effort will increase environmental property and shield the world from the results of world temperature change. Governments and policymakers must take the necessary steps to ensure that the healing process is not only temporary. As a result, before we return to our normal lives, we should make a commitment to instilling sustainable development concepts in our social behavior, lifestyle, and public policymaking in order to keep our environment clean and sustainable. The study focuses on the changes in air quality that occur throughout the lockdown. an intensive analysis of the impact of implementing such a short ending as an alternate tool for pollution reduction and its economic impact is needed. This study may also be used as a reference document to look at post-covid conditions and also the impact of reduced pollution on sensitive receptor health knowledge. At a time once the complete world is attempting to work out the way to battle Covid-19, the first lockdown has well-tried to be an efficient technique of replenish ecosystems and also the nature.

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7. Study of Growth Pattern of the Microbial Life in an Artificial Ecosystem i.e. Winogradsky Column

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Abstract

A Winogradsky column is employed to check the soil scheme and aquatic scheme along. It's a clear glass column stuffed with enriched sediment and incubated in light weight. weight. An exceeding stratified scheme microbic communities within the sediment grow with an oxic high layer that is additionally referred to as because the aerobic zone, microaerophilic zone at the centre, associate in nursing a hypoxia layers i.e. anaerobic zone at rock bottom, over sixty days. Winogradsky columns are used extensively to demonstrate these microbic nutrient sport within the column. There was testing of impact of sediment supply, supplemental polysaccharide and different nutrients sources, and depth at intervals the column on microbic community structure. we tend to found that the Winogradsky columns were extremely numerous communities however square measure dominated by three phyla: Proteobacteria, Bacteroidetes, and Firmicutes. The community is structured by an innovation population obsessed on the supply of sediment accustomed prepare the column and is differentiated by depth at intervals the column. varied biomarkers were known characteristic sample depth, as well as true bacteria. Alphaproteobacteria, and Betaproteobacteria as biomarkers of the soil-water interface, and Clostridia as a biomarker of the deepest depth. Supplemental polysaccharide other at the start promotes speedy microbic growth that presently depletes the O2 within the sediment and within the water column, high of the column remains aerated as O2 diffuses terribly slowly through water. This study brings this historical methodology for enrichment culture of chemolithotrophs and different soil microorganism into the trendy era of biology and demonstrates the potential and importance of

the Winogradsky column as a model system for work the result of environmental variables on soil microbic communities.

Key Words: Winogradsky Column, Microbic Differentiation, Artificial Ecosystem

Introduction

There is a presence of extraordinary diversity and abundance of microorganisms in soils and sediments and a big analysis work is being done to analyse factors that maintain and influence of such high microbic diversity. Analysis work on role and variety of microbial populations like bacteriophages lives within the sediments and soil microbic community lags behind as compared to the marine setting despite of phage abundance, which is actually more than that of aquatic setting; therefore, for study of this microbic activity in soil a winogradsky column is ready which might be related to with a miniature lake Bottom. Russian biologist Winogradsky (1856-1953) initial developed the straightforward technique. He is conjointly the founding father of soil biology. The Winogradsky column will be created employing a clear cylinder and filling it with soil or sediment that is additionally referred to as the enrichment cultures and is incubated in presence of sunshine. Over fundamental quality, several abiotic processes and microbic activity leads to environmental gradients and chemical from high to bottom, surface to interior of columns leading to numerous microbial growths. The most energy supply that manufacture the first producers is thru light-weight. For the maintenance of nutrient cycle, a structured microbic scheme develops. Once assembled the column will be maintained with least or bottom effort for many months. There square measure changes within the microbic community over time, through that we are able to get a brand new or distinctive surface biofilm that is often laborious to search out. Therefore, this Winogradsky column will be accustomed mimic the microbic diversity and varied organisms found within the sediments.

Materials and Methods

ITEM	AMOUNT	PURPOSE
Sediment/ Mud sample	1-2 cups	The mud sample is the snapshot of environment under the investigation. Mud sample is important as it is the inoculum for the community of microbes that will grow in the Winogradsky column.
Water (from same source as the mud sample)	1 liters	Water collected from the source of the mud will act as an additional inoculum of microbes

		and also help to recreate the environment.
Shredded paper	½ cup	Shredded paper here act as a source of cellulose or carbon.
Plaster of Paris (Calcium Sulfate dehydrate i.e. $CaSO_4.2H_2O$ and other binders)	1 tbs	Plaster of Paris will act as a source of sulfur for the column.
Antacids ($CaCO_3$)	5- 10 Tablets dissolved in hot water	Calcium carbonate act as a buffering agent and a source of CO_2 for autotrophs.
Clean glass cylinder	1	For building and growing the winogradsky column.
Permanent marker	1	If required for certain marking or labelling
Measuring cup	Depending on the quantity of the materials	To measure the ingredients
Shovel	1	For collecting the mud sample
Buckets	1-2	For collecting mud sample and also for mixing the ingredients.
Plastic wraps	According to the size of glass cylinder	To seal the top of the glass cylinder
Rubber bands	1-5	To tighten the plastic wraps
Large spoon	1	To eliminate trapped air in the mud mixture.

Research Methodology

1. Site Description

Achole talao is a fresh water pond situated in Ambawadi, Nallasopara East, Vasai-Virar, Maharashtra 401209. It is a shallow waterbody with varying abundance of aquatic animals and plants. There is diversity of aquatic life is rich in terms of phytoplankton's & zooplanktons with few examples including algae, small fish, frogs, turtles, etc. While top predators include large fish. It is surrounded by trees so it has cool winds even during the summer season. The sediment and the water sample for the column was collected from this location.

Photoplate:1. Achole Talao, Nallasopara, Mumbai Maharashtra

2. Sample collection and Column Preparation

1. Mud sample was made prepared by removing any stones, twigs, or lumps.
2. The glass cylinder was labeled with the following information: a) Source of the sediment and b) Collection Date
3. Then a mixture was prepared by dissolving the antacid tablets in the sample water and then the plaster of paris was stirred into it making sure there is no clumps forming in it. Now we have the base mixture to which the sediment sample can be added. The above mixture prepared is then added to the sediment sample and is mixed together thoroughly in the bucket.
4. Then a small amount of water is added which is collected from the same source as the sediment sample to make the mixture thick, sludge like consistency.
5. Then the column was prepared by lining the glass cylinder with the cellulose source which is the shredded paper. These shredded papers are first wet and then added to the column to avoid air bubbles and to easily mix with sediment.
6. Then the sediment sample along with mixture was added in the column using the spoon. The sediments were added carefully and slowly by patting it down to avoid the air bubbles in the column.
7. Then the column was filled using the same protocol and also in between the sediments were pressed little using the spoon to avoid the air bubbles in between.
8. Next the layer of water from the same source as the sediment sample was added on the top of the mixture up to 1.5-2 cm below the rim or the neck of the glass cylinder.

9. Then the top of the glass cylinder was sealed with plastic wraps and a rubber band (making sure it is sealed not too tight nor too loose).
10. The column was placed in the window which receives indirect sunlight for about 8 weeks.

Photoplate.2: Sediment and water sample from Source

3. Safety Concerns

Though minimal, there are some safety concerns regarding the handling and assembling of the Winogradsky columns. Safety measures was taken while collecting the sample and handling the column. While handling the sediment mixture and column, gloves and mask was worn to avoid contamination and direct breathe over the uncovered column. While covering the column with the plastic wrap care was taken to not seal it completely, as gas can build up in the column if tightly sealed and can explode. Sediments were collected freshly on the same day when column was planned to build up.

Result and Discussions

After 6 weeks the column was stabilizing into 3 distinct zones and there was development of bacterial communities specific to their environmental requirements. The three zones developed was a) Aerobic zone b) Microaerophilic zone c) Anaerobic zone.

The Winogradsky column produced the following results:

1. Green algae appeared in 3-4 days after the column was set up;
2. Sulfate reducing bacteria generates black spots of hydrogen sulfide which appeared within 6-7 days and increased in size for the next 3 weeks, until the column appears black;

3. Photosynthesis purple-sulfur bacteria are visible as reddish-purple spots approximate to 6cm from the base of the column in 4 weeks, the area of spot gradually increase but later it starts disappearing;
4. Purple non-sulfur bacteria form a rust color zone which appeared in the upper third of the column within 2 weeks and it proliferated with time. These microorganisms developed can be chemosynthetic, photosynthetic, heterotrophic depending on the time of appearance in the column and also on the location where they appear. There were many chemical reactions carried out by these different genera of microorganisms resulting into carbon and sulfur cycle in the closed system.

a. Anaerobic zone: In this zone there is the growth of Clostridium which is called as the cellulose degraders as Clostridium degrades the cellulose in the column into glucose and the glucose that is generated is converted into organic acid and gas. There is the development of the sulfur reducing bacteria example: Desulfovibrio and Desulfotomaculum, these sulfur reducing bacteria utilize organic acid produced by Clostridium. Here organic acid serves as the electron donor and sulfur reducing bacteria in anaerobic respiration they use sulfate or sulfite to produce H_2S gas which diffuse through column. The H_2S gas produced react with iron and form 'black ferrous sulphide'. H_2S diffuse into the column also leads to the growth of 'Green sulfur bacteria' and 'Purple sulfur bacteria'. The Purple sulfur bacteria which is the Chromatium and the Green sulfur bacteria i.e. Chlorobium use H_2S as the electron donor to reduce CO_2. Overall Reaction: $CO_2 + H_2S$ Carbohydrate + Sulfur

From bottom to top, Green sulfur bacteria such as Chlorobium creates an olive- green color zone, while, Purple sulfur bacteria such as Chromatium creates a red to purple zone. In Purple sulfur bacteria cells, sulfur is deposited inside the cells and in Green sulfur bacteria sulfur is deposited outside the cells.

b. Microaerophilic zone: Purple non-sulfur bacteria example: Rhodopseudomonas and Rhodospirilum usually require a small amount of oxygen so called as microaerophilic. It is located nearer to top of column. Growth of purple non-sulfur bacteria results in bright red to dark rust color. They are facultative phototrophs. They can utilize sulfide (H_2S) at low levels. They use H_2 as electron donor in photosynthesis.

c. Aerobic zone: Aerobic sulfur metabolizing bacteria such as Thiobacillus, Thiothrix, and Beggiatoa develop in the upper portion of column. It oxidizes the reduced sulfur compound to produce sulfate and obtain energy. In the top of water column, aerobic organisms

are found. Protozoa are found in large numbers. Cyanobacteria are also found which is also called as oxygenic phototrophs.

Physical Property of various Bacteria observed from Winogradsky Column

BACTERIA	GRAM STAIN	SHAPE and NATURE	CLASSIFICATION
Desulfovibrio	-	Vibrio	Sulfur reducing anaerobic
Chlorobium	-	Straight or curved rods; non-motile	Green sulfur anoxygenic photosynthetic
Chromatium	-	Ovals or rod, polarly flagellated sulfur deposited internally	Purple sulfur anoxygenic photosynthetic
Clostridium	+	Rod	Endospore forming anerobic
Rhodospirillum	-	Spirals, polarly flagellated	Purple, non-sulfur Anoxygenic photosynthetic
Rhodopseudomonas	-	Rods, polarly flagellated; divide by budding	Purple, non-sulfur Anoxygenic photosynthetic
Beggiatoa	-	Filamentous, long, gliding	Non-photosynthetic Chemolithotropic sulfur oxidizing
Thiobacillus	-	Rod	Colorless sulfur aerobic Chemolithotropic

Photoplate.3: Winogradsky Column Before and After

Objectives

1. To construct a Winogradsky column for study of microbial diversity in soil.
2. Identify the various bacteria that grow.
3. To determine the Nutrient cycle in the column that exist and the bacteria associated with each part.

Conclusion

The Winogradsky column is a unique microbial ecosystem that has many advantages for use as a model system to study microbial and viral dynamics, interactions, and diversity. It is an ideal activity as they encourage customization and personalization of experience. Depending on the input of light which acts as an exogenous energy source, Winogradsky column is an self- sustaining, enclosed ecosystem. Through time and space i.e. top to bottom and surface to interior, there is formation of gradients which provides a unique chance to evaluate the alteration, development and response of the microbial community to environment variables. The community changed from the founding population and formed a unique biofilm on the light exposed surface within 60 days. There was high enrichment of the surface community in the rare taxa which indicates that under appropriate environmental conditions the rare taxa can become abundant. Each type of bacteria and their metabolism and location shows us that as we went down in the column the amount of oxygen diminishes, indicating its maximum concentration in the surface. On the other hand, the amount of H_2S increases as we go down, such that, at the bottom there is the highest concentration of H_2S from the entire column. The Winogradsky column is an excellent way to investigate and study what is growing in the column.

Acknowledgement

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8. A Review: "Hand Sanitizers are an Alternative for Hand Washing"

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Abstract

In the time of the global devastation caused by world-wide pandemic on account of COVID-19 (SARS-CoV-2) all the people of the world came to know about the importance of washing hands to prevent the spread of the virus and prevent them & their families to get fatally infected and drop dead. But as we went on through this rough times, many people started using hand-sanitizers as a way to clean their hands which made many scientists, few people and the whole scientific community to raise an eyebrow on the effectiveness of sanitizers & to find out that is hand sanitizers an alternative of hand washing (which it is not). This literature encompasses the types of sanitizers, their uses in particular scenarios, methods of usage, effectiveness of sanitizers over soap and water & provides sufficient information to clearly state that hand sanitizers are not an alternative to hand washing with soap and water.

Introduction

Hand washing is one of the most underrated and ignored daily habits of human beings. We wash our hands to get rid of almost all of the germs that are hidden in front of our naked eyes which can cause severe damage to us mentally and physically by causing a barrage of diseases and health hazards in our houses , work places and any other place we visit. Washing our hands with a proper soap or hand wash and water was taught to us by our parents for as long as I can remember.

But during the time of global pandemic caused by Covid-19 virus raised the eyebrows of many individuals as the use of hand sanitizers were preferred more by people than regular

hand wash as sanitizers are easy to use and can be used anywhere & anytime and doesn't even require water. Some even dubbed the sanitizer the alternative for hand wash

Hand Sanitizers are more effective in environments like hospitals because there are lots of germs there but no mud, dust or soil. But if you have soiled hands dredged with mud than hand wash will be significantly more useful and efficient in cleaning than sanitizers.

According to the Centre for Disease Control (CDC), hand hygiene encompasses the cleansing of hands by using soap and water, antiseptic hand washes, antiseptic hand rubs such as alcohol-based hand sanitizers (ABHS), foams or gels, or surgical hand antisepsis. Due to their proven efficiency of killing microbes, no water required and is quick to use made Sanitizers as disinfectants more often.

What is Sanitizer?

- According to the dictionary, a substance used to make something clean and hygienic is know as a sanitizer.
- A substance or product that is used to reduce or eliminate pathogenic agents (such as bacteria) on surfaces is known as sanitizer.
- According to the World Health Organization (WHO), "an alcohol-containing preparation (liquid, gel, or foam) designed for application to the hands to inactivate microorganisms and/or temporarily suppress their growth. Such preparations may contain one or more types of alcohol, other active ingredients with excipients, and humectants."

Types of sanitizers

There are 2 types of hand sanitizers:-

1. Alcohol-free hand sanitizers
2. Alcohol-based hand sanitizers

Alcohol-based sanitizers comprise between 60 and 95 percent alcohol in the form of ethanol, isopropanol, or n-propanol.

Alcohol have tendency to disseminate proteins and counteract certain micro-organisms at this concentration.

Properties of a disinfectant are to be seen in alcohol-free hand sanitizers like benzalkonium chloride (BAC), or on antimicrobial agents, such as triclosan. A large number

of sanitizers comprise emollients (e.g., glycerine, petrolatum) that pacify the skin, thickening agents, and provides aroma.

Types of hand sanitizers	Features & utility
Alcohol-based sanitizers	Effective in cleaning
Alcohol-free sanitizers	Safe for kids
Gel-based sanitizers	Easy to carry
Hand sanitizer sprays	Easy to spread on your palm
Hand sanitizer wipes	Convenient to use even on the go

Chemical classification of commonly used disinfectants in hand sanitizer and their mechanism of antimicrobial action.

Chemical Group	Examples	Mechanism of Action
Alcohol	• Ethanol (C_2H_6O) • Iso-propanol (C_3H_8O)	Denaturation of proteins in the plasma membrane
Chlorine compounds	• Hypochlorites (ClO^-) (e.g., Sodium hypochlorite) • Chlorine dioxide (ClO_2) • Chloramine-t trihydrate ($C_7H_7ClNNaO_2S$)	Halogenation/oxidation of cellular proteins
Iodine compounds	• Povidone-iodine (polyvinylpyrrolidone with iodine)	Iodine can easily penetrate through the cell membranes of pathogens Followed by attacking vital proteins, nucleotides and fatty acids of cell
Quaternary ammonium compounds	• Benzalkonium chlorides, including alkyl dimethyl benzyl ammonium chloride ($C_{22}H_{40}N^+$). • Benzyl dimethyl octyl ammonium Chloride ($C_{17}H_{30}ClN$). • Didecyl dimethyl ammonium chloride ($C_{22}H_{48}ClN$).	Lower surface tension Inactivate enzymes Degrade cell-proteins
Peroxygens	• Hydrogen peroxide (H_2O_2) • Peracetic acid (PAA) (C_2H_4O3)	Free-radical oxidation of essential cell components
(Bis) phenols	Triclosan	Penetrate cytoplasmic bilayer
Biguanide	Chlorhexidine	Ionic interaction Disrupt cell membrane

When to Use?

One of the most importance questions is when to use hand sanitizers & when to use hand wash.

Following are the situations when hand sanitizers will be upmost preferable:-

- When you don't have murky or greasy hands
- When there isn't any soap or hand wash available at the time.
- When in contiguity of a patient.
- Before wearing gloves(sterile).
- After removing gloves.
- While taking blood pressure or a pulse and while lifting a patient.
- When inserting a central intravascular catheter.

- When in contiguity of bodily fluids like mucous, etc. (only if your hands are noticeable non-greasy).
- After coming in contact of any inanimate objects.
- Figure 3 shows the effectiveness of sanitizers on pathogenic bacteria.

Advantages/Benefits

- There are many benefits of preferring sanitizers such as being more potable, practical, handy and downright quick to use.
- Most of the commercial available hand sanitizers have a moisturizing component in them which prevents dryness of skin
- Individuals who use hand sanitizers are less likely to have gastrointestinal and respiratory infections
- Diseases among children will be exponentially reduced by making the use of hand sanitizers a norm

Limitations, Conditions &Variables

- For an effective sanitization process, the sanitizer should contain more than 60% of alcohol content and the proportion of alcohol should be 60 to 95 % when used.
- Ethyl alcohol, isopropanol, or ethanol, are the only forms of alcohol which are admissible in the sanitizer
- For the proper fruitfulness, the sanitizer should be applied to the hand which is free from mud, blood, dust or soil.
- Hand sanitizers are not an alternative but are circumstantial products which can be a better alternative than soap and water.

Effectiveness /Efficiency

- Hand sanitizers are considerable more effective for certain situations as in when water is not available or if you are in a hurry.
- The duration of exposure, frequency of usage and proper usage is the main factors which determine the efficaciousness of the particular sanitizer.
- The infective agent on the host must be susceptible to the active agent in the product for the effectiveness of the product.
- Alcohol-based sanitizers should be properly rubbed for at least 30 seconds accompanied by complete air drying should be done for the most effective results.

- Alcohol-free sanitizers such as the SAB (surfactant, allantoin, and BAC) hand sanitizer, also show effectivity if used properly.
- But some studies and articles states that hand sanitizers are not effective for eradication of bacterial spores, encysted parasites (e.g., Giardia), & enveloped viruses (e.g., norovirus) on the hand.
- Greasy and grubby hands will have little to no effect of sanitizers on them.
- As there is unpredictability in the effectiveness, hand sanitizers can be recommended to control the transmission of infectious diseases, where accessibility to soap and water is difficult.

Potential of Sanitizers

Cold and flu microbes cannot be easily killed by ethanol based hand sanitizers because of the presence of mucus.

It has been debunked that non-Alcohol Based Hand Sanitizers (non-ABHS) or low alcohol concentration hand sanitizers are not effective in killing microbes.

Washing hands with soap & water are exponentially very more effective than hand sanitizers as they eliminate soil, mud, dust and blood and is overall very efficacious.

For proper hand washing, the US Centres for Disease Control and Prevention suggested:

- Wash hands with clean running water and lather hands with the application of soap.
- Scrubbing of palms, backs, fingers, between fingers, and under nails, which should cover all surface.
- Time period should be for 20 seconds of scrubbing as the time it takes to sing "Happy Birthday" twice.
- Lastly, rinse under clean, running water, and dry with a clean towel or air dry hands

Conclusion

Soap or sanitizer, the efficiency of any of these 2 are dependent on the usage by the specific individual and may differ between individual. It also depends on the quality of product use and the quantity which it was applied.

It is safe to say that washing hands with soap and water is the most effective of eradicating not only germs but also mud and other unwanted substances which were unintentionally bounded to the surface of your hand.

Even though sanitizers have a fair share of advantages in certain situations, Sanitizers are not an alternative for hand washing with soap and water.

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9. Screening and Identification of Halophilic Bacteria for Plant Growth Promoting Traits from Mangrove Associated Soil Sediment

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Abstract

It has been estimated that an approximate area of 7 million hectares of land is covered by saline soil in India. Agricultural crops exhibit a spectrum of responses under salt stress. The impacts of salinity include low agricultural productivity, low economic returns and soil erosions. The role of microorganism in plant growth promotion, nutrient management and disease control is well known.So in this study total 6 halophilic strains were isolated and identified using morphological and 16S rRNA sequencing method from mangrove associated soil sediment from coastal region of bordi. The 16S rRNA sequencing data reveals names of organisms were Virgibacillus dokdonensis DSW-10(T), Kocuria flava HO-9041(T), Halomonas piezotolerans NBT06E8(T), Halolactibacillus miurensis DSM 17074(T), Oceanobacillus caeni S-11(T), Planococcus plakortidis DSM 23997 (T) Then isolates were screened for their plant growth promoting activity,among all screened properties,all isolates show Hydrogen cyanide production which is an important attribute of PGPR which influences plant growth indirectly and strengthen the host disease resistance mechanism. so inoculations with selected PGPR and other microbes could serve as the potential tool for alleviating salinity stress in salt sensitive crops. It can be useful in developing strategies to facilitate sustainable agriculture in saline soils.

Keywords: Halophiles, Bordi beach, Mangrove Vegetation, 16S rRNA analysis, PGPR, HCN

Introduction

Mangroves are woody, specialized types of trees of the tropics that can live on the edge, where rain forests meet oceansMangroves are woody, specialized types of trees of the tropics that can live on the edge, where rain forests meet oceans Mangroves are woody, specialized types of trees of the tropics that can live on the edge, where rain forests meet oceans. Mangroves have very specialized adaptations that enable them to live in salt waters. It exists under very hostile and inhospitable conditions (Khan & Mohideen, 2016) Due to high salinity,halophilic bacteria are believed to be predominant in this ecosystem. It serves as important source of food for a variety of marine organisms and maintains pristine nature of the environment. It also acts as a biological mediator through their involvement in the bio-geochemical process. Hypersaline environments comprise hypersaline waters and soils. The bacterial communities in saline environment would be halophilic and halotolerant bacteria of various functionalities. (Holguin G et al 2001)Halophilic microorganisms constitute the natural microbial communities of hypersaline ecosystems, which are widely distributed around the world(Oren, 2008) (Holguin G et al 2001) general features of halophilic microorganisms are the low nutritional requirements and resistance to high concentrations of salt with the capacity to balance the osmotic pressure of the environment. Their mechanisms of haloadaptation are based on the intracellular storage of KCl over 37% (5 M) (salt-in strategy) or the accumulation of compatible solutes (salt-out strategy) to keep the balance of sodium into the cytoplasm and counteract the osmotic pressure of the external environment given by the high salinity (Bremer et al 2019) On the other hand,in agriculture soil salinity, which is on the rise globally, poses a major hindrance to the realization of actual yield potentials of most crop plants. India is one of the most salt effected countries in the world after USSR, China, Argentina and Iran. Salinity affects almost all aspects of plant development including: germination, vegetative growth and reproductive development. Soil salinity imposes ion toxicity, osmotic stress, nutrient (N, Ca, K, P, Fe, Zn) deficiency and oxidative stress on plants, and thus limits water uptake from soil (Jouyban et al.,2008) Soil salinity significantly reduces plant phosphorus (P) uptake because phosphate ions precipitate with Ca ions (Bano et al 2009)

Microbial elicited stress tolerance in plants may be due to a variety of mechanisms proposed from time to time based on studies done.(Ahmad et al.,)Production of indole acetic acid, Phosphate solubalization, HCN production and some unknown determinants by PGPR, results in increased root length, root surface area and number of root tips, leading to an

enhanced uptake of nutrients thereby improving plant health under stress conditions.(Orhana et al.,2016)(Kucharova et al 2009) So this study is mainly focusing on Screening and identification of halophilic bacteria for plant growth promoting traits from mangrove associated soil sediment from bordi village. Bordi is a coastal village in the Palghar district of Maharashtra, India. It is located in Dahanu taluka. Major community which found near to Bordi is tribal. It is also tourist destination due to beach and natural environment. Bordi is famous for the Chikoo farm.

Phosphate solubalization - Phosphorous is the major nutrient for plant growth as it is an integral part of different biochemicals like nucleic acids, nucleotides, phospholipids etc. Soils are often high in insoluble mineral phosphates but deficient in the soluble orthophosphate (Pi) essential for the growth of most plants and microorganisms (Goldstein et al 1986). There is a broad spectrum of mineral phosphate chemistries; but in arid to semiarid soils the predominant forms are the calcium phosphates. In most cases, salinity decreased P accumulation in plain, which developed P deficiency symptoms (Kumar & Bandhu, 2005) The conversion of insoluble phosphate compounds (both organic and inorganic) in a form accessible to the plant is an important trait of PGPB strains. This is achieved through the acidification, chelation, ion-exchange reactions, and production of low-molecular-weight organic acids such as gluconic acids. Halotolerant PGPBs have been proved to be vital for circulation of plant nutrients in many ways, thereby reducing the need for chemical fertilizers.

Organic acid production- organic acids produced by microorganisms, mainly include gluconic, citric, malic, malonic, oxalic, succinic, lactic and tartaric acid. These acids provide both protons and organic anions that serve as chelating agents. The anions have a negative charge, so that possess the ability to form complexes with the positively charged ions (eg Ca^{+2}, Al^{+3}, $Fe^{+3)}$ present in the soil and thus, release the phosphorus which is precipitated. In addition to solubilizing Phosphate, these organic acids are carbon sources for microorganisms, those consuming and reduce. Therefore, its solubilizing effect have allowed to estimate the life span of these acids is between 0.5 and 12 h, suggesting that they must be continuously produced and secreted down (Xiao & Wu, 2014)

Ammonia production - PGPR are able to promote plant growth via direct or indirect mechanisms, or a combination of both. Ammonia production is as important as nitrogen fixation, as ammonia is taken up by plants as nitrogen source for the nitrogen containing bio-molecules. Direct mechanisms include an altered nutrition through the provision of fixed

nitrogen; iron through siderophores; soluble phosphate (P) and zinc (Zn)

IAA production: Plant growth promoting bacteria produce physiologically active auxins i.e. indole acetic acid (IAA). It regulates several fundamental cellular processes including cell divisions, elongation and differentiation. Bacterial indole acetic acid also plays an important role in suppression of rot diseases in various plants (Khare et al 2010) . It is a metabolite derived from tryptophan (Trp) by many Trp-dependant and Trp independent pathways in plants and bacteria

HCN production. Plant growth promoting rhizobacteria produce chemical compounds with different benefits for the plant. Among them, HCN is recognized as a biocontrol agent, based on its ascribed toxicity against plant pathogens. Cyanide forms stable complexes with the essential elements (Cu^{2+}, Fe^{2+}, and Mn^{2+}) for the protein function and therefore is considered a toxic substance to most living organisms. Hydrogen cyanide (HCN) is a volatile secondary metabolite that is synthesized by many rhizobacteria and has a powerful effect on many organisms. HCN inhibits the electron transport and disrupts the energy supply to the cell, which leads to death of living organisms. Many bacterial genera have the ability to produce HCN.

The present study aims to isolate salt-tolerant bacteria from mangrove rhizosphere and characterize them by morphological, molecular means; and to define whether any of the isolated bacteria possess PGPR actions by their tendency of solubilization of mineral like phosphorus, production of IAA, HCN production, Ammonia production etc.

Materials and Methods

Sampling site

Sampling station of present investigation Bordi region having latitude 20.116556 and longitude 72.740013 district Palghar Maharashtra, India, with GPS co-ordinates of $20^0$6'59.06016'' N and $72^0$44'24.0468'' E. this region is far away from industrial area hence declared as green belt tribal zone.

Sediment and water sample collection

Five sampling area were identified and samples of water and sediment of rhizosphere of mangrove collected from these sites namely BS_1, BS_2, BS_3, BS_4 and BS_5 for sediment and BW_1, BW_2, BW_3, BW_4 and BW_5 for water. Samples of water and sediment were collected in pre-sterilized polythene container and transported to laboratory. The temperature was recorded during the sampling and samples were stored at 4^0C until analysis completes.

Isolation of Halophiles from Marine Environment

Halophiles from the samples enriched and isolated by inoculating the composite sediment and water samples of each site in to nutrient broth containing pre-sterilized filtered sea water. Inoculated flask was incubated at room temperature for 8 days on a rotary shaking incubator at 120 rpm speed.

After enrichment halophilic bacteria containing broth suspension were serially diluted to 10^{-1} to 10^{-10} by using physiological saline (0.85 % NaCl). Last five dilutions were used for isolation of halophilic bacteria. For isolation used a modified nutrient agar medium with 5%, 10%, 15% and 20% NaCl and spread plate technique and use 0.1 ml diluted sample for spreading. Plates were incubated at room temperature for 8 days. Morphologically different colonies were selected for further investigation and total plate count was noted. (Deshmukh K.B. et al 2011)

Differential Staining

As gram staining method unable to give proper grams nature of halophilic bacteria because of due to high salt concentration. Hence an improved technique used for staining of halophilic isolates i.e. Dussault method. In which smear of halophilic bacteria was desalted by using 2% glacial acetic acid and then addition of crystal violet and basic fuchsin as counter stain and observation was recorded. (HP Dussault 1955).

16s rRNA analysis

16s rRNA analysis was performed by extracting DNA of isolates. The amplification of 16s rRNA fragments were performed by using PCR with suitable primer. The identification was generated by EzBiocloud Database and extent of homology shown by the 1200 base pair sequence of sample by NCMR Pune, Maharashtra India, for the six isolates respectively.

Screening of Phosphate Solubilizing Bacteria

Phosphate solubilization of the isolates was checked using Pikovskaya's agar medium prepared according to composition stated by Hi-Media,Mumbai. test isolates were spot inoculated on plates, then the plates were the incubated at 28-30°C for 2-4 days. Then observed the zone of phosphate solubilization

Organic acid Production Test organisms were inoculated on M9 minimal agar medium with methyl red as pH indicator. Plates were incubated for 3 days at 28-30 °C for 3 days then observed for colour change if there is pH change.

Ammonia Production

Test organisms were tested for production of ammonia in peptone water. Freshly grown culture inoculated in 10ml peptone water in each tube & incubated for 48-78hrs 28-30°C then Nassler's reagent (0.5ml) was added in each tube. Development of brown to yellow color indicates positive test foe ammonia production. (Cappuccino and Sherman, 1992)

Indole-3-acetic acid (IAA) Production

For IAA production first of all, prepared salkowski reagent 50ml, 35% perchloric acid and 1ml 0.5M FeCl3 solution mixed it well. Prepared the tryptophan broth 55ml, dissolved it by heating and poured in all the test tubes, sterilized the same in autoclave. Inoculated the tryptophan broth with obtained isolates and incubated all the test tubes in incubator at 28-30°C for 48 hours. After incubation, add the 2ml of salkowski reagent in all the test tubes. Observed the color change as the indicator of IAA production.(Rahman et al.,2010)

Hydrogen Cyanide (HCN) Production

HCN production was determined by color change of filter paper (Alstrom and Burns, 1989). Loop full of bacterial suspension was inoculated on nutrient agar medium containing 4.4 g L-1 glycine. Filter papers were soaked in a reagent solution (sodium carbonate 2% and picric acid 0.5%) and placed in the upper lid of Petri dishes. To prevent volatilization, the plates were sealed with parafilm and incubated at 37°C for 5-6 days. If HCN was produced, yellow filter papers changed to cream, light brown, dark brown and eventually turn into reddish-brown.

Result and Discussion

For isolation of halophilic bacteria from sediment nutrient agar was used with 5%, 10%, 15% and 20% NaCl. Large number of colonies was observed on nutrient agar containing 5% NaCl. Majority of colonies shows similar morphological characters hence colonies was selected for further investigation from each of these 5%, 10%, 15% and 20% NaCl containing nutrient agar. Total 117 colonies selected and processed for morphological and grams characters. From 117 six colonies was selected due to different morphological character and showing unique pigmentation. For determination of grams nature Dussault method was used. All the isolates were aerobic, gram positive except isolate BJ which show gram negative nature. Isolate BB was gram positive, rod shaped and spore forming bacteria, non-motile. Isolate BC_4 was gram positive, rod shaped and non spore former, non-motile. Isolate BJ was gram negative, non spore former, motile, rod shaped bacteria. Isolate BK was rod shaped, gram

positive, non spore former and motile. Isolate BS_6 was gram positive, rod shaped, spore former. Isolate BS_2^{13} was found gram positive, non spore former, motile, coccoid shaped bacteria.

All isolates were able to growing in NaCl concentration 10%-20%. Isolate BJ and BK able to tolerate on 20% NaCl concentration. While isolates BB, BS_2^{13} and BS_6 able to tolerate on 15% NaCl concentration and BC_4 able to tolerate on 10% NaCl concentration. Similarly pH tolerance was also observed and was able to grow in pH range 8-10 but optimum pH was 8.5. The isolate BB showed 100% similarity with Virgibacillus dokdonensis DSW-10(T) (AY822043), BC_4 showed 99.48% similarity with Kocuria flava HO-9041(T) (CP013254), BJ showed 99.84% similarity with Halomonas piezotolerans NBT06E8(T) (MN435603), BK showed 99.17% similarity with Halolactibacillus miurensis DSM 17074(T) (jgi.1085779), BS_6 showed 99.73% similarity with Oceanobacillus caeni S-11(T) (AB275883), BS_2^{13} showed 99.77% similarity with Planococcus plakortidis DSM 23997(T) (CP016539) respectively, noted in table-1

Table-1: 16s rRNA analysis and % similarity of Isolates with closest neighbor:

Sr.no	Isolate	% similarity	Name of organism closest neighbor	Accession number
1	BB	100.00	Virgibacillus dokdonensis DSW-10(T)	AY822043
2	BC_4	99.48	Kocuria flava HO-9041(T)	CP013254
3	BJ	99.84	Halomonas piezotolerans NBT06E8(T)	MN435603
4	BK	99.17	Halolactibacillus miurensis DSM 17074(T)	jgi.1085779
5	BS_6	99.73	Oceanobacillus caeni S-11(T)	AB275883
6	$BS2^{13}$	99.77	Planococcus plakortidis DSM 23997(T)	CP016539

Note: 16s rRNA analysis for 1200 bp was performed by NCMR Pune and above analysis is according to result provided by them only

Now for assessment of PGP traits, in phosphate solubilization from all 6 isolates not any isolate have ability to solubilize inorganic phosphate, so there could be a possibility that organisms doesn't have any mechanism to solubilize phosphate. As none of the isolate show production of organic acid which is confirmed by observing m9 medium plate containing methyl red as pH indicator dye so hence due to unavailability of organic acid hurdle may occur in the solubilization of phosphate or there could be the absence of chelator specific for phosphate. six isolates then further subjected for screening of ammonia production in peptone broth by using Nessler's reagent. The change in colour from yellow to brown indicates production of ammonia. Out of 6 isolates, none of the isolate shows ammonia production. As

number of factors may affect production of ammonia in certain report the effect of temperature, medium composition, and oxygen requirements on sustaining and maximizing elevated levels of ammonium production from a nitrogenase deregulated strain were depicted.

All the isolates then screen for IAA(Auxin) production which doesn't show production by any of the isolate but as the provided tryptophan is 2mg/ml so there may be a possibility if we increases the concentration of tryptophan then there may be a higher production of auxin as similar report is evidenced by Rajani devi et al (2018)

Microbial cyanides seem to play a role in suppression of many plant diseases. A positive correlation between production of HCN and suppression of root rot by bacterial isolates has been reported (Defago et al, 1990) In present study, 06 isolates were tested for qualitative HCN production on nutrient agar plates supplemented with 0.14 per cent glycine. All isolates showed maximum HCN production (Fig 1) Glycine has been found to be the direct precursor of microbial cyanide production (Voisard et al, 1989) Although the role of microbial HCN in disease suppression is not considered to be firmly established. It may be involved in the induction of plant resistance as reported by Schipper et al., (1990)

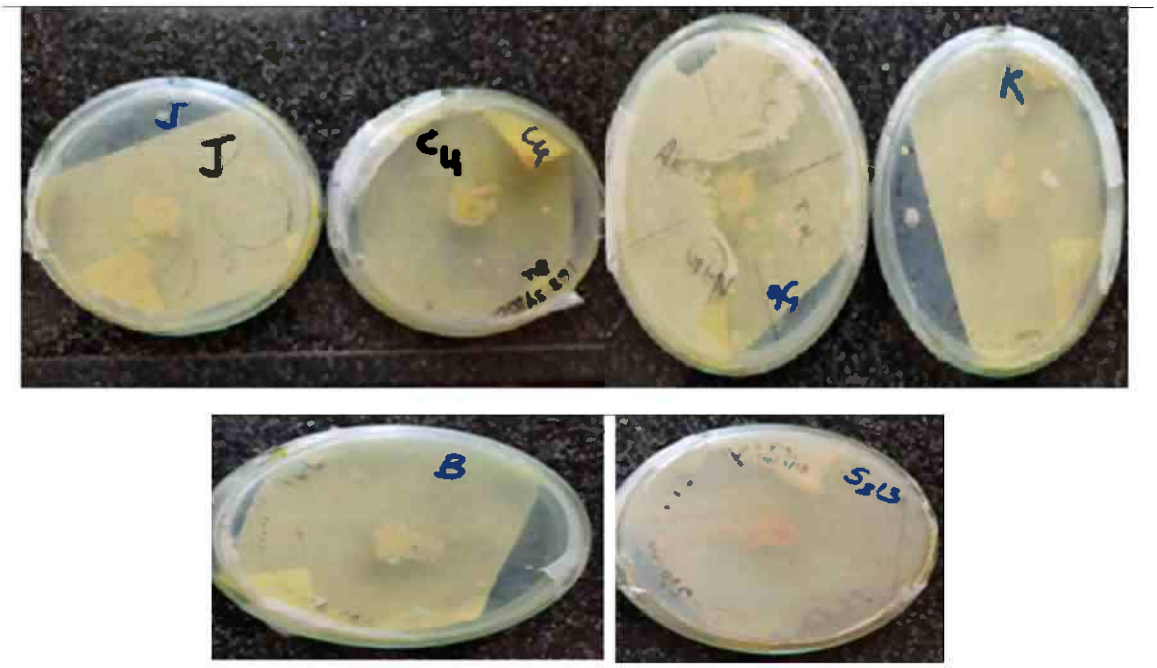

Fig 1. HCN production by all 6 isolates

To build up plant growth under saline condition, direct use of salt-accepting bacteria has drawn significant study both in industry and in research. In the current study, number of halophilic bacteria were isolated and characterized for their tolerance levels of NaCl. Isolation

of PGPR from saline soil was the main approach of this study. So, total of 06 isolates were selected from the sample. The bacteria separated in this study grew best at 28-30°C and pH 8-10.0 supplemented with 5-18% NaCl. These strains with high salt tolerance were further characterized for the PGP activities including IAA production, P-Solubilization and HCN production. The results for HCN producing bacteria are very effective. The use of such microorganisms can induce tolerance to abiotic stresses in the host as biofertilizers may be a blessing to agriculture since urbanization and industrialization are fast depleting our cultivable lands. these microorganisms can contribute to sustainable agriculture under adverse conditions.

Conclusion

From the present study it is clear that the area selected for sampling is having diversity of microorganism which are halophilic bacteria. All isolates have shown significant role in HCN production. So, finally it is clear that rhizospheric soil of mangrove (Bordi region, Maharashtra) was having not only halotolerant but also had plant growth promoting traits. These can be introduced against abiotic stress as biofertilizers. So this may have future application to use as Bioinoculants in saline soil-based agriculture.

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10. Identification and Isolation of Microbial Contamination from Electronic Devices

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Abstract

The present study was conducted to isolate and identify pathogenic microorganisms on the external surface of computer keyboard and mobile phones. For this purpose, we collected 5 sample of mobile phone and 5 sample of computer keyboard of microbiology laboratories and E- library of ZSCT'S Thakur Shyamnarayan Degree College, Mumbai. Sample were collected from computer keyboard and mobile phone with normal saline rinsed swab. Sample were immediately cultivated on Nutrient agar plate and MacConkey agar and then we have to see the growing bacteria and identified based on their morphology and biochemical properties. Approx. 90% of computer keyboard and mobile phone were contaminated with bacteria and fungi. The must contaminated pertained to gram positive bacteria and in the computer, keyboard were must isolated bacteria were coagulase negative staphylococcus. The highest contamination rate was found on computer keyboard rather than the mobile phone. This study demonstrates that monitoring inanimate surface and considering these surfaces as source of nosocomial infection is necessary

Keyword: Contamination on Mobile phone, computer keyboard, pathogenic bacteria.

Introduction

Microorganism occur nearly everywhere in nature. They present in the air currents on earth surface, mountaintops, bottom of the ocean, soil, water bodies, etc microorganisms occur most abundantly where they found moisture and a temperature suitable for their growth and multiplication. Since the condition that favor the survival and growth of many microorganism are those under which people normally live it is inevitable that we live among a multiple of microbe. That are present in the air we breathe and the food we eat. They are on the surface of our bodies, in our alimentary tracts and in our mouth's, noses and other body surfaces.

Predominantly organism like gram positive cocci (staphylococcus spp. etc) or gram-negative bacteria (pseudomonas aeruginosa etc.) can be transmitted through device like Mobile phone and computer keyboard.

Mobile phones or cellular telephone as a long range portable electronic device for personal communication. In many countries mobile phone, landline telephone since most of the adult and children are have their own mobile phone. Because of the achievement and benefit of the mobile phone, it is easy to overlook its hazard to health this is against the background that many users may have no regards for personal hygiene and also a mobile phone usage has a personal character being attached to the close proximity of parts of the body such as the face, ears, nose, lips and hand which are most common infections gateway. Our Research has shown that the mobile phone could be a health hazard with tens of thousands of microbes living on each square inch of the phone. Staphylococcus particularly S. aureus are members of the normal flora of the human skin, respiratory and gastrointestinal tract. S. aureus occur in 20 to 50% of human skin. Staphylococcus are also found regular in cloth; bed lines and another human environment.

Computer keyboard are among the most commonly used interface. The majority of keyboard have over 101 individual key which make it difficult and time consuming to clean. This is often the reason why must owner do not clean and disinfectant the keyboard. As well as mobile phone, computer keyboard has been also implicated as a potential reservoir for various infectious fungal agents. Given that computer is not routinely disinfectant, the opportunity for the transmission of contaminating microorganisms is potentially great. Therefore, the bacteria that live on our skin, Fingernails, hand and anywhere the hands have been are likely to transfer new bacteria over to the keyboard. Eating above computer keyboard is also one of the causes of bacterial infection.

Our study aimed at investigating bacterial contamination of mobile phone and computer keyboard to identify the microbes regularly associated with mobile phone and computer keyboard and their pathogenicity.

Material and Method

A. Swab sample collection

Swabs from the investigated surface of 5 mobile phone and 5 computer keyboards were collected using disposable sterile cotton swab. Mobile phone and keyboard samples swab were taken in the microbiology laboratories and E-library of Thakur shyamnarayan degree college.

Swabs were collected by through rotating a cotton swab on the surface of the back of the mobile phone including keypad, touch screen and both the side of the Phone and swab for the keyboard were carried out in the same way.

B. Isolation

1. Sample which are collected on the sterile swab immediately streaked on the MacConkey agar and nutrient agar plate.

Composition of Nutrient agar: (Distilled water 500ml, beef extract 0.5g, year extract 1g, peptone 5g, sodium chloride 2.5g, agar 7.5g)

Composition of MacConkey agar: (peptone 17g, proteose peptone 3g, lactose 10g, bile sales 1.5g, sodium chloride 5g, agar 13.5g, neutral red 0.03g, crystal violet 0.001g, distilled water 1L, final ph 7.1)

2. Then we have to incubate the MacConkey and nutrient agar plate aerobically at 37°c to 24 hours and then observe for the growth and colonial description of the isolation

C. Characteristics and Identification of isolate

Morphological description of colonies, gram staining (it is used for differentiate between gram positive and gram-negative bacteria and also for determination of size, shape and specific arrangements of colonies)

Morality test (observe morality of bacteria, native preparation was prepared by method of impressed drop) and identification were used for bacterial identification

D. Biochemical Reaction

Physiological and biochemical reaction each bacterial isolate was vertical using the standard kit API identification system (Biomerieus Marey Letuil, France) for the identification of both gram positive and gram-negative bacteria

Results and Discussions

Table No.1 depicts that, after the incubation we observe that *Staphylococcus aureus, Staphylococcus epidermidis, Pseudomonas aeruginosa, Neisseria siccia, micrococcus luteus, proteus mirabilis, bacillus subtilis, Enterobacter aerogenes* are the main bacteria isolate frequently associated with mobile phones.

These organisms may probably have found their way into the phone through the skin and from hand to hand. This is because the isolated bacteria are a subset of the normal microbiota of the skin. *Staphylococcus aureus* is known to cause illness ranging from pimples to boils.

The presences of the gram-negative rod, Enterobacter aerogenes a member of the Coliform indicates the possibility of the presence of fecal contamination on the mobile phone.

Bacillus subitilis with 100% frequency of occurrence has been identification on organism in food spoilage.

Table No. 2 represents, the results which demonstrate the highest positive culture belonged to bacteria are *Staphylococcus auerus, Coagulase negative bacteria, gram positive bacillus, viridans streptococcus, enterbaceriaceae. Staphylococcus auerus* and enterococcus were present in high ratio all over the 5 sample and the plates were also contaminated with saprophytic fungal hyphae and yeast respectively

Contamination rate of computer keyboard place were 95% respectively so among all the contaminated keyboard had a cleaning program once a day or once a week to protect us from a harmful infection

Table No. 1: Bacteria isolate from mobile phone

Bacterial isolate	No of colonies present	Gram character	Shape
Staphylococcus aureus	83	Positive	Cocci
Staphylococcus epidermidis	20	Positive	Cocci
Pseudomonas aeruginosa	11	Negative	Rod
Neisseria siccia	13	Negative	Diplococcus
Proteus mirabilis	9	Negative	Rod
Micrococcus luteus	6	Positive	Cocci
Bacillus subtilis	5	Positive	Rod
Enterobacter aerogenes	7	Negative	Rod

Table No.2: Bacteria isolated in computer keyboard

Microorganisms	No of colonies present	Gram character	Shape
Staphylococcus aureus	95	Positive	Cocci
Bacillus spp.	30	Positive	Rod
Coagulase negative Staphylococcus	54	Negative	Spherical
Micrococcus spp.	15	Positive	Spherical
Viridans streptococcus spp.	10	Positive	Cocci
Enterococcus spp.	10	Positive	Cocci
Yeast	20	--	Circular

A. Colonies from Mobile Phone

B. Colonies from Computer Keyboard

Figure 1: Nutrient Agar Plate (A) Mobile Phone and (B) Computer Keyboard

A. Colonies from Mobile Phone B. Colonies from Computer Keyboard

Figure 2: Mac-Conkey Agar Plate (A) Mobile Phone and (B) Computer Keyboard

Discussion

1. In this study more than 90% of all computer keyboard and mobile phone were infected with microorganisms that could contribute to the higher infection.
2. One of the main cause of epidemics obtained from the environment and nosocomial infection is the bio-contamination of surface of various items and equipment used by the public.
3. Contamination surface become fomites transmitting infectious organism between inanimate and living object and in the infectious chain serve as the reservoir for pathogens from which they spread further through via. hands.
4. We investigated the occurrence of microorganisms on every day object like mobile phone and computer keyboard the incidence of bacteria was detected on 90% on mobile phone and 95 % on computer keyboard with a mixed flora of gram positive and gram-negative bacteria and potentially pathogenic or non-pathogenic bacteria.
5. The results of our work confirmed that 92% of mobile phone were examined microbial contaminated usually by Staphylococcus epidermidis. These bacteria are part of the physiological microbiota of the skin and mucous membrane.
6. Coagulase negative for *Staphylococci* were the most prevalent bacteria pal et al.
7. In addition, we established the presence of representatives of the general bacillus and micrococcus, enteric bacteria and S. *aureus* were present in the mobile.
8. These bacteria under certain circumstances mainly in immunosuppressed person may cause prevent infection in human.

9. Our studies have confirmed that computer keyboard is contaminated with more heterogeneous spectrum of microorganisms like bacteria & fungi as compared to mobile phone as evidence by the presence of yeast and fungi that were not detected on phone.
10. However due to excessive contact with computer keyboard and other fomites surface and the carelessness has to led to a reservoir and source for nosocomial infection This process eventually results in lower compliance with hand hygiene regimens among people.
11. In our study the contamination rate of both the equipment was higher than 90%.
12. Our research demonstrate that microbial contamination of mobile and computer keyboard is frequent and the most common organism are in skin Commensals.
13. The presence of potentially pathogenic bacteria such as S. aureus, gram positive bacilli and enteric bacteria represent a risk of infection.

Conclusion

The study' showed that all mobile phone and computer under consideration were infected by several microbes, most of which belonged to natural flora of the human body as well as airborne fungi and soil. This means that it is necessary to clean our hands after the contact with a phone and computer keyboard and we should clean a keyboard by once a day or a week since it is a source of disease transmission.

We can reduce the presences of microorganisms on device like mobile phone and computer keyboard by using Commercially available antibacterial wet wipes. It helps to the reduction of bacterial contamination after the disinfectant achieved even 100% in the case of enteric bacteria on mobile phone and also 100% in case of *Staphylococcus aureus* or Streptococcus spp. On the surface of computer keyboard after the disinfection no yeast or moulds were present on the device.

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11. A Review: "Local Significance of Biodiversity Science in National Park Mumbai, Maharashtra"

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Abstract

Loss of Green Delts in cities as a result of pre-urban urbanization as a single factor that has a negative impact on ecosystem-based social services. Our paper represents the introduction to BIODIVERSITY, in which the entire biodiversity theory has been covered. Following the introduction includes the method of this research paper. In the SGNP, the city of Mumbai demonstrates the many ways in which conservation politics works not only in rural areas but also in cities, in highly designated ways. Then we have our main topic called "THE VALUE OF HOME BIODIVERSITY IN SGNP". In that part, the plants and animals are covered in the park and the plants there. Finally, we have the conclusion of our research paper. The results of the study highlight the social and environmental aspects of conservation in Mumbai.

Introduction

Biodiversity represents the diversity between living organisms from all sources including Terrestrial, Marine and other aquatic ecosystems and the ecological complexes that are part of it; Biodiversity includes the diversity of species and ecosystems. At the same time, indigenous peoples consume an abundance of plants, fungi, and fish, especially in food and medicine. Marine diversity usually meets in tropical areas, and has been growing over time, but is said to be slowing down in the future as a major effect. Fortunately, there is now more concern about biodiversity conservation and the environment than ever before in forests. It is surrounded by evolutionary, biological, cultural and biological processes that support life. The

natural environment encompasses all living and nonliving things that occur naturally on Earth or in a specific location, as well as the interactions between all living things and inanimate matter. According to the 2019 Global Biodiversity Services Report conducted by IPBES 25% of plant and animal species are at risk of extinction due to human activities.

Local significance of biodiversity

National parks protect natural beauty. A recent survey conducted at Sanjay Gandhi National Park in Mumbai shows how conservation politics works not only in rural areas but also in cities, in unequal and established ways. This has had an impact on the poor, powerless and unscrupulous residents who comprise most of the Mumbai population, living within the PAs. This is the last of the clean people, a comfortable beauty zone in the cities, with increasing demand from the area. The results of the study highlight the social and environmental aspects of conservation politics in the city of Mumbai. The immediate results are about international rights questions on PAs or highlighting the elitist provision of environmental integrity to visitors to the right of the city.

Flora and Fauna

Sanjay Gandhi National Park is 87 km. National Park located in Borivali, Mumbai, Maharashtra State. Sahyadri Hills in the east, is strongly being influenced by The Sanjay Gandhi National Park's biodiversity and over the years, changes brought about by human influence.

1. Flora

The forest area is the most dominant type of habitat here. Speaking of flowering plants alone, about 1300 species are found in SNGP. The diverse forest species with numbers here adhere to the mixed forest of the south, which is full of Tectona, Albizzia, Terminalia, Holarrhena, Firmiana and bamboo tracks.

There are magical little Asoca shrubs that are magical, dense, and deep green that remain stunning in the fall of a leafy tree that falls all around.

Especially in low-lying areas, bamboo is very widespread, and the teak forest community - a bamboo with a bird's trait - life and normal structure is easily seen. The widespread karv tree covers the tall trees of the forest here; this dense shrub, while still visible everywhere, even as a dry trunk in summer, thrives once every seven years.

Species of bamboo in one family, one species Epiphyte and Parasite and 4 species of Palms from 11 families. The known value was almost 81 of the 84 species to have an internal

value such as food, trade, medicine etc. Of the 79 species of 66 plants they have shown high environmental value and are used by local communities to generate natural income. After determining the value of the trees, 6 of the 84 species of trees were listed as endangered, endangered, rare, or found in the area.

2. Fauna

The park is said to have more than 251 species of migratory birds and water. 5,000 species of insects and mammals. In addition, the park provides shelter for 38 species of reptiles, 9 species of marine mammals, 150 species of buttocks and large species of fish. Chital (spotted deer), rhesus macaque and bonnet macaque are some of the wild mammals found in the park naped black or Indian rabbit, Muntjac (barking deer), porcupine, Asian palm civet, Gray langur, Indian flying fox and Leaper.

There are a variety of reptiles in the park's home. Some of them are crocodiles in Tulsi Lake, Pythons, Cobras, Cautious lizards, Russell snakes, Bamboo pit viper and Ceylonese cat snakes.

A total of 172 species of butterflies are reported here.

3. Wilderness as Discursive Infrastructure

Sanjay Gandhi National Park is located about 40 square miles [104 sq km] north of Mumbai, making it one of the largest national parks in the world within the city limits. Prior to Indian independence, the park was owned by the Indian Forest Service, a British government agency responsible for "scientific" research and colonial logging. After independence, it was renamed Borivali National Park until 1981, when the Forest Department was established and the park was renamed Sanjay Gandhi after Indira Gandhi's son.

In the center of the park are the Kanheri caves, a collection of more than 100 ancient Buddhist caves, associated with a wide variety of famous wildlife, forming a major SGNP tourist attraction.

In 2016, the park attracted more than 13.5 lakh visitors and made Rs. 9.63 crore in revenue on admission fees and program, ranging from 8.84 lakh for guests and Rs. 6.42 million in 2015.

Described as a "unique wilderness" on the Forest Division website, SGNP traffic is aimed at tourists especially with the names of religious and cultural relics (preserved as Kanheri caves) surrounded by pristine forest with biodiversity.· I. Desert as a talking infrastructure.

Biodiversity changes caused by the driver list are any natural or man-made factors that directly or indirectly cause changes in the ecosystem with growing populations, industries, and urban growth in Mumbai.

Conclusion

This study identified significant differences in the Sanjay Gandhi National Park forest area from 1991 to 2011. Especially the middle dense vegetation. There has been an increase in light vegetation in the region. Much of the barren land has also been converted into a

vegetation area. However, it is important to note that even after the increase of green regions in the park is the reason for the increase, it will give a clear idea about the health of the park.

This study has shown a number of important, alarming changes. The SGNP has a VERY important value to it, so you need to get deeper into the reality of this park. It is imperative to find a reason for such changes and appropriate steps must be taken to reverse the trend.

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12. A Review: "Impact of Covid-19 on Air and Water Quality"

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Abstract

The covid-19 outbreak at the end of December 2019 caused a global pandemic affecting millions of human lives. Human interaction was restricted as industrial activities, tourism, social gathering places, trains, buses, were shut down. The restriction in human interaction during the pandemic gave nature time to recover. Reports have shown that after the outbreak of Covid-19, environmental conditions including air quality and water quality are improving. India is one of the biggest contributors to world pollution. But after the outbreak, the quality of air and water has started to improve. This study was performed to explore the positive and negative impacts of the Covid-19 pandemic on the environment by analyzing the available scientific reports and data.

Keywords

- Air pollution
- water pollution
- Lockdown
- Covid-19

1. Introduction

At the end of December 2019, an outbreak caused by Covid-19 from the Wuhan city located in China affected millions. The outbreak of Covid-19 caused a global pandemic, World health organization declared it as an international public emergency. In India, the first confirmed positive case was reported in Kerala. On January 27, 2020, a 20-year old female who had returned home for a vacation from Wuhan University of china presented to the emergency department in the General hospital followed by two other cases on February 2nd and 3rd again in Kerala having the same history. Coronavirus disease-19, often known as

Covid-19, is an infectious disease caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). *Coronaviruses* are a group of viruses that affects human beings through zoonotic transmission(*Ashour,H.M.,Elkhatib.,et.al*). This isn't the first time that the world has faced a global pandemic, in the past two decades novel viruses like Severe Acute Respiratory Syndrome (SARS) on June 12, 2002, and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) on June 6, 2012, has caused a global pandemic. The major concern regarding the Covid-19 includes its global transmission, health emergence, a significant number of deaths, infection, and mortality rate. As of July 2021, the virus has spread to more than 200 countries, with more than 194 million confirmed cases and more than 4 million deaths around the world. Covid-19 affects different people in different ways. Usually, the symptoms include fever, dry cough, tiredness, sore throat, aches and pains, diarrhea, headache, rashes on the skin. Serious symptoms difficulty in breathing, chest pain, loss of speech or movement. Older people, in their 50s, 60s, 70s, are more vulnerable to this disease, they might need hospitalization, medical care, or a ventilator to assist them to breathe.

In to other top countries India has a lesser capacity to serve patients. India has a population of 1.3 billion, but India has only 1,291 government laboratories along with 1,473 private laboratories for Covid-19 testing. On January 16, 2021, the 2 vaccines Covaxin developed by the Bharat Biotech and Covishield manufactured by the Serum Institute of India were approved by the Ministry of Health and Human welfare (MOHW) (https://www. bharatbiotech.com/covaxin.html). But before the release of the vaccine, the only possible way to control the spread of the virus at that moment was "social distancing", being practiced by many countries led to the reduction of Greenhouse gas emissions. On March 24, 2020, Prime Minister Shri Narendra Modi addressed the nation and declared a complete lockdown of 21 days (BBC news), and it was further extended for 19 days on April 14, in phase 2 followed by 14 days till 17th May in phase 3 and more 14 days in phase 4. The government of India shut all the industrial activities, construction projects, transportation, tourism, in the period of lockdown. The government of India announced that the citizen must avoid participating in social gathering events and should use personal protective equipment like masks.

During the past two decades, Industrial growth has boosted the economy of the nation and has certainly increased employment, and has led to the development of the standard of living of its people. However, industrial growth has also resulted in the emission of harmful effluent and pollutants in the air, soil, and water. The environment of India before the

pandemic was extremely degraded and was the major cause of diseases like respiratory infections, heart disease, and lung cancer among the citizens of India. According to a survey of IQ Air, in 2019, it was discovered that 21 out of 30 most polluted cities were in India. The PM2.5 figure recorded by the US AQI was 58.08μg/m³. This concentration was 5 times above that recommended by the World Health Organisation (*WHO*). It was estimated that 50% of this pollution is caused by industry, 27% come from vehicles, 17% from crop burning, and 7 % by domestic cooking (*CPCB, 2020*). However, Covid-19 has positively affected the environment. Immediate shut down of transportation, and vehicular movements along with the social distancing allowed the earth to recover and heal itself. The major impact of Covid-19 was observed in the air quality, most polluted cities like New Delhi, Mumbai, Ghaziabad, Noida, and Lucknow has shown improved air quality in the lockdown period. Major rivers like Ganga, Yamuna have shown signs of improved water quality due to reduced industrial inference.

2. Effects of Covid-19 on the Air Quality

The covid-19 outbreak has given the earth time to recover and heal itself. At the end of March 2020, the government imposed a nationwide lockdown. The government shut all the factories, markets, public transport, construction work, and advised the citizen to stay home and practice social distancing. Different reports showed that the major cities were recording much lower levels of harmful microscopic Particulate matter known as PM2.5, and of Nitrogen dioxide, which is released by vehicles and power plants. The common air pollutants in cities and industrial towns are NO2, SO2, PM2.5, which are responsible for cardiovascular and respiratory diseases.

The main sources of these pollutants are vehicular exhaust and metal processing industries. During the period of lockdown, major cities in India like Delhi, Lucknow, Ghaziabad, Noida, Muzaffarpur, observed a sudden fall in pollutants. The data from the Central Pollution Control Board (CPBC), showed that the nitrogen dioxide went from 52 per cubic meter to 15 in the same period. Cities like Mumbai, Chennai, Kolkata, and Bangalore also recorded a fall in these air pollutants.

2.1 Effects of NO2 in Air

NO2 (Nitrogen dioxide)is a harmful pollutant and increased levels of nitrogen dioxide can cause damage to the human respiratory tract and increase an individual's vulnerability to, respiratory infections and asthma. Long-term exposure to high levels of NO2 can cause severe chronic lung disease. Research published by environmental NGO Greenpeace India in July

2019 revealed that as per satellite data, transportation and industrial activities have resulted in a major increase of NO2 in India. Mumbai, Delhi, Bengaluru, Kolkata, Chennai, and Hyderabad are major NO2 hotspots in India, with a large vehicular population and diesel consumption. However, after the government imposed nationwide lockdown, most of the cities recorded a reduction in NO2. Satellite images released by the European space agency produced using data recorded from the Copernicus Sentinel-5P satellite showed averaged NO2 concentration over India from 1 January to 24 March 2020, and 25 March to 20 April 2020 (The Times of India, 2020) . The considerable reduction in the concentration can be seen in major cities across India, Mumbai and Delhi saw drops of around 40-50% compared to the same time around in 2019 (*Mahato,et.al*).

However, after the Unlock in India, cities recorded a sharper rise in the levels of pollutants. According to an analysis disclosed by the System of Air Quality Weather Forecasting and Research (SAFAR) the pollution level between June 1 and June 14, 2020, for Mumbai, Pune, Ahmedabad, and Delhi. When compared to the levels recorded during the fourth lockdown, Mumbai's nitrogen dioxide emissions increased by 60%. According to a recent study report, disclosed by Greenpeace India in July 2021, Delhi recorded an increase of 125% in NO2 pollution between April 2020 and April 2021. NO2 levels have risen in all major cities, including Bengaluru, Delhi, Hyderabad, Mumbai, Jaipur, Chennai, Kolkata, and Lucknow, but Delhi has shown a massive increase (Greenpeace India, 2021). NO2 concentration increased by 90% in Bengaluru, 69% in Hyderabad, 52% in Mumbai, 94% in Chennai, 11% in Kolkata, 32% in Lucknow, and 47% in Jaipur in April 2021 compared to the same month in 2020.

2.2 Effects of SO2 in Air

SO2 (sulphur dioxide) is a poisonous air pollutant that increases the risk of stroke, heart disease, lung cancer. SO2 adversely affects the respiratory system, causes lung infection, and increases the risk of tract infections. India continues to occupy the position of top emitters of SO2. The reports based on the analysis by the Greenpeace Indian and the Centre for Research on Energy and Clean Air (CREA), India emitted 21% of global anthropogenic SO2 emissions, almost double than Russia in 2019.

Reports have revealed that the biggest emission hotspots in India are the thermal power station located at Neyveli, Singrauli, Sipat, Mundra, Korba, Bonda, Tamnar, Talcher, Jharsuguda, Kutch, Surat, Chennai, Ramagundam, Chandrapur, Visakhapatnam, and Koradi

(Greenpeace India., 2019). However, two months lockdown in India created a great impact on the environment as the new satellite maps, released by the European Space Agency (ESA) in 2020, showed that the concentration of SO2 dropped in Indian during the Covid-19 lockdown. The report revealed that the SO2 level in most polluted areas in India had decreased by 40% in April 2020 compared to April 2019.

2.3 Effects of PM2.5 on Air

PM2.5 is fine particulate matter an air pollutant with a diameter of 2.5 microns. PM2.5 is small practical and can travel deeply into the respiratory tract. Long-term exposure to elevated levels of PM2.5 can irritate the eyes, nose, throat, and can cause shortness of breath, and can also affect lung function, increases the rate of bronchitis and lung cancer. A report from Central Pollution Control Board (CPBP) in 2019 revealed that India has been observing an increase in PM2.5 over the past decade. A report from the State of Global Air in October 2020, showed that India recorded the world's highest annual average concentration of PM2.5 in the air in 2019.

Several reports presented a rough estimation that before lockdown in India, major polluted regions showed 5-10 times higher concentrations of PM2.5 than the WHO (world health organization) standard guideline. But as the government imposed lockdown in the country, all the cities except Mumbai, recorded a reduction in the concentration of PM2.5 as the average concentration was comparable to the safe limit prescribed by the Central Pollution Control Board (CPCB) which is 40μg/m3. Satellite images revealed the change in concentration of PM2.5 in 2019, 2020, and 2021.

However, after the end of the lockdown phase, India detected a gradual increase in pollution in cities like Mumbai, Delhi, Bengaluru, Hyderabad, Chennai, Kolkata, and Lucknow. The concentration of PM2.5 around the country started to elevate. Delhi recorded an increase in the concentration of PM2.5 from 69μg/m3 in 2020 quickly back to 95μg/m3 in 2021. Satellite images show an increase in concentration oF PM2.5 in India in a year from April 2020 to April 2021. But the recent data fetched from the Central Pollution Control Board (CPCB) in July 2021, indicate that air quality in most of the cities in India has certainly improved.

3. Effects of Covid-19 on the Water Quality

The Covid-19 pandemic has a created a great impact on the daily activities across multiple regions in India. The extent of its impact on river water, groundwater, wastewater, and associated sectors such as agriculture is still uncertain. Central Pollution Control Board (CPCB) reports have disclosed that in India, due to the limited sewage treatment capacity, which can treat only 38% of the sewage generated, more than 38,000 million liters of untreated sewage are released into rivers(CPCB, 2015). The addition of industrial effluents in rivers makes the situation worse. Some reports showed that in river Ganga, industrial effluents account for almost 12% of the total volume of effluents. Due to the nationwide lockdown from March 2020 to April 2020, many small-scale and large-scale industries were closed.

Between this period the water quality and quantity have significantly improved, especially in rivers like Ganga, Yamuna, Narmada, Sabarmati (*Dutta et al., 2020; Shukla et al., 2021).* An analysis revealed that water samples collected from different sites ranging from the upper, middle, and lower levels of Ganga showed a significant improvement in the water quality due to the shutdown of industrial activities. Similarly reports from Karnataka State Pollution Control Board (KSPCB) disclosed that Krishna and Cauvery rivers have shown improvement in water quality (KSPCB, 2020).

However, some articles from the Indian Water Portal in 2020 revealed that rivers located near major polluted cities like Delhi, Mumbai have shown no major reduction in water pollution. Remote sensors are being used to record the level of Suspended particulate matter (SPM) in the Vembanad Lake, the longest freshwater lake in India.

The SPM records based on the turbidity algorithm from Landsat-8 OLI images showed that the SPM concentration in the lockdown period decreased by 15.9% on average. Satellite images revealed that the SPM observed for April 2020 was the lowest for 11out of 20 zones of the Vembanad Lake. A significant reduction in the concentration of SPM up to 34% was observed in April 2020 compared to 2019.Covid-19 also affected the domestic and commercial water sectors during the lockdown. An increase in domestic water demand has been observed by many cities in the period of lockdown. Many cities observed a sharp increase in domestic water consumption of up to 25%. But some regions in Karnataka and Ahmedabad reported a decrease in domestic water demand.

Water supply in most of the Indian cities is 2-3 hours on average per day, and compared to the service benchmark of 135 liters per capita per day (LPCD), in most Indian cities, just 69

lpcd has been observed on average. However, the Central Pollution Control Board released a report in September 2020, and it revealed that an improvement in water quality was observed in rivers Brahmani, Brahmaputra, Godavari, Krishna, Cauvery, Yamuna, and Tapi due to the closure of industries and reduced human (CPCB,2020).

But the same report revealed that water quality in Beas, Chambal, Sutlej, Ganga, and Swarnarekha deteriorated due to the high sewage flow and a lesser volume of water. The water quality was assessed on parameters Ph, Dissolved oxygen, Biochemical Oxygen Demand, and fecal coliform.

Conclusion

The Covid-19 pandemic is certainly affecting millions of human lives and the global economy. The pandemic has reminded us of the damage caused by humans to the environment and how we have affected the nature around us. It also teaches us to work together and create a safe environment for everyone.

Declaration Authors contribution

All the author's mentions have significantly contributed to the writing and development of this article.

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13. In- Vitro Antifungal Activity of Allium Sativum Fresh Extract against Two Fungal Species Aspergillus Niger and Fusarium Oxysporum

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Abstract

Plants square measure wealthy supply of medication antifungal and antiviral properties. These properties square measure employed by plants to safeguard themselves from foreign particles or pathogens. With the advancement of techniques currently we tend to were extracting the chemicals and victimisation to cure plant and animal infection. The in vitro antifungal activity of binary compound extract from Murraya Exotica plants utilized in ancient drugs for the treatment of varied diseases. Extract effectivity was evaluated victimization the agar well diffusion assay against 2 fungi i.e. fungus genus Niger and Fusarium Exosporium. Zone of inhibition against fungi studied. the importance of those ends up in reference to ethnobotanical information is mentioned.

Keywords: Antifungal activity, healthful plants, Murraya Exotica, agar well diffusion assay.

Introduction

A variety of microorganisms as well as fungi, bacteria, viruses, harbour the soil. Out of those microorganisms, few area units useful for the soil, some don't damage the soil in any respect neither have the benefit of it, however a number of them have the potential to cause major injury to plant growth moreover because the quality of soil. They will result in reduction in plant growth that takes place by obstruction the nutrients that the plant should absorb, or they could cause physical damage that result in uncommon look of the plant successively reducing the market price. Soil borne illness will be a serious limitation for plants.

The infective agent might stay dormant within the soil and may become morbific once more as shortly because the host is out there. Preventive measures taken for the soil to avoid contamination and healthy environmental conditions will be effective for healthy plant growth. Fungi area unit present and infection caused thanks to them has become common. Morbific fungi area unit to blame for infecting flora diseases of the plants. They cause alterations throughout biological process stages as well as post-harvest. There's a good variety of flora genera that causes issues within the quality of fruit, vegetable or crop that area unit associated with aspects like organic process worth, organoleptic characteristics and restricted period of time. In some cases, fungi area unit indirectly to blame for allergic or cytotoxic disorders among shoppers thanks to the assembly of mycotoxins or allergens.

Generally, for the management of phytopathogenic fungi use of artificial fungicides is finished. These chemical fungicides have tremendous facet effects on the plant moreover as on the animals feeding on them the human intense the plant merchandise because it may contain harmful chemicals. Hence, there has been an increasing demand to create use of natural merchandise which will function antifungal agents inflicting less injury to the surroundings and living organisms. Biologically active compounds found in plants area unit a lot of safer than the artificial fungicides. Hence, extracts and oils of medicative plants has been used since it contains a great deal of secondary metabolites as compared to the other plants.

The effectivity of Murraya koenigii leaf extract on some microorganism and a plant life strain by disc diffusion technique (Mohar Singh 2011). In the gift study Murraya koenigii unremarkably known as "curry leaf" leaves extracts subjected to a screening study to find potential antimicrobial activity against Strains of Escherichia coli, eubacteria genus Cereus, Coccus aureus, Bacillus, causes respiratory illness, coccus epidermidis, bacteria genus aeruginosa, coccus faecalis, antibiotics resistant enterococcus and candida. The antibacterial drug activity of the merchandise was evaluated exploitation colonies growing in solid medium, establishing the zone of inhibition in vitro growth (ZOI). Plant (leaf) extract was conjointly used for the phytochemical tests for compounds that embrace Glycosides, Steroids, Tannins, Alkaloids, Flavonoids, Saponins, Quinone, macromolecule and Sugar in accordance with the strategies. The results showed that almost all of the microorganism strains (except E. coli, B. genus Cereus and S. faecalis) had intermediate impact at low concentration leaf extract (10 and 15%) of Murraya koenigii however the effectivity of the leaf extract might be increased by increasing the concentration of the extract.

Therapeutic Uses and pharmacologic Properties of Garlic, and their biologically active compounds (Peyman Mikaili, 2013) is documented in Iran and its leaves, flowers, and cloves are employed in in ancient medication for a protracted time. Analysis in recent decades has shown widespread pharmacologic effects of A. sativum and its organosulfur compounds particularly Allicin. Allicin represents one amongst most studied among these present compounds.

Materials and Method

Materials

A. Fungi Used

1. Aspergillus niger

Isolation - *Aspergillus* culture was obtained by doing agar plate method and the culture was observed under microscope and sub-culturing was done to obtain pure cultures of *Aspergillus* niger.

Seven days old culture of fungi was used. The culture of *Aspergillus niger* was maintained on PDA medium throughout the project.

Taxonomic position [According to the classification system of Alexopoulos and Mims (1979)]:

Kingdom	:	Mycetae
Division	:	Amastigomycota
Sub-division	:	Deuteromycotina
Form-class	:	Deuteromycetes
Form-sub-class	:	Hyphomycetidae
Form-order	:	Moniliales
Form-family	:	Moniliaceae
Form-genus	:	*Apergillus*
Form-species	:	*niger*

Figure I: *Aspergillus niger pure* culture

Macroscopic characters - The colony is black in colour and the reverse surface is white to light yellow in colour.

Microscopic characters - Hypha is septate and hyaline. Conidiophore is present and arises from the basal foot of the. Its conidiophores are smooth-walled, hyaline or turning dark towards the vesicle. Conidial heads are biseriate with the phialides borne on brown, often septate metulae. Conidia are globose to sub globose (3.5-5.0 um in diameter), dark brown to

black and rough-walled. It is known to create increased amount of pathogenicity in various species of plant.

2. Fusarium Oxysporum

Isolation - *Fusarium* culture was obtained by placing banana peel on agar which gave pinkish white colonies surrounding the peel. The colony was first identified under microscope and then sub-cultured and *Fusarium* oxysporum pure cultures were obtained.

Seven days old culture of fungi was used. The culture of *Fusarium oxysporum* was maintained on PDA medium throughout the project.

Taxonomic position [According to the classification system of Alexopoulos and Mims (1979)]:

Kingdom	: Mycetae	
Division	: Amastigomycota	
Sub-division	: Deuteromycotina	
Form-class	: Hyphomycetidae	
Form-order	: Moniliales	
Form-family	: Tuberculariaceae	
Form-genus	: *Fusarium*	
Form-species	: *oxysporum*	**Figure II:** *Fusarium oxysporum* pure culture

Macroscopic characters - Colonies are initially white in colour and turn pinkish or purplish in colour at maturity. The reverse of the plate shows purplish colour.

Microscopic characters - Hyphae are septate and hyaline. Conidiophores are short and simple (mostly not branched). Conidia maybe ellipsoidal, slightly curved in shape.

B. Plants used

Alllium sativum- (Garlic, Family: Liliaceae). For centuries it was used as a traditional Remedy for most health-related disorders. Also, it is widely used as a food ingredient--spice and aphrodisiac. The active ingredients of garlic include enzymes (e.g. alliinase), sulfur-containing compounds such as alliin and compounds produced enzymatically from alliin (e.g. allicin). Garlic is used for many conditions related to the heart and blood system. These conditions include high blood pressure, low blood pressure, high cholesterol, inherited high

cholesterol, coronary heart disease, heart attack, reduced blood flow due to narrowed arteries, and "hardening of the arteries" (atherosclerosis).

C. Culture Medium Used

1. Liquid Culture Medium

a. Richard's Broth

Potassium Nitrate	: 10 g
Potassium Monobasic Phosphate	: 5 g
Magnesium Sulphate	: 0.25 g
Ferric Chloride	: 0.02 g
Sucrose	: 50 g
Distilled water	: 1000 ml

All above constituents was added in conical flask. The flask was plugged and autoclaved at the pressure of 15 lbs./sq.inch. at 121°C for 20 minutes. Streptomycin was added before using the broth.

b. Potato Dextrose Broth, (Bilgrami, 1978)

Potato	: 200 g
Dextrose	: 20 g
Distilled water	: 1000 ml

Peeled and chopped potatoes were boiled in distilled water, till the water became starchy. Solution was filtered through muslin cloth and the volume was raised to 1000 ml by adding distilled water. Filtrate was then transferred to a conical flask and dextrose was added. The flask was plugged and autoclaved at the pressure of 15 lbs./sq. inch at 121°C for 20 minutes. The pH of the media was checked (5.6 ±0.2). Streptomycin was added before pouring the plates.

2. Solid Culture Medium

a. Potato Dextrose Agar (PDA), (Bilgrami, 1978)

Potato	: 200 g
Dextrose	: 20 g
Agar	: 20 g
Distilled water	: 1000 ml

Peeled and chopped potatoes were boiled in distilled water, till the water became starchy. Solution was filtered through muslin cloth and the volume was raised to 1000 ml by adding distilled water. Filtrate was then transferred to a conical flask and dextrose and agar were added. The flask was plugged and autoclaved at the pressure of 15 lbs./sq. inch at 121°C

for 20 minutes. The pH of the media was checked (5.6 ±0.2). Streptomycin was added before pouring the plates.

b. Richard's Agar

Potassium Nitrate	: 10 g
Potassium Monobasic Phosphate	: 5 g
Magnesium Sulphate	: 0.25 g
Ferric Chloride	: 0.02 g
Sucrose	: 50 g
Agar	: 18 g
Distilled water	: 1000 ml

All above constituents was added in conical flask. The flask was plugged and autoclaved at the pressure of 15 lbs./sq. inch. at 121°C for 20 minutes. Streptomycin was added before using the agar.

3. Chemicals Used

Ethanol - Used as a solvent for extraction of secondary metabolites from *Allium sativum.*

Dimethyl sulfoxide (DMSO) -Used to dissolved ethanol extract of *Allium sativum*

4. Other Requirements

Petri plates, Conical flasks, Micropipettes, cork borer, forceps, nichrome loop, Laminar Air Flow, etc.

The entire experiment must be carried out in Aseptic conditions with sterilized glasswares.

Method

A. Aqueous Extract Preparation

Extract Preparation of *Allium Sativum* - Garlic bulbs were crushed and soaked in Distilled water and kept on shaker overnight (150 rpm for 24 hours). Next day the mixture was filtered using muslin cloth. The extract was stored at 4°C.

Extract of different concentration

Concentration (%)	Dried Powder (gm)	Distilled water (ml)
10%	10	100
20%	20	100
30%	30	100
40%	40	100
50%	50	100

B. Ethanolic Extract Preparation

Extract Preparation of Allium sativum

Plant material (Bulbs) were carefully washed and oven-dried (120°C for 2 hours) and put in shade and aerated place later for drying completely. The dried bulbs are ground into a fine powder and the powder is then soaked in Ethanol and kept on shaker overnight (150 rpm for 24 hours). Next day the mixture was filtered using muslin cloth then Whatmann filter paper and the concentrations were made using another organic solvent i.e. DMSO (Dimethyl sulfoxide). The concentrations made and used were 5%, 10%, 20%, 30%, 40%.

C. Testing of Plant Extract (Aqueous/Ethanolic) of *Allium sativum:*

1. In Liquid Culture Medium: 49 ml of Richard's Broth was added to each conical flask and during the time of experiment 1 ml of plant extract (*Allium sativum*) was added to it. The total volume should sum up to be 50 ml in each conical flask. A control flask was maintained to compare the growth and efficacy. The flasks were plugged and autoclaved for sterilization and homogenization of Richard's broth and extract.

Preparation of the concentrations of aqueous extract of *Allium sativum*

Concentrations g/ml (wt./vol.)	Volume of extract (ml)	Volume of Richard's Broth (ml)
Control	0	50
5%	1	49
10%	1	49
20%	1	49
30%	1	49
40%	1	49
50%	1	49

After 7 days of incubation, the fungal growth was observed visually and biomass was measured for different concentrations.

Biomass Estimation - The flasks filtrate was separated by filtration with Whatmann no. 1 filter paper. The weight of filter paper was taken prior. After complete filtration, the mat left on the filter paper was dried completely in oven/incubator (180°C for 2 hours). The dry weight was taken and biomass was calculated.

Observations are recorded and given below.

2. On Solid Culture Medium

The antifungal activity on Solid medium was studied using Agar well diffusion method. In Agar well diffusion method, sterilized PDA is poured into the petri-plates aseptically. Then the media was allowed to cool. About 5 mm diameter well (reservoir) was made in the centre

of the petri-plate using a sterilized cork borer. The plates were then inoculated with fungal discs at equidistant radii. About 100 µl of the plant extract of respective concentration was filled in the well by using sterilized micropipettes. A control petri-plate was maintained without extract for comparison purpose.

Petri-plates were incubated for 7 days to observe the zone of inhibition. The observations and pictures are given below.

Observations and Results

A. Observations for Aqueous Extracts

1. In Liquid Culture Media

Excellent	+++++
Very Good	++++
Good	+++
Fair	++
Poor Growth	+
No Growth	-

Table no 1.a.: For Allium sativum on Aspergillus niger

Concentration of Extract	Weight of Whatmann filter paper (g)	Weight of paper + Biomass (After drying)	Weight of Biomass (g)	Visual Fungal growth in PD Broth
Control	0.830	1.612	0.782	+++++
10%	0.820	1.517	0.697	++++
20%	0.822	1.484	0.662	+++
30%	0.831	1.478	0.647	+++
40%	0.821	1.440	0.619	++
50%	0.823	0.874	0.051	-

Figure 1.a.: Aspergillus niger grown on PD Broth + Allium sativum aqueous extract

Table no 1.b.: For Allium Sativum on Fusarium Oxysporum

Concentration of Extract	Weight of Whatmann filter paper (g)	Weight of paper + Biomass (After drying)	Weight of Biomass (g)	Visual Fungal growth in PD Broth
Control	0.831	1.809	0.978	+++++
10%	0.882	1.158	0.276	++++
20%	0.825	1.078	0.253	++++
30%	0.812	0.988	0.176	+++
40%	0.822	0.895	0.073	++
50%	0.841	0.871	0.030	-

Figure 1.b.: *Fusarium oxysporum* grown on PD Broth + *Allium sativum* aqueous extract

2. On Solid Culture Media

Table no 2-For *Allium sativum on Fusarium oxysporum*

Concentration of Extract	Inhibition zone observed on the 8th day (cm)		
	I	II	Average
Control	0.1	0.5	0.3
10%	0.1	0.4	0.25
20%	0.1	0.1	0.1
30%	0.2	0.7	0.45
40%	0.2	0.3	0.25
50%	0.6	0.4	0.5

Figure 2: *Fusarium oxysporum* inoculated on PDA plate with *Allium sativum* aqueous extract

B. Observations for Ethanolic Extracts

1. In Liquid Culture Media

Table no 3.a.: ***For Allium sativum on Aspergillus niger***

Concentration of Extract	Weight of Whatmann filter paper (g)	Weight of paper + Biomass (After drying)	Weight of Biomass (g)	Visual Fungal growth in Richard's Broth
Control	0.730	1.789	1.059	+++++
5%	0.737	1.728	0.991	++++
10%	0.731	1.650	0.919	+++
20%	0.722	1.642	0.920	+++
30%	0.718	1.548	0.830	++
40%	0.716	1.083	0.367	+

Figure 3.a.: *Aspergillus niger* grown on Richard's Broth + *Allium sativum* ethanolic extract

Table no 3.b.: For Allium sativum on Fusarium oxysporum

Concentration of Extract	Weight of Whatmann filter paper (g)	Weight of paper + Biomass (After drying)	Weight of Biomass (g)	Visual Fungal growth in Richard's Broth
Control	0.896	1.199	0.303	++++
5%	0.886	1.102	0.216	+++
10%	0.866	0.982	0.116	++
20%	0.889	0.967	0.078	+
30%	0.857	0.925	0.068	+
40%	0.861	0.898	0.037	-

Figure 3.b.: *Fusarium oxysporum* grown on Richard's Broth+ *Allium sativum* ethanolic extract

2. On Solid Culture Media

Table no 4: For Allium sativum on Fusarium oxysporum

Concentration of Extract	**Inhibition zone observed on the 8th day (cm)**		
	I	**II**	**Average**
Control	0.5	0.7	0.6
5%	0.2	0.2	0.2
10%	0.1	0.2	0.15
20%	0.2	0.1	0.15
30%	0.2	0.1	0.15
40%	0.2	0.4	0.3

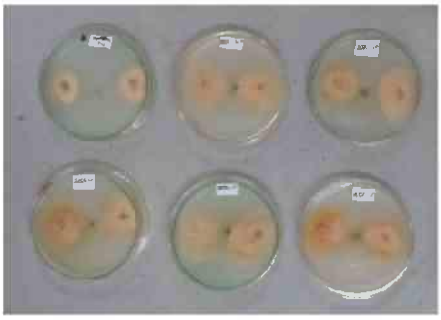

Figure 4: *Fusarium Oxysporum* Inoculated on Richard's Agar Plate with *Allium Sativum* Ethanolic Extract

Results

The results indicated that *Allium sativum* was effective as an antifungal extract because it showed considerable amount of Zone of Inhibition. Although, Allium sativum was resistant, still it did show a fair amount of reduction in biomass at higher concentrations of plant extracts (both aqueous and ethanolic). *Fusarium oxysporum* on the other hand was very sensitive to plant extracts and hence was very slow growing too.

A. On Liquid Culture Medium

For Aqueous Extracts of Allium Sativum (Garlic)

- The growth of *Aspergillus niger* was completely inhibited at 50% concentration of aqueous Garlic extract. Other concentrations (10%, 20%, 30%, 40%) showed fair amount of growth.
- The growth was very slow for *Fusarium oxysporum* on Garlic aqueous extract on 10%, 20% and 30%. 40% showed a great amount of inhibition whereas, 50% didn't show growth at all. Hence, minimum inhibitory concentration was found in 50%.

For Ethanolic Extract of *Allium Sativum* (Garlic)

- *Aspergillus* showed a considerable reduction in mycelial growth on 40% ethanolic extract of Garlic. It also showed colour changes (brown pigmentation) as compared to the *Aspergillus* control (on Richard's media).
- The growth of *Fusarium* was very slow in ethanolic extract of garlic and it also showed complete inhibition at 40%. The mycelial mat quantity varied considerably in 20%, 30% of ethanolic extract as compared to the Control used.

B. On Solid Culture Medium

Aspergillus niger is very resistant to the plant extracts (*Aqueous & Ethanolic*). When inoculated on equidistant radii it tends to overgrow on the reservoir in between too. Hence, agar well diffusion method was not an effective method to test the inhibition for *A. niger*.

The agar well diffusion method showed a clear inhibition zone on higher concentrations of both Aqueous and Ethanolic extracts for *Fusarium oxysporum only*.

1. For Aqueous Extracts of Allium Sativum (Garlic) - As compared to the control plate and other concentrations (10%, 20%, 40%), *Fusarium oxysporum* showed very clear inhibition in 30% and 50% concentrations.

2. For Ethanolic Extract of Allium Sativum (Garlic) - 5% shows overgrowth of *Fusarium oxysporum* on the well. 10% onwards there is a major inhibition seen. 40% show maximum inhibitory zone as compared to rest of the concentrations.

Discussion

Plants are susceptible to fungal attacks which causes major loss of yield and causes damage to the quantity and quality of crops and its product. In order to overcome this problem synthetic fungicides are brought to use to lessen the effects of fungi. The usage of chemical/ synthetic fungicides results in accumulation of toxic chemicals in the plant which may lead to undesirable effects. To avoid these problems and promote healthy growth of plants simultaneously eradicating the fungi from the plant, there is a growing need to create natural fungicides which has minimal or no side effects on the plant.

Both fungi (*Aspergillus niger* and *Fusarium oxysporum*) which fall under the sub division Deuteromycotina, against which antifungal extracts were tested are pathogenic fungi which caused disease of the plants and are most common contaminants of crops worldwide.

The active components present in Allium sativum were extracted using water (aqueous) and ethanol (organic solvent).

According to a research study, *Allium sativum* consists of organo-sulphur compounds, out of which Allicin is the main sulphur containing compound. Allicin is known to show inhibition mostly in ethanolic extracts as compared to aqueous extract. Allicin in garlic extract showed inhibitory activity against murine pulmonary aspergillosis and against *Candida albicans.* High zones of inhibition were noticed against dermatophytic fungi in ethanolic extracts. (Peyman Mikaili, Surush Maadirad, Milad Moloudizargari, Shahin Aghanjanshakeri and Shadi Sarahroodi, 2013).

For testing the efficacy of extracts, (aqueous and ethanolic) of *Allium sativum* on pathogenic fungi *A. niger* and *Fusarium oxysporum.* 2 types of methods were performed - 1. Liquid culture media method (Broth method) and 2. Solid culture media method (Agar well-diffusion method).

On Liquid culture media for aqueous Garlic extract showed complete inhibitory effect on both *A. niger* as well as *F. oxysporum* on 50% concentrations and major reduction in mat at 40% concentration. Minimum Inhibitory Concentration here is 50%.

On solid culture media maximum inhibitory zones were observed at 50% concentration in *Fusarium oxysporum* for Garlic aqueous plant extracts. *Aspergillus niger* does not show a zone and also grew on the reservoir.

Ethanolic garlic extract showed reduction at 40% in *A. niger* and complete inhibition in *F. oxysporum* at 40%. On solid media however, Garlic showed maximum inhibition zone at 40%.

Conclusion

The above investigation has brought us to the conclusion that Ethanolic and Aqueous plant extract of *Allium sativum* are effective against the both pathogenic fungi *i.e. Aspergillus* niger (which causes mold disease) and *Fusarium oxysporum* (which is a wilt causing fungi). In this particular study Aqueous extracts showed better inhibitory results as compared to Ethanolic solvents. *Aspergillus niger* showed more resistance against garlic plant extracts at most concentrations. *Fusarium* being sensitive to the antifungal compounds present in garlic extracts has shown considerable decrease in biomass and the plant extracts (aqueous and ethanolic) showed complete inhibition at the highest concentrations used (50% for Aqueous extract and 40% for Ethanolic extract).

The variations in the effects of plant extracts on inhibiting the pathogenic fungi maybe due to the variable concentrations of plant extract we used. Also, the type of solvent used for plant extract preparation may have a profound effect on inhibition.

Studies indicate that the higher the concentration of plant extract (both aqueous and ethanolic) the higher is effect of inhibition. Higher concentrations of Garlic extract for both types show tremendous reduction in *Aspergillus niger* growth and complete inhibition at a certain percentage for *Fusarium oxysporum. Aspergillus niger* does not show inhibition zones even higher concentrations whereas, *Fusarium oxysporum.* does.

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14. Isolation and Identification of Dandruff Causing Microorganism and Study Effectiveness of Shampoo W.R.T. Zone of Inhibition

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Abstract

Dandruff is that the major drawback for several folks in today's world. Several anti-dandruff shampoos square measure marketed to combat the matter of dandruff. The current Study deals with testing the impact of various shampoos on dandruff inflicting flora isolate Malassezia. Isolation of Malassezia was distributed by exploitation Mueller-Hinton agar and Sabouraud grape sugar Agar medium. Total four shampoos were hand-picked to examine the effectualness against Malassezia by Kirby-Bauer disc diffusion methodology. All the chosen shampoos were established to be effective as all of them showed the inhibition against Malassezia.

Keywords: Dandruff, Malassezia species, shampoos.

Introduction

Dandruff may be a chronic scalp condition characterised by scaling, haptic sensation and redness of the Scalp. It happens once scalp sheds stratum cells in massive clumps. The skin of scalp renews itself concerning once a month. Usually, scalp sheds dead cells in nearly invisible means, however generally cell turnover becomes speedy and dead cells square measure shed as visible flakes known as dandruff. Dandruff may be a major cosmetic drawback that poses terribly nice public health concern each in developed and developing countries (Krishnamoorthy et.al. 2006). In step with the symptoms dandruff is assessed into 2 sorts – Dry (common) and Oily. Dry dandruff additionally referred to as dermatosis simplex is characterised by excessive formation of Minute scales of white grey or ashen color, accumulating on the scalp space. These scales square measure initially localized within the middle of scalp space then unfold towards membrane

bone, frontal areas. during this variety of dandruff, no excessive hair loss is determined. the opposite variety of Dandruff is termed oily dandruff or dermatosis steatoides. It arises on the scalp skin with varied Intensity of secretion production. Inflammation of assorted intensity develops on the scalp skin beside the looks of oily scales of dirty yellow color that may type lesions. Hair fall is common; it should additionally exacerbate parthenogenesis baldness. the foremost common website plagued by this sort of dandruff is scalp, however it will occur between eyebrows, on the facet of nose, behind the ears. Dandruff will virtually be controlled and effectively treated, how- ever the treatment of dandruff might take a touch patience and persistence.

In general, daily cleansing with shampoo to cut back oily ness and somatic cell build-up will usually up will usually facilitate mild dandruff. Once regular shampoos aren't effective, dandruff shampoos will be used. Also, dandruff shampoos aren't all alike, and one might have to experiment till they realize the one that most closely fits them. The formulations should appropriate for furry regions and combat the dandruff conditions. It's so essential that these formulations have accepted pharmaceutical properties at the cosmetologically level. Differing kinds of formulations like shampoos, creams, lotions, Emulsions, hair oils and different cosmetic formulations square measure pronto obtainable within the market that square measure accustomed management dandruff. Malassezia (formerly referred to as Pityrosporum) may be a Monophyletic and unipolar oleophilic yeast. It's naturally Found on the skin surfaces of the many animals, as well as Humans and related to a range of conditions as well as dandruff, atopic eczema/ dermatitis, dermatosis versicolor, seborrheic eczema and inflammation. It's a vicinity of natural body flora. It lives Quietly and overlooked on our body, typically while not our Being awake to its presence unless stress, illness, antibiotics or different unfavourable conditions upset the natural balance of Our body's response. The genus Malassezia consists of seven species. M. furfur is Restricted to the human host, M. sympodialis may be a cat and Human microorganism and M. Pachydermatis, the responsible agent of canine otitis (Klein et al., 1996) is additionally a person's microorganism. The remaining four species viz., M. globosa, M. obtusa, M. restricta and M. slooffiae were recently Isolated from infections that were antecedently believed to be Caused by M. furfur, M. sympodialis or M. pachydermatis in origin. A shampoo is also delineated as a cosmetic preparation needed for the laundry of hair and scalp, packed in an exceedingly type that is convenient to be used. The word shampoo comes from the French sense Beard soap. Its

primary perform is to cleanse the hair of accumulated secretion, scalp scrap and residues of hair-Grooming preparations. The accessorial functions of shampoo embody lubrication, acquisition, body building, interference of static charge build up, medication so on.

Materials and Methods

To perform the experiments various agar medium required and they are; Sabouraud dextrose agar, Mueller-Hinton agar, Nutrient agar.

Sample Collection and Identification

Sterile swab sticks were used to collect the samples by rolling the sticks on the scalp of 2 female students of Thakur Shyamnarayan degree college, Kandivali. The samples Were inoculated over the surface of Sabouraud Dextrose Agar (SDA). The plates were then Incubated at 37 °C for 3 days, which were observed Regularly. Gram Staining was performed for all the isolates to observe the shape of the cells and their type of budding by Standard Gram staining procedure.

Biochemical Analysis

3 mL of 3% Hydrogen peroxide (H_2O_2) solution was poured into a test Tube. Several colonies of the isolated fungal colonies were immersed into the test tube using a sterile glass rod.

Photoplate.1: Dandruff Sample

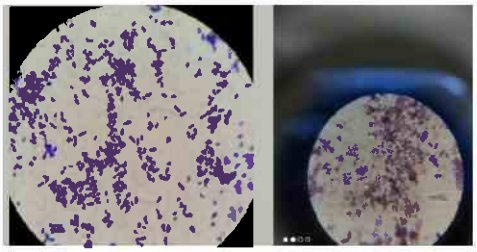
Result and Discussion

Catalase test was carried out to ascertain the presence of Malassezia species as it is catalase positive, Except M. restricta which is catalase negative. Zone of Inhibition was done on Sabouraud dextrose agar and Mueller-Hinton agar by disc diffusion method. 24 hours of active culture was spread using a sterile glass spreader over the surface of Sabouraud dextrose agar and Mueller-Hinton agar. All the shampoos were dissolved in sterile distilled water (concentration 5ml of shampoo were added 10ml of distilled water and add disc take rest into 1 hour). Then applied antimicrobial disc and the Plates were incubated at 37 °C for 24 hours. After incubation, the plates were observed. The inhibition zone was using a zone measuring

scale and the results were recorded. Head & Shoulders, Clinic plus, sunsilk, Loreal shampoos were used and it shows ZOI up to 2.3cm, 1.8cm, 0.6cm, 1 cm respectively in MH agar whereas up to 2cm, 1.5cm, 1.2cm, 1.1cm in SD agar respectively. On this we can say the among the four Head and Shoulders shampoos are more effective to treat dandruff. Hence, Zinc Pyrithione is more effective chemical agent to treat the dandruff as compare to Sodium Laureth Sulphate.

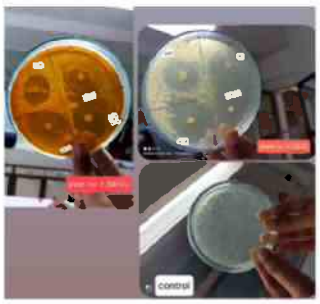
Name of the shampoo	**Active Chemical Agent**	**Zone of Inhibition in diameter (in cm) Plate 1 in (MHA)**	**Zone of Inhibition in diameter (in cm) Plate 2 in (SDA)**
Head & Shoulders	Zinc Pyrithione	2.3	2
Clinic Plus	Sodium Laureth Sulphate	1.8	1.5
Sunsilk	Almond Oil,	0.6	1.2
Loreal	Sodium Laureth Sulphate	1	1.1

Table 1: List of Shampoos used and their respective ZOI size in diameter (in cm)



Photoplate.2: Microscopic Observations

Test for Catalase showing active bubbling



Photoplate.3: Zone of Inhibition observed in MHA and SDA

Conclusion

Anti-dandruff shampoos area unit wide accepted nowadays to induce obviate dandruff. These anti-dandruff formulations embody Therapeutic use of anti-dandruff agents that area unit classified into 3 teams per their mechanism of action. These include Fungicidal substances (Zinc pyrithione, Ketoconazole etc.), Cytostatic substances (Selenium sulfide, Tar etc.) and Keratolytic substances (Salicylic acid, sulfur Derivatives etc.). Anti-dandruff product containing these Agents work symptomatically and sometimes repeat of Dandruff is determined when the treatment has been stopped, that is that the principally frustrating. the best zone of inhibition was Obtained by head & shoulders.

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15. Isolation and Identification of Microorganisms Present in the Air of Different Western Railway Junction in Mumbai Suburban during CORONA Pandemic

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Abstract

The presence of aeroallergens can be of great impact in humans as they cause severe allergic reactions and they consist of bacteria, fungal spores, organic dust, soot particles, viruses or pollen grains. A study of air micro flora was conducted in order to estimate the bio allergens present in different locations in Mumbai suburban station. The air consists of Aeromycoflora and Aeromicroflora and collectively known as Aeroflora. In this Covid pandemic it is a need of time to know about the different constituents of the microorganism present in the air. Our study is to more focus on study related to aeromycoflora at different railway station in western suburban.

Keywords: Aeromycoflora, Aeromicroflora, Bio allergens, Microbial study, etc.

Introduction

Biological material as well as microorganisms and toxins are found in air or the atmosphere, and therefore the study of this space is termed "aeromicrobiology". Mobile biological materials area unit referred to as bioaerosols. the fundamentals of aeromicrobiology as well as the character of bioaerosols and fundamentals of the aeromicrobiological. the character of the atmosphere as a microbic environs, and therefore the factors that influence microbic survival within the air area unit represented. This can be followed by a discussion of interschool aeromicrobiology associated with aerosolization of native soil pathogens; contagion pandemics; biology within the clouds; agriculture; waste

disposal; and mobile toxins. Intramural biology inside buildings is mentioned with relevancy public health inside buildings, hospitals and laboratories. Finally, measures to regulate bioaerosols as well as safety within the laboratory area unit documented.

Fungi area unit typically plant morbific. There area unit relatively few species that area unit morbific to animals, particularly mammals. in keeping with Hawksworth (1992), there area unit or so one. 5 million represented species of fungi. over four hundred species area unit glorious to cause illness in animals, and much fewer of those species can specifically cause illness in kinsmen. Several of them can cause solely superficial varieties of diseases that area unit a lot of of a cosmetic than a pathological state. Thus, there don't seem to be several species of fungi that area unit morbific to human that may be fatal. The study of Fungi as animal and human pathogens is understood as medical phytology. There's conjointly a branch referred to as veterinary phytology however the kinds of diseases that area unit found within the pets area unit typically a similar as area unit found in kinsmen. attributable to the rarity of human diseases caused by Fungi, there's less information of such diseases. Roman scholar, Marcus Terentius Varro (116BC-27BC) suspected that illness was caused by very little animals within the air.

In 1674, Anton Van Leuwenhoek became the primary person to examine and describe numerous microorganisms. He continuing to watch the microorganisms till his death in 1723. In 1841, David Gruby incontestable for the primary time that a flora infection of the scalp, referred to as fungal infection, was caused by a flora (in Rippon, 1988). In 1890 Sabouraud began business enterprise giant numbers of articles on flora disorders of the skin and eventually gave monumental contribution to the sphere of medical phytology. It'd not be till 1934 that species ideas of dermatophytes would be redefined by Chester Emmons, in keeping with the foundations of botanic terminology, and current mycological standards of reproductive structure morphology and therefore the structures on/in that they were borne. The first case of desert rheumatism was represented in Argentina shortly before 1890; the patient suffered for seven years before finally dying and by 1915, there have been forty glorious cases of this illness, that was thought to be a rare and universally fatal.

However, by now it had been already glorious that there was an illness referred to as mycosis, that wasn't associated, at that point, with C. immitis. It'd not be till Dickson (1937) that it had been accomplished that mycosis was simply a milder style of desert rheumatism,

that was conjointly represented by Fiese, M. J. 1958. Dickson & Gifford (1938) closing coccidioidin diagnostic test of old residents of Jerome Kern County incontestable that 50-70% have, at it slow been infected by this flora.

Aspergillus fumigatus may be a species advanced instead of one species. it's truly composed of 10 species. These species area unit unremarkably found in decaying vegetation, particularly once the latter is undergoing microbiological heating, as a result of this advanced is thermophilic, tailored to growing at high temperatures fifty - 55°C (120 -130°F).

In people, the illness will cause a chronic respiratory organ infection that is seemingly terribly contagious. The flora is believed to cause death, however that's not bound. In patients that have died, and A. fumigatus has been isolated, several have conjointly had underlying illness that probably down their resistance to the flora. However, it's conjointly attainable that the flora had down their resistance to the opposite infective agents. it's tough to grasp what came initial.

There area unit regarding one, 20,000 and odd individuals commute daily within the space of western suburb Railway station, Mumbai. Hence, it had been of prime importance to try and do the survey of air quality during this space to isolate and establish aeromycoflora. So, threats to the life is detected. There are many of us who commute at completely different components of those terminal and also the samples collected at these places. thence it absolutely was necessary to understand regarding the aeromicroflora and aeromicroflora of various suburbs of the stations at this covid pandemic.This conjointly tells North American nation regarding the air quality of the various station that is admittedly necessary at this pandemic time.

Materials and Methods

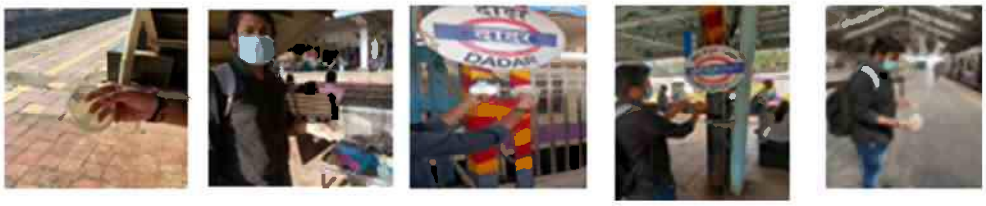
Isolation of air micro flora was done by using Gravity Settling method. For this Nutrient Agar plates and sabouraud dextrose plate was used.

For preparation of nutrient agar, 28gms of nutrient agar was added to 1l distilled water and the medium was sterilized at 120°c and 15 lbs pressure. 20 ml of sterilized NA was poured into sterile petri plates and medium was allowed to cool till solidified.

For preparation of Sabouraud dextrose agar, 65gms of nutrient agar was added to 1l distilled water and the medium was sterilized at 120°c and 15 lbs pressure. 20 ml of sterilized NA was poured into sterile petri plates and medium was allowed to cool till solidified.

Locations of Western Line Railway station

Sr. No.	Railway Station Name	Latitude	Longitude
1	Churchgate	18.9353^{0}N	72.8272^{0}E
2	Mumbai central	18.9696^{0}N	72.8194^{0}E
3	Dadar	19.0181^{0}N	72.8434^{0}E
4	Bandra	19.0625^{0}N	72.8413^{0}E
5	Andheri	19.1198^{0}N	72.8465^{0}E
6	Borivali	19.2291^{0}N	72.8574^{0}E
7	Virar	19.4550^{0}N	72.8119^{0}E



Photoplate.1: Collection of samples at different Railway Junction

Result and Discussion

Table 1: Characters and Identification of Fungal Organisms

Sr. No.	Characters		Name of the Organism
	Mycelium	Spores / Conidia	
1	Colonies olive black, velvety.	Conidiophores short, simple, unbranched; conidia forming branched chain of 2 to 10 with 3 to 8 transverse septa in each; conidia golden brown, pale, 20-63 X 9-13µm.	*Alternaria alternata (Fr.) Keissl., Beihefte Bot. Centralbl.*, Abt. 129(2):434(1912). Ellis, p. 466 (1971).
2	Colonies brown at first but turning into black.	Conidiophores coarse, Head varying in size, biseriate but some having phialides borne directly on the vesicle, Phialides 7 – 10 X 2 – 2.5 µm, Conidia globose or subglobose, sometimes elliptic, 3 – 6 µm in diameter formed in chains giving rise to ornamented conidia.	*Aspergillus carbonicus Gallo, A. et. al. Int. J. Food* Microbiol. 179, 10-17 (2014).
3	Colonies yellow at first	Conidiophores coarse with	*Aspergillus flavus*

	but turning into bright to dark yellow green.	length of 1mm & diameter of 19 – 20 µm, Head varying in size, loosely radiate / splitting / columnar, biseriate but some having phialides borne directly on the vesicle, Phialides 7 – 10 X 2 – 2.5 µm, Conidia globose or subglobose, sometimes elliptic, 3 – 6 µm in diameter	(Raper and Fennell, 1965; N. K. Udaya Prakash, 2004)
4	Growth spreading, dark smoky green, more or less velvety, Young heads bluish green, Conidial heads columnar with varying length,	Conidiophores smooth, short, often greenish, 2–8 µm diameter, Vesicles flask shaped, fertile on upper half of / 3 quarters, Often greenish, phialides borne directly on vesicles, closely packed, lower ones deflected upwards, 6 – 8 X 2 – 3 µm. Conidia small, globose, smooth, mostly 2.5 – 3 µm in diameter	*Aspergillus fumigatus* (Raper and Fennell, 1965; N. K. Udaya Prakash,2004)
5	Colonies light green, smooth, velvety; developing dirty white patch from the center outwards; reverse deep red to purple;	Conidial heads columnar, short, brown, with distinct foot cells, usually short, phialides biseriate, conidia globose, rough about 2.5 – 4 µm in diameter	*Aspergillus nidulans* (Raper and Fennell, 1965; Raper, 1966b; Clutterbuck, 1974)
6	Colonies spreading rapidly, with mycelium white to dark brown, black to purple heads, Conidial heads globose, radiate	Conidiophores arise from substratum varying from 200 µm to several mm long, 10 – 20 µm in diameter, smooth, vesicles globose, phialides borne directly on the vesicle or metulae present, metulae vary in length 10 – 15 µm; Conidia small, globose, rough, 4 - µm in diameter	*Aspergillus niger* (Raper and Fennell, 1965)
7	Colonies yellowish to orange brown, reverse orange red to maroon.	Conidial heads few, scattered; pale, grey, green in colour; conidiophores hyaline, thin walled; vesicles about 21-27 X 15-18 µm; phialids uniseriate; conidia elliptical, spinulose, orange brown in colour.	*Aspergillus ruber* Thom & Church, *The Genus* Aspergillus: 112 (1926).
8	Colonies grayish black;	Conidiophores solitary,	*Bipolaris papendorfii* (Aa)

	diffused.	straight; pale, brown, large, dark; conidia typically curved, navicular; olive brown with pale ends; mostly 35-45 µm long and 20-24 µm wide.	Alcon, *Mycotaxon* 17: 68 (1983); Ellis, p.413 (1971).
9	Colonies white to cream coloured, slow growing, smooth; mycelium hyaline, submerged; pseudohyphae and true hyphae also seen.	Budding cells (blastoconidia) of varying shapes; usually round or short oval, 2.8-10.5 µm in diam; chlamydospores round, large, thick-walled and usually terminal.	*Candida albicans* (C.P. *Robin) Berkhout, De Schimmelgesl. Monilia, Oidium, Oospora en Torula, Disset. Ultrecht: 44 (1923);* Watanabe, p. 212 (2002).
10	Colonies golden yellow with production of ample conidial masses; ascomata globous, dark brown without peridial hairs.	Ascospores brown, smooth walled, ellipsoidal, formed singly, spherical, nearly hyaline, thin-walled.	*Corynacus sepedonium* (C.W.Emmons) *Arx, Proc. K. Ned. Akad. Wet., Ser. C, Biol, Med. Sci.* 76(3):292(1973); Domsch et.al., Vol.1.p.232(1980).
11	Colonies dark grey, velvety with branched, septate mycelium.	Conidiophores long; conidia elliptic curved; septa usually 3 with 3rd cell broader and darker than the others.	*Curvularia lunata M. B. Ellis, Mycol. Pap.* 106:34(1966).
12	Colonies yellowish brown with similar colour on reverse.	Sporodochia pulvinate, visible as black dots; conidia globose usually 15 to 25 µm in diam.	Epicocum nigrum Link., Magazin Ges. naturf. Freunde, Berlin 7:32(1815); Ellis p. 72(1971).
13	Colony peach colored, conidiogenous cells hyaline, enteroblastic, mono or polyphialidic	Macroconodia abundant, typically falcate with foot cell, tapering at both the ends, 4 septate	*Fusarium equisetii* (Booth, 1971; John Webster 1980; Barnett and Hunter, 1987)
14	Colony salmon pink colored, conidiogenous cells hyaline, enteroblastic, mono or polyphialidic.	Straight, tapering, fusiform, 5 septate macroconidia	*Fusarium moniliforme* (Booth, 1971; John Webster, 1980; Barnett and Hunter, 1987)
15	Colonies white with purple violet tinge; reverse dark purple.	Conidiophores unbranched; microconidia abundant, ellipsoidal; macroconidia 2 to 5 septate, fusiform curved.	*Fusarium oxysporum* Schlecht, *Flora Beroliensis*2:139(1824).
16	Colonies thick olive green colour with reddish brown reverse.	Conidiophores formed on surface usually terminal; conidia ellipsoidal and smooth.	*Penicillium chrysogenum Thom, Bull. Bur. Anim. Ind. US Dep. Agric.* 118:58(1910); Pitt, p. 328 – 331 (1979).
17	Mycelium with no obvious pattern, whitish in colour.	Chlamydospores abundant, delimited from mycelium with septum, usually	*Phytophthora palmivora (E. J. Butler) E. J. Butler, Science Rep. agric.* Res. Inst.

		yellowish brown in colour; sporangia abundant, ellipsoidal with a prominent papilla.	Pusa:82 (1919)
18	Mycelium with abundant branching, thread like curve.	Sporangia spherical terminal; conidia colourless terminal with thick wall.	*Pythium debaryanum R. Hesse, Inaug. Diss., Halle:14*-34(1874); Gilman, p.158(1957); Waterhouse, p.19-20(1968).
19	Presence of the rhizoids at the base of sporangiophores, Stoloniferous habit, An aerial hypha grows out and where it touches the substratum it bears rhizoids and sporangiophores. The growth is repeated.	Sporangiophores in groups from stolon, opposite to rhizoids; sporangium spherical, brown with well-developed Columella	*Rhizopus stolonifer* (N. K. Udaya Prakash, 2004)
20	Colonies loose, white turning greenish on maturation.	Conidiophores branched; conidia conspicuously rough, globose; bluish green in colour.	*Trichoderma viridae Pers., Syst. Mycol.* (Lundae) 3:215 (1794); Mycol. Pap. 116: 1-56(1969); Subramanian, p. 653-655 (1971).

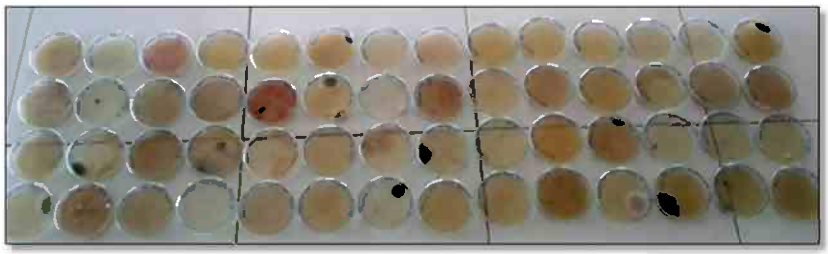
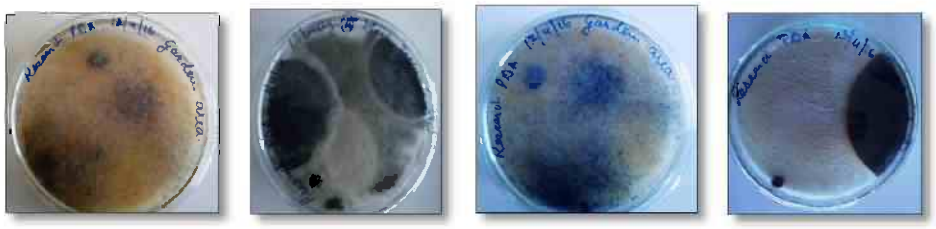
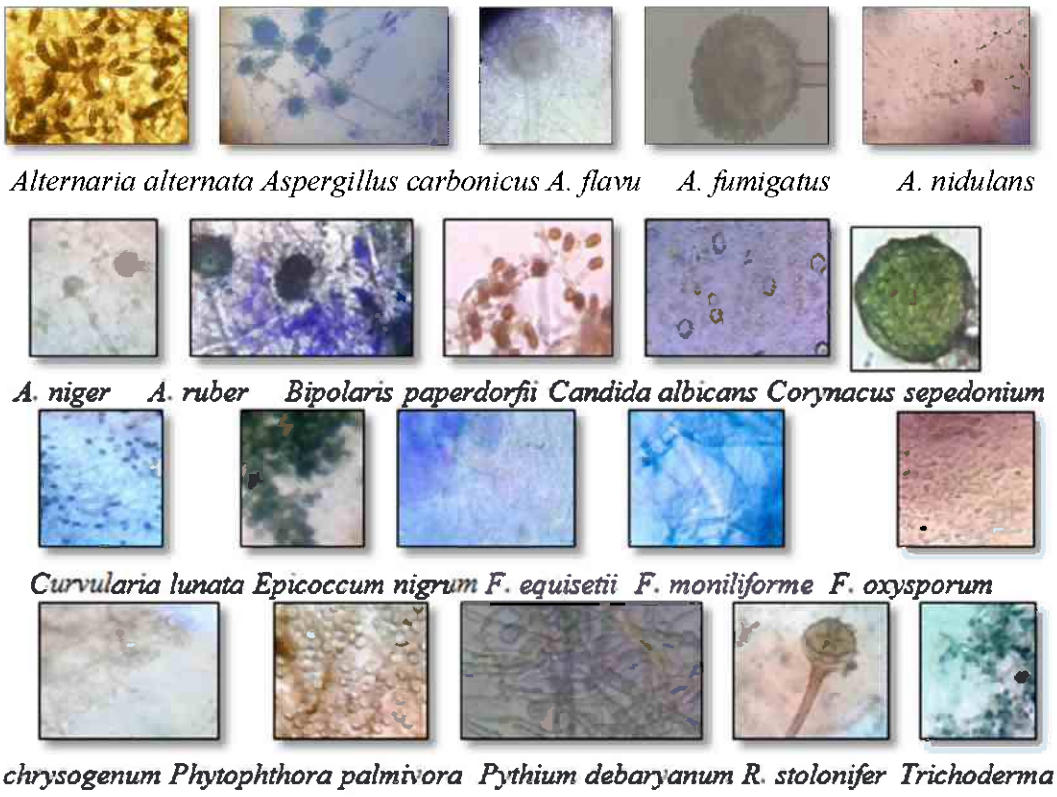


Photo Plate 2: Petri plates kept for incubation after exposed at different railway station



Photoplate 3: Colony Cultures of the Fungi

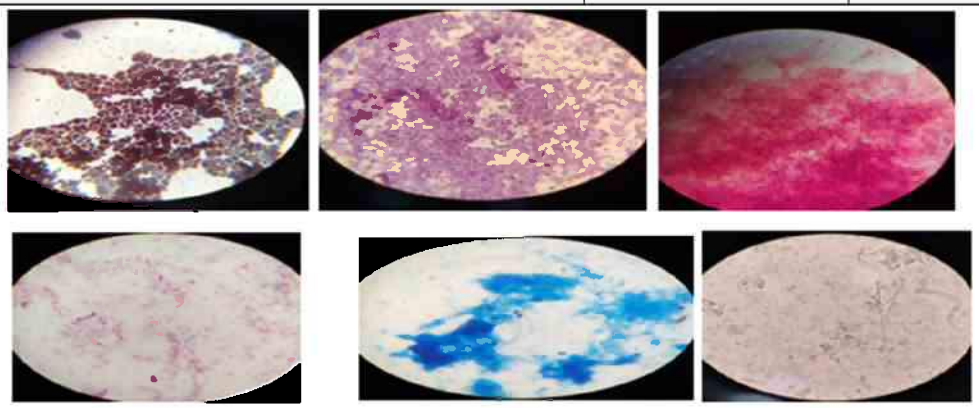


Photoplate 4: Microscopic Characters of the Fungi

Table.2: Characters and Identification of Bacteria

Sr. No	Colony Characteristic	Family	Organism
1)	Round, smooth, convex, glistening with entire edge. S. aureus from cattle, human and other domestic animals produces golden yellow coloured colonies in nutrient agar.	*Micrococcaceae*	*Staphylococcus aureus*

2)	Dome-shaped with a smooth or moist surface and clear margins. They display a white-greyish color and have a diameter of > 0.5 mm, and are surrounded by a zone of β-hemolysis that is often two to four times as large as the colony diameter.	*Enterococci*	*Streptococcus pyogenes*
3)	Off-white or beige in color with a shiny texture. It often looks like mucus or a cloudy film over the whole surface of the plate. An E. coli colony is slightly raised and has an entire, fixed margin and a steady growth pattern, creating concentric growth rings in the colony.	*Enterobacteriaceae*	*Escherichia coli*
4)	Rod-shaped and Gram-positive, When cultured on ordinary nutrient agar, the morphology circular colony of this bacteria is rough, opaque, fuzzy white or slightly yellow with jagged edges.	*Bacillaceae*	*Bacillus sp.*
5)	Gram-negative, oxidase negative, catalase positive, citrate positive, indole negative, rod-shaped bacterium. The bacterium is approximately 1-3 microns in length, and is capable of motility via peritrichous flagella.	*Enterobacteriaceae*	*Enterobacter aerogenes*
6)	Small Gram-negative rods, 0.3 - 1μm in diameter and 1 - 6μm in length, appearing singly, in pairs and in chains. Shigella species are facultative anaerobes and are non-spore formers. Shigella species do not possess flagella and hence are non-motile.	*Enterobacteriaceae*	*Shigella sp.*



Photoplate 4: Microscopic Characters of the Bacteria

Conclusion

Different microflora and mycoflora at different railway junction in Mumbai suburb were studied and classification of organisms was done. Outdoor aeromycoflora from railway station, where 10000s of public commute from one place to other is known to be significant in respect of allergic as well as air borne diseases to human being. The present research reveals that there are diverse mycoflora and microflora of outdoor environment of the Mumbai western Railway Suburbs. The effect of airborne fungal spores on human health is also point of concern which could be studied by the use of preliminary data provided in this study. Exposure to outdoor airborne inhalant mould allergens develops respiratory symptoms, airways disorders and allergies may impose the direct impact on commuters and their relatives who travels via this route.

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16. A Revew: "Local Significance of Biodiversity Science at Marine Drive Mumbai, Maharashtra"

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Abstract

India is one of the 12 mega-biodiverse countries and one among 25 biodiversity hotspots of the richest and highly endangered eco-regions of the world. According to the Indian naval hydrographical charts, the mainland coast consists of the following 43% sandy beaches, 4% rocky coast including cliffs and 46% mudflats or marshy coast. Marine ecosystems are highly dynamic, tightly connected through a network of surface and deep water currents whose stratification are broken by upwelling that create vertical and horizontal heterogeneity. Coral reefs are important for fisheries and protecting coasts from wave action and erosion. This study brings our attention to the fact that beaches are of great importance and contribute in increasing the revenue and the development of infrastructure. This study highlights the rich biodiversity of one of the most prominent beaches of Mumbai i.e. Marine drive and it's locality.

Keywords: Biodiversity, Ecosystem, Marine Life, Coastal Region, Habitats, Tourist Attraction, Human Population, Conservation and benefits

Introduction

Diversity of life is formed at all levels of organization. The variety of life on our planet is referred to as biodiversity. From barnacles to whales to coral reefs, it encompasses all animals, plants, and microorganisms that live in our waters. The phrase is also used to indicate the number of different species that live in a certain location. Some sites are considered to as biological "hotspots" because they host such a diverse range of uncommon and endangered species. These are habitats with high diversity that support important biological processes like procreation, nurseries, and feeding grounds. Some even feature species that aren't found

anywhere else on the planet. The levels of biodiversity are diversity within a species, the diversity of species and the diversity of ecosystems. The Convention of Biological Diversity (CBD) of 1992 states that biodiversity is variety among living organisms from sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part of. India is quite popular among other countries for its diverse culture and rich biodiversity. India is undoubtedly well-known for having a high level of aquatic biodiversity. Marine ecosystems are richer in nutrients and hence are able to support more life. The marine environment of India consists of a variety of ecosystems occurring along the coastline which borders the Indian peninsula and encircles two major islands. The Indian coastline measures 7,516 km of which the mainland part measures 5,422 km. and that around the two major island groups measures 2,904 km. (encompassing 132 km. surrounding Lakshadweep and 1962 km circling the Andaman and Nicobar islands). Mumbai is an island in the Arabian Sea off the west coast of the Indian peninsula. The city of Mumbai was discovered on a group of seven islets. It has now grown into a three-mile-wide swarm of islands. Mumbai has a 100 kilometer-long coastline. One of the most famous tourist attraction and also a part of aquatic biodiversity, Marine drive has around 4 kilometer road along the Netaji Subhash Chandra Bose Road in Mumbai, India. It is a concrete road which looks like 'C'-shape. At the northern end of Marine Drive is Girgaon Chowpatty, well known for its fast food stalls. There are restaurants that are which are present along the stretch of the road.

Marine Drive is situated on retrieved land facing west/south-west. At night when viewed from an elevated point along the drive, the street lights resemble a string of pearls in a necklace hence its called as Queen's Necklace. It also connects the central business district situated at Nariman Point to the rest of the city. Numerous Sports Clubs are situated along the tract of Marine Drive. The majority of Mumbai's population has access to housing and sanitary amenities; nearly half of the city's 12 million citizens live in slums or are homeless. This contributes to great extent in the pollution of coastal shores and water bodies like Marine drive. One needs to understand that marine ecosystem and biodiversity plays a great role in providing services that are beneficial to man kind in many ways. Cultural, regulating, provisioning and supporting are some of the services available due to biodiversity.

Sub-topics

Marine ecosystems are important to mankind, ecologically and economically, providing numerous vital goods and services, supporting the processes that sustain the entire biosphere.

Supporting services: These services are necessary for the production of all other ecosystem services, such as production of atmospheric oxygen, nutrient cycling, water cycling and provisioning of the habitat.

Regulating services: The benefits people obtain from regulation of ecosystem processes, including air quality maintenance, climate regulation, regulation of human diseases, disease control, water purification, natural hazard and disaster risk reduction (mitigation of the threat from floods and tsunamis) etc.

Provisioning services: The products people obtain from ecosystems, such as food (fish), medicinal and aromatic products, fresh water, minerals and genetic resources.

Review of Literature

Biodiversity forms the base for strong ecosystems supporting a wide range of 'functions'. Changes in biodiversity can influence all these functions and the products arising out of these. Sustainable improvement and protection of the environment are interrelated. It is evident that are coasts are becoming the hub for commercial real estate expansion without consideration for the environment. Despite the fact that the majority of Mumbai's population has access to housing and sanitary amenities, nearly half of the city's 12 million citizens live in slums or are homeless. They occupy 6% of the city's total land area. Sewage from Colaba, Worli, Malad, and Bandra residential neighborhoods is discharged into the coastal area by marine outfalls, respectively, whereas sewage from other areas is discharged into neighboring creeks. The Mumbai coastal region has been severely deteriorated as a result of human pressures. The present study is mainly focused on the intertidal zones of Girgaon Chowpatty and Marine Drive, of Mumbai. Girgaon Chowpatty Area is a well known tourist destination because it's a part of Queen's Necklace shore. It is a sandy region that is one of Mumbai's most popular recreational places. Despite the presence of a wide pool of coarse sand, the majority of the uppermost area is clogged with food and snack shops. Thousands of people visit there every day, and it is where the majority of human activities take place. As a result, the shoreline is rapidly degrading. A long-term study of an intertidal area in and around Mumbai has been ongoing for many years. Similar situations are predicted to recur in and around Mumbai's remaining intertidal zones. There have been allegations of habitat degradation and species loss as a result of increased pollution in the coastline waters near Mumbai. A variety of trash is discharged into the Patalganga, Amba, and Ulhas rivers, as well as Thane Creek. A large

amount of wastewater is generated from both home and industrial sources, with the majority of it being discharged directly into Mumbai's coastal waters.

Factors leading to exploitation of marine biodiversity

Coastal Road: Damage to Marine Life Diversity

Coastal road is a project financially costing 12700 crore rupees, currently under construction which is 8 lane, with being 22.2 km long freeway. With being Worli as north end and marine lines being as south end. Marine lines being one of the intertidal zone of Maharashtra is being ignored in term of its ecosystem. Many construction activities like land fill, constant destruction of land resulting in destruction of fishes, crabs, coral reefs and many more entities. Also it affects the life of daily wagers like fishermen whose life is dependent on daily hard work.

Invasion of alien species

It shows that the resilience of certain species to the impacts of fragmentation depends largely on its distribution capability. Invasive species especially those that are disease causing with high distribution capacity proves to be a threat at global level to marine biodiversity.

Green Crab *(Carcinusmaenas)*

One such example is European crab which is used as fish bait in most of the part of the country, also being carried by ships in ballast water. From which it has settled its habitat in coast of North America, Australia, South America, Africa and Japan. Its appetite has been problem for many life form including worms and many more short lives.

Another such example is of water hyacinth (also known as Terror of Bengal) which is considered the successful colonizer in India. It was introduced in India by British which were considered as ornament plant but it soon adjusted itself to climatic conditions of India. It soon covered the water bodies and become the reason for oxygen cutout in the water body, resulting in death and destruction of local habitat. So it is now very important we should learn from above examples and continuously monitor marine line's habitat and should keep a regular check on it's local as well as prevent invasion of any other alien species.

Over fishing

Unsustainable or destructive fishing can have a significant impact on biodiversity. Around 34.4 percent of the world's fish stocks are currently overfished, and if this trend continues, future generations will have fewer fish and biodiversity in the ocean. Overfishing

has an influence not just on the fish that are harvested, but also on other marine species that interacts with fishing vessels. Overfishing is the leading cause of loss in oceanic shark and ray species, which has decreased by 71% during the 1970s. Unwanted catch, or bycatch, is one of the most serious threats to marine biodiversity. Each year, maritime commercial fisheries are predicted to discard 9.1 million tonnes (about 10% of yearly catches). Unwanted catch, or bycatch, is one of the most serious threats to marine biodiversity. Each year, maritime commercial fisheries are predicted to discard 9.1 million tonnes (about 10% of yearly catches).

Extinction of species

Species with high dispersal capabilities are less prone to extinction because of their vast ranges, various populations, and the potential for local recovery through larval transport.

Our eco-system is made up of interconnected animals and plants that form a complicated web of life. This diversity of life on Earth, the biodiversity that includes a wide range of species interactions, is critical to the survival of our planet and, in particular, humans. As a result, the extinction of a single species has the potential to impact the entire biological system that governs life and living things. Unfortunately, human interventions in nature are threatening the extinction of various species in the environment. The exceptional unnatural extinction of these species has had a significant impact on not just the ecosystem's functioning but also on ecological challenges. Marine species, such as marine mammals, sea turtles, and salmonids, are also on the verge of extinction, since climate change and overfishing pose serious threats to their survival.

Climate change

Human-caused climate change has a direct impact on marine organisms. It affects their variety, abundance, and dispersion. Their nutrition, development, and breeding, as well as interspecies relationships, are all impacted. Specific behavior patterns displayed by certain species are influenced by increasing temperatures. Oceans play a significant influence in climate dynamics, accounting for 83 percent of the global carbon cycle. Since the 1970s, they have absorbed 93 percent of the surplus heat from greenhouse gas emissions. Between 500,000 and 10 million marine species live in the waters, adding significantly to our planet's biodiversity. It's critical that we manage the oceans in a sustainable manner, given their importance to the globe. Fish stocks are affected by changes in the ocean. To manage fishing sustainably, it is necessary to adapt to the challenges that climate change presents. Marine heatwaves are thought to have grown by more than 50% in the last 30 years. Ocean

temperatures are expected to rise by 1-4°C globally by 2100.Marine life is being impacted by these changes. Temperature spikes and acidity can result in the extinction of marine environments and species. The distribution of fish stocks and the structure of ecosystems are changing as a result of shifting ocean currents and warming seas. Over the last 30 years, the ocean has begun to travel quicker. Ocean currents have more kinetic energy as a result of greater surface wind caused by warmer temperatures, especially in the tropics. The tendency is much larger than any natural fluctuation, implying that present speeds will continue to rise in the long run. As the climate warms, marine life from all areas of the food chain is migrating to the poles to stay cool, and these changes could have huge economic implications. The food web and delicate patterns of life are disrupted as species shift in space and time at different rates. Preventing overfishing and continuing to support long-term monitoring programmes are more critical than ever.

Pollution

Marine debris impacts at least 800 species worldwide, according to the United Nations, with plastic accounting for up to 80% of the garbage. Many fishes, seabirds, sea turtles, and marine mammals get entangled in or consume plastic garbage, and end up suffering from problems like suffocation, starvation, and drowning. Toxins That Don't Go Away (PCBs, Heavy metals, DDT etc.) Pesticides from farms, woods, and home use, among other things; industrial discharge; wastewater discharge from cities; pesticides from farms, forests, and home usage, among other things; Seepage from landfills is a problem. Coastal marine life, particularly near major cities or industries, can be poisoned or infected. Contain bacteria in seafood. The accumulation of plastic in our oceans and on our seashores has changed into an international problem. Hundreds of billions of kilos of plastic may be located in swirling convergences that cowl kind of 40% of the world's oceans. Plastic is expected to outweigh all fish with inside the oceans through 2050 if cutting-edge developments continue. The Great Pacific Garbage Patch is a gyre of plastic particles with inside the north-crucial Pacific Ocean. It's the most important accumulation of plastic with inside the world. India, as according to 2017-18 estimates, consumes 16.5 meters of plastic annually, 43% of which become toward the manufacture of single-use plastic material. ... Land-primarily based totally reassets are recognized as the primary cause (as much as 80% of overall marine debris) of marine plastic pollution.

Importance of marine biodiversity

Much greater knowledge is required for optimal strategic planning for conservation of marine biodiversity. On a bigger scale, managing marine biodiversity based on information on relation will be a balancing act, ruining the benefits and minimizing the loss of extent of dispersal. Nature's productivity, resilience, and adaptability to environmental changes are all made possible by biodiversity. Climate change, disease spread, pollution, invading species, overfishing, and other human-related problems may be to blame. Biodiversity can prevent extinction of a single species from having far-reaching negative consequences for an ecosystem. We call an ecological system robust if it continues to operate even when a species' population drops or becomes extinct. A healthy ecosystem indicates that natural processes are running well, including those that provide goods and services to humans, such as carbon storage and water filtering

Importance of Marine Reserves in protecting Biodiversity

Marine areas protected from the sea surface to sea floor, including the sea shore are called Marine Reserve Areas. Marine reserves provide with a certain level of marine safety, and are an effective conservation option with many benefits. Marine protected areas (MPAs) are now established as fisheries management tools and for conservation of biodiversity. However, the extent to which reserves can actually protect the species is uncertain. MPAs can be of limited benefit where loss of habitat, fragmentation, pollution, and climate change contribute a great deal in declines in marine biodiversity *(Allison et al., 1998)*

The composition of MPA network includes size of single reserves, numerous reserves, cumulative total reserve area, the comparative study between a few big reserves or several small reserves and the spacing and locations of reserves, can be changed to achieve different conservation goals.

Reserve Size: The pros and cons of small versus large marine reserves have received increased attention. The smallest reserves monitored appear to have some benefits in terms of increase in fished species. However, very little benefit is achieved by ever increasing reserve size above levels at which persistent populations can be achieved.

Reserve Number: Self-sustaining populations inside reserves may be achieved by a relatively small number of reserves, while recruitment subsidies outside reserves and connectivity among reserves should increase in pro-portion to reserve number

Reserve location: The decision regarding location of reserves is influenced by three main factors: (1) Conservation of source species population, (2) Conservation of isolated populations, and (3) Conservation of growing aggregation sites.

Reserve spacing: Survival of population inside reserves might be marginally better if reserves are close together. The lower is the effective dispersal, the closer MPAs should be for the benefit of unprotected areas.

Total Reserve Area: If 100% of the available habitat were protected, this would maximize the advantages inside the boundaries but provide no outcome beyond the boundaries. Small, exotic and endangered species require safety of 100% of the habitat or the area containing the population.

Single big or Numerous Small: One of the alternatives is more effective than the other depends on the degree to which small reserves represent nested subsamples of species from larger reserves (Lomolino, 1994; Worthen, 1996). Single large MPA may maximize population survival through self-recruitment, but numerous smaller MPAs will maximize recruitment beyond boundaries. In case of high local retention, it is likely that it would not make any difference over a wide range of reserve size or number. Numerous medium sized reserves, placed accordingly are likely to maximize recruitment subsidies from MPAs, basically because the proportion of recruitment subsidies has to increase as a function of the sum total of circumferences of all reserves.

Drawbacks of Marine Reserves

Marine reserves are necessary but not enough to manage exploited species or to conserve marine biodiversity. An effective diversity management plan must include minimizing human influence both inside and outside MPAs. Population inside the MPAs and the local biodiversity inside MPAs can be endangered by the buildup of huge predators (Jones et al., 1993; Micheli et al., 2004) and sources of environmental depletion, such as sedimentation and climate change on global level.

Future Perspective

The ever expanding diverse, intense scale of human effects on marine ecosystem will surely reduce probable connection that exists among the remaining populations, all due to decrease in the numbers and soaring fragmentation. There has been a lot of damage in recent time due to many factors, so it important for us to us take care and maintain the local significance of Marine drive and it's beauty, so all we can do is to maintain and take care of

this beautiful place, take action and should stand against any development that is not sustainable and illegal activities like throwing garbage, disposing any chemical entity which is a matter of great urgency. Activities like pollution, introduction of alien species, habitat destruction, overexploitation and climate change must be avoided in order to prevent destruction of local diversity.

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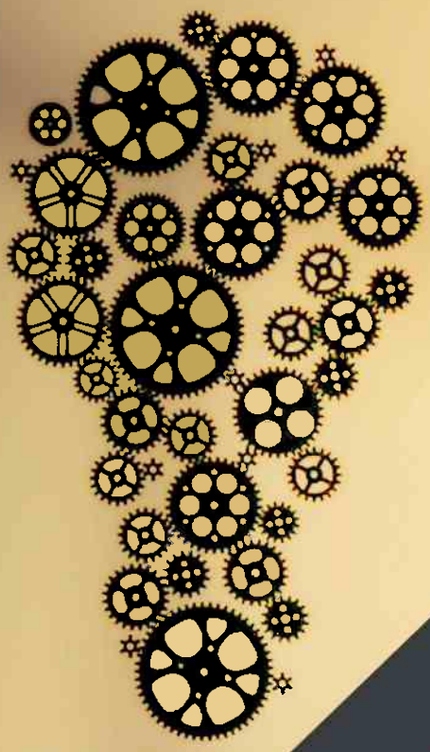

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