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Mycoremediation Mycofiltration Magnetism in Mycorrhizal Bed of Pleurotus Ostreatus

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ABSTRACT:

Mycoremediation is bioremediation process by fungi and their enzymes present in It due to their ligninolytic or lignocellulolytic activity they secreate the enzyme to degrade or scavenge the environmental organic & inorganic compound to the simplest and absorbable form. In case of Pleurotus ostreatus (OM mushroom) hypha shows the microfiltration & iron binding magnetism property to eat and entrap into their interwoven hypha, when attached with substrate they from a biofilm or biofilter like layered porous structure (permeable) easy to filter the polluted water to its optimum level. when the hypha is in growing stage or active stage, show multiplicatory bioremedial effect to purify the impure water leads to change in physicochemical properties like colour, odour pH , acidity, alkalinity, hardness, tds, conductivity or excessive metal like iron. Etc The term "infiltration" refers to the process of water moving in all directions into the soil. or utilized are included in the process of drip irrigation maintained the equal regulation of water The maximum rate at which water is absorbed into the soil or substrate in case of Macro fungus OM mushroom play a maximum filtration rate by its multiplicatory hypha like structure. OM mushroom shows hairy or hypha cottony filter sheet like structure able to entrap iron particles very closely & digest it, specificity for iron uptake or digestion shows the mycorrhizal bed forming by 10 units to check the filtration rate at the treatment giving per day at on consecutive days results shows increasing of iron uptake or digestion by the Pleurotous mycorrhiza is more in 1day<2day<3day<4day<5day<6day because of increase in the activity of iron particle digestion & growth of fungal hypha or vice versa , maximum the growth of hypha greater the iron uptake greater the growth of Pleurotous ostreatus by drip irrigation method created by the conventional system arrangement to maintained the flow of water to initiate the mushroom growth then spray method ,with respect of each days or initiated growth , increase in Iron digestion & total dissolved solids gives solution of contamination water, at maximum

ISSN PRINT 2319 1775 Online 2320 7876

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extent by digesting un absorbable metallic ion to absorbable form to get colorless odorless or tasteless water without any change in there purity level (purification after filtration through mycorrhizal bed or unit) of contaminated water .

Keywords: Infiltration, Mycoremediation, mycofiltration, magnetism, OM mushroom.

INTRODUCTION:

The application of fugal biotechnology is innovative and interdisciplinary way by trying together the field of public health, bioremedial , environmental engineering because of high protein value food, carbohydrates, fat, fiber, different kinds of vitamins and minerals, medicinal & maximum of water Content Present in it [1] Many unknown mysterious components are very much needed for Human well beings are present in OM mushroom, which are now recognized as important area for biomedical researches. OM mushroom Shows the Specific life Stages During their life Stages during their maturation

“Mycorhiza to Mushroom or mushroom to mycorrhiza” or vice versa this mycorrhizal system also act as protective layer to the environment by its whole root and shoot System to entrapped and eat the pollutant like oily compounds, synthetic matters, organic compounds , metals etc “the magic of this microfiltration technique is that it can readily incorporate industrial and municipal byproducts such as sawdust from mills and wood chips ‘agricultural [8] like husks ,crushed plant waste , residue of [7]seed , organic waste[5], effluent ,and storm water etc give new microfiltration & mycoremediation concluded “Stamets”[3] there fungal mycelium can remove or act as mycofilters can be developed to meet design requirement to treat contaminated Storm water runoff or irrigational left over [2] Some fungi, including oysters, can remove heavy metals from soil and water because Of their enzymatic[6] lignolytic Or lignocellolytic properties which they bioaccumulation in mushrooms. Numerous mycoremediation studies indicate capacity for mycelium to treat urban storm water, where pollution from vehicles and industrial activity threaten precious water [20] OM shows miraculously properties of secreting degrading enzymes to decompose the complex organic material on which act as a substrate or growing layer to mushroom into simpler nutritional source (chang and miles1992)[13] [16][17][12]these substrate are either raw or residual product (waste) of industries fields initiates Mycelium growth or pining start up shows projectile role to Mushroom yield, biological efficiency & Economical efficiency rather its also functional active as bioremediation process or also from a layer or Brick like structure if in active (after all flush are removed or pinning formation)

OBJECTIVES:

In observational phase:-Mycelium is treated with given sample By Preparing Mycelium Film or Mycorrhizal bed.

To Make the Mycorrhizal Layer or bed system easy to create to or maintained the mycorrhizal networking to absorbing the iron particle or check the mycorrhizal iron uptake

ISSN PRINT 2319 1775 Online 2320 7876

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property shows the magnetic nature by Pleurotus oysteratous & check the mycorrhizal System easy to create or maintained the mycorrhizal permeability to absorbed the iron uptake substrate shows enzymatic activity taken from food industry different manholes Dairy, shops & agricultural [14] [10] to Increase the Productivity of Mycelium growth in a given time ,temperature or Substrate media [16][15] Its Shows the high efficiency to make porous matrix or protein content utilized by Om Nutritive compound act as a growth promoting agent to the sample of oyster mushroom[18]

FUTURE PROSPECTIVE DESIGN:

In future with use of different Agro waste product like coconut coir wooden chips Wheat Straw substrates or Bamboo shoots make a floating cage or floating mycorrhizal bed like structure to collect the water pollutant (easy to move on water surface) river, ponds or rain water. closed & controlled by connecting unit .also able to filter & purify water by the systematic designing of mycorrhizal bed multifunctional or single unit of *Pleurotus oysteratous mushroom* to create the maximum purity level with low coast without causing water ecosystem.

MATERIALS AND METHODS:

Materials

Mushroom strain used in this study was the commercial strain of. *Pleurotus oysteratous*.

Substrates used are Wheat Straw.

Resources:-Sample Natural water for,raw water , Natural Spring water, Wastewater samples were taken from food industry different manholes Dairy, Laundry, shops & agricultural irrigational remains Effluent water, polluted river water etc [24][25][26]

Instruments:

UV –Vis Spectrophotometer, ph meters , TDS, Conductivity meter, filtration unit ,digital thermometer and hygrometers

Parameters which were analyzed are as follows:

Total Dissolved Solids, Determination of pH, Conductivity, Iron content.

Material and Methods

Iron Estimated by colorimeter method

The Iron exhibits absorption at 540nm

Iron STD 100%

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, S Iss 2, 2022

All chemicals were used of analytical grade .spectral & absorbance measurement were made on Simadzu double beam UV-Visible spectrophotometer at 540 with 10 mm matched quartz cell. Preparation of sample solution Weight powder accurately std & transfer 100ml of volumetric flask add 10ml distilled water & 5ml 1M sulphuric acid dilute up To the marc with distilled water. 10ml of stock solution to 100ml with distilled water, further 10ml of stock solution to 100ml with distilled water.10ml of this Stock solution 50ml volumetric flask add 5ml 20% citric acid 5ml 10% thioglycolic acid & 5ml ammonia solution & dilute up to the mark with distilled water wait till full iron digest or color develop[21][22][23][27][28][29][30].

Microbiological instruments:-Autoclave steam sterilization, Hot air Oven DHS , Incubators, BOD Incubators , laminar, Filtration units ,Vortex mixture .

Methods of culture preparation:

Cultures were grown and maintained on Media Malt Extract powder and Agar Agar type I, Reagents and stored in an 4±1°C in a refrigerator and make primary secondary ,tertiary derived from mother culture for further Study

Swan culture of OM Mushroom or seed For Mycelium growth

Stain sources: *Pleurotus Species. Pleurotus oysteratous*

From DMR SOLAN (H.P) , Media Malt Extract powder and Agar Agar type I, Reagents . Test Following The all sterility requirements of glassware, media, sterile environment with Borer, Laminar Air flow Burner lamp, etc for Making Media Plates inoculated with different Concentration Mix with bio loaded material, plastic bags heat resistant polypropylene bags, nozzles, wheat straw

Methods of Collection and preparation of Sample:

Sample of w ater taken in Sterilized Autoclaved Properly sealed labeled bottle:- Water samples from all the sites were collected in sterile glass bottles, brought to the laboratory, processed within 1-3 hrs, and stored at −20°C for further analysis.

Collection and preparation Of Raw water, Natural Spring water and Wastewater samples were taken from food industry different manholes Dairy, Laundry, shops& agricultural irrigational remains

Methods of growing bag preparation:

Cultures were grown and maintained on malt extract & nutrient agar and stored in an incubator at 25 °C for three weeks. After the completion of culture run, the mycelium was added to sterilized wheat grain in bottles for spawning. Homogeneous substrate mixtures were obtained by mixing in the component materials based on their dry weights The substrate mixtures were wetted for 3 day to increase their moisture content to Suitable levels, checked

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by squeezed method without over flow of water. The mixed Substrate & all residue waste separately was put in heat-resistant polypropylene bags (40 x 60 cm) and sterilized in an Autoclave at 121 °C for 90 min. After the substrate was sterilized, Later, the substrate samples were left to cool to ambient Temperature and were immediately inoculated with spawn for cultivation. all inoculated substrate was placed in polyethylene bags (1 kg of substrate / bag) with Spawn seed mix, 10 bags for single sample treatment Incubated at room temperature until colonization was completed [30]. Afterwards, the samples were subjected to conditions of 25 °C and 95 to 90% relative humidity for spawn running.

Substrates and Spawn Ratio :

Wheat Straw mix with ratio 1kg: 250gm Spawn Seed

After the mycelium colonization was completed, the bags were exposed to Conditions of 25 to30 °C and 80% to 90% relative humidity in a controlled room. After the initiation of mycelium growth, to check the spawn run distance per day, or full bag completion of mycorrhizal layer (a whole filter unit formation) of the OM

Methods of growing bag preparation (Set Up of single or multifunctional unit) and System of drip irrigation for filtration on the mycelium bed of OM:

Drip irrigation system with Small Autoclave poly Bag for sample(container of Sample) Separated chamber pricked to make hole with Sterile needle with equal size at equal no and distance for maintain the continuity or flow of water sample at a suitable distance on a rack Create a System to ease in collection of filtered sample from the outer most covering or closed bag.

Systematic Stages Shown by Pleurotus oysteratous to Clean the given water Sample :-

Fig1 A. wheat straw substrate mix with spawn seed substrate of (Preparative phase)

Fig1B.Spread of mycelium to mycorrhizal bed formation (Activation phase)

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, S Iss 2, 2022

Fig2A.Saprated unit of mycelium bed with drip irrigation system to purify the water sample (Filtration phase)

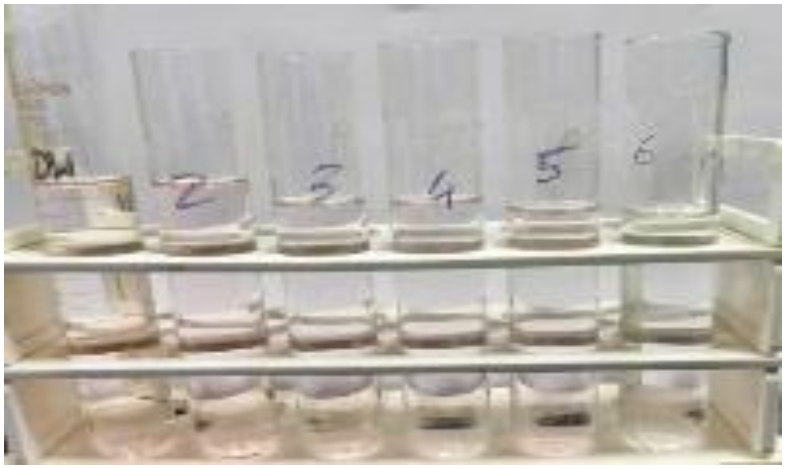
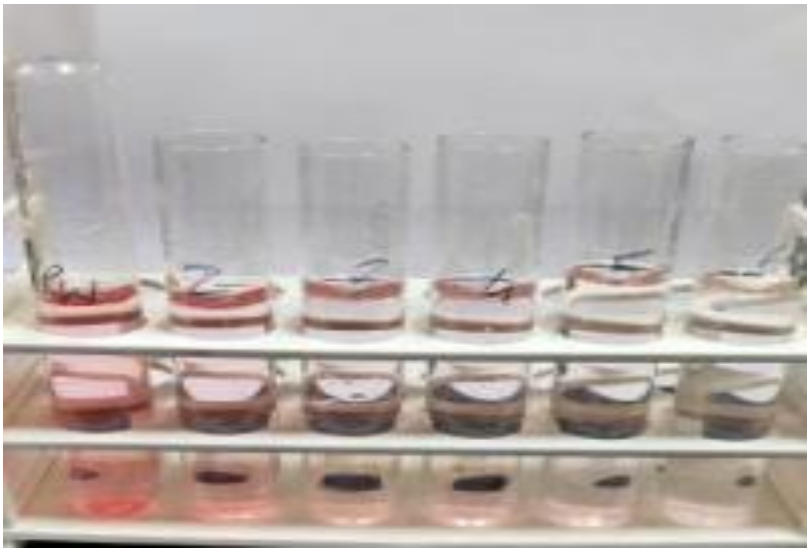


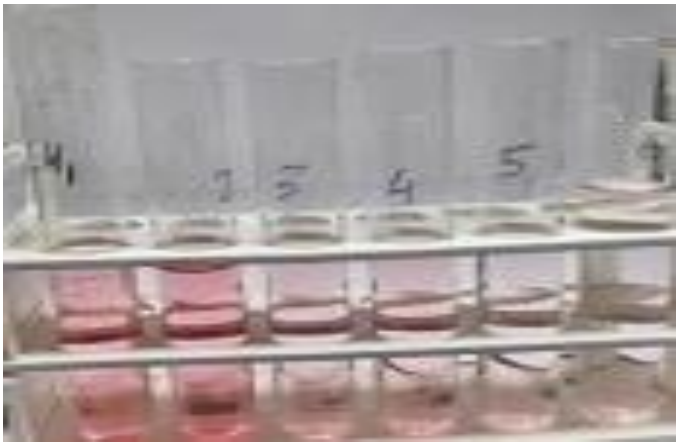
Fig3 A.Colorimetery Determination of iron content in DW on consecutive day of treatment (Quantitative detection phase)



B.Colorimetery Determination of iron content in RW on consecutive day of treatment (Quantitative detection phase)

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, S Iss 2, 2022



C. Colorimetery Determination of iron content in EW on consecutive day of treatment (Quantitative detection phase)

Data Collection Procedure:

Collection of Different Sample Collection and preparation Of Raw water, Natural Spring water , and Wastewater samples were taken from food industry different manholes Dairy, Laundry, shops& agricultural irrigational remains (Natural as well as industrial) Maintaining & enhancing mycelium &substrates of Pleurotus Ostreatus Hypha for Bioremidial studies, or filtration through drip irrigation system, All the experimental Performed in Six consecutive day and the data were expressed as the mean & standard Deviations,

ANOVA ,Paired T-test were used to determine the significant of the mean in all value of significance($P < 0.05$) and LSD test with significant value of ($p<0.05$).

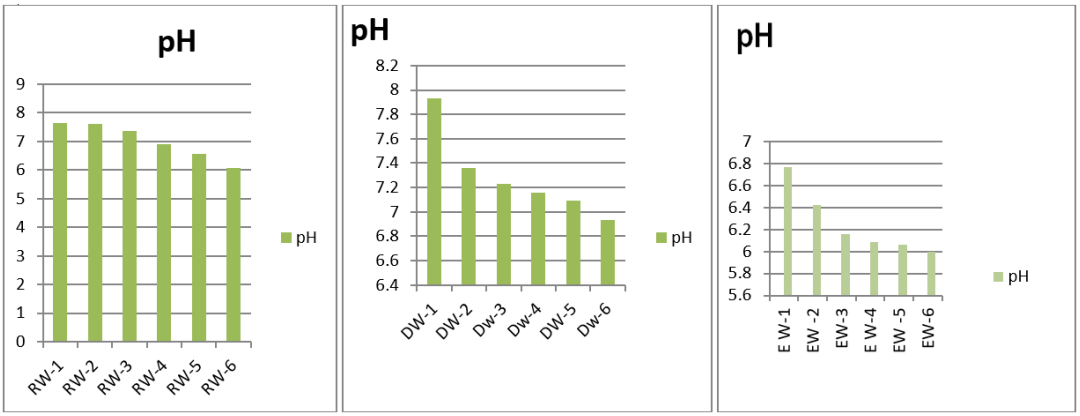
Table 1. Physico-chemical parameters of six consecutive day treatment shows declined graph:

Physicochemical parameters	**RW-1**	**RW-2**	**RW-3**	**RW-4**	**RW-5**	**RW-6**	**std**	**rsd**
pH	7.6	7.63	7.36	6.08	6.89	6.56	0.72	10.33012
tds (ppm)	360	330	300	283	266	239	25.5147	7.616
con µs/cm	1.068	0.826	0.668	0.566	0.468	0.366	0.2015	23.591
physicochemical parameters	**DW-1**	**DW-2**	**Dw-3**	**Dw-4**	**DW-5**	**Dw-6**	**std**	**rsd**
ph	7.93	7.36	7.23	7.16	7.09	6.93	0.35	4.773348
tds (ppm)	236	219	203	186	170	166	16.5025	7.524
con µs/cm	0.468	0.436	0.394	0.368	0.324	0.236	0.08319375	22.4241913
Physicochemical parameters	**E W-1**	**EW -2**	**EW-3**	**E W-4**	**EW -5**	**EW-6**	**std**	**rsd**
ph	6.77	6.42	6.16	6.09	6.06	6	0.29	4.70084
tds (ppm)	1076	999	986	850	610	570	48.645	4.768
con µs/cm	1.66	1.42	1.356	1.266	1	0.960	0.3	20.73973

ISSN PRINT 2319 1775 Online 2320 7876

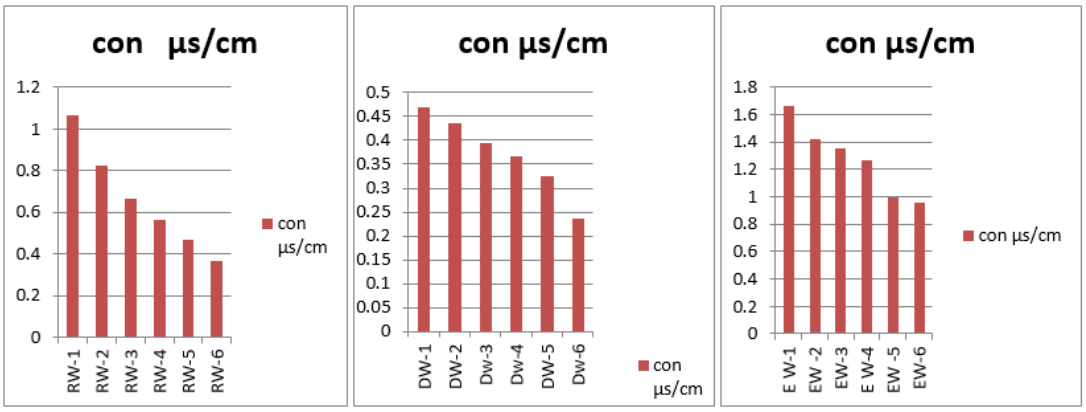
 UGC CARE Listed (Group -I) Journal Volume 11, S Iss 2, 2022

Graphical representation of pH in RW, DW, EW After treatment After treatment on Six consecutive days :-



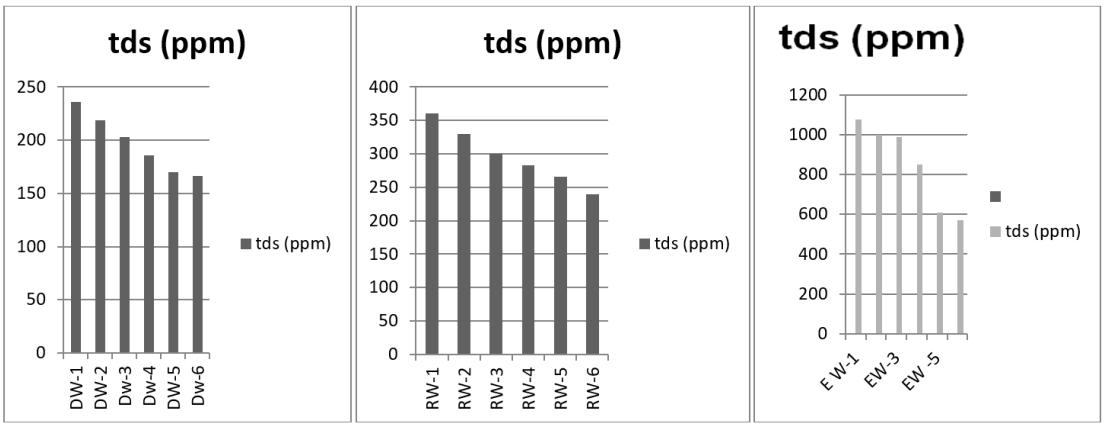
RW [A] **DW [B]** **EW [C]**

Graphical representation of pH in RW, DW, EW After treatment on Six consecutive days:



RW [A] **DW [B]** **EW [C]**

Graphical representation of tds (ppm) in RW, DW, EW After treatment on Six consecutive days :



RW [A] **DW [B]** **EW [C]**

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, S Iss 2, 2022

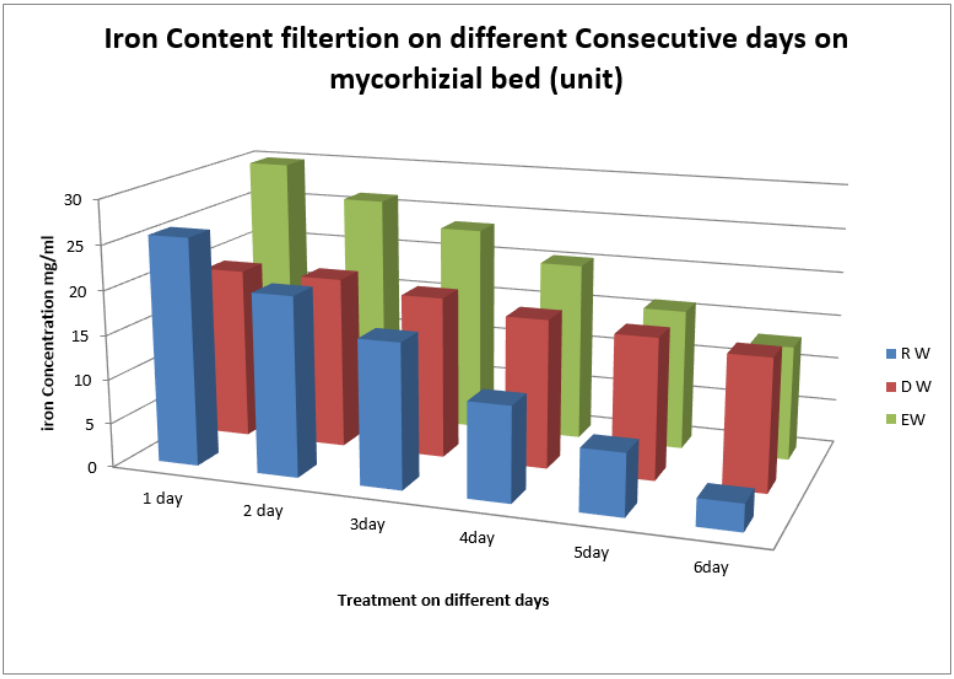
Testing of given specimens for Data collection & Results:

Table 1.water Sample test for iron on consecutive days on mycorrhizal bed (unit) of Pleurotus oysteratous

sample (Iron concentration on mg/ml)	1 day	2 day	3day	4day	5day	6day
Raw water for –R W	25.73	20.28	16.3	10.69	6.98	3.06
Natural Spring water -D W	19.47	19.46	18.3	16.89	16.0	14.96
Wastewater samples were taken from food industry different manholes Dairy, Laundry, shops & agricultural irrigational remains -E W	29.94	26.29	23.59	20.36	16.03	13

LSD test with significant value of ($p<0.05$)

Graph represents the Iron Content filtration rate on different Consecutive days on mycorrhizal bed (unit) of Pleurotus Ostreatus mushroom Substrates:



DISCUSSION:

Pleurtous Ostreatus species shows there conventional method of cultivation to filter garbage's synthetic metallic elements present in excess or Pathogens from storm water, in an innovative and interdisciplinary way by trying together the fields of public health, & waste management using utilization of natural sources

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, S Iss 2, 2022

The research is anticipated to confirm that fungal mycelium can remove The contaminated, Pollution causing from flowing water, and that OM mycofilters by making a bio material to control the environment pollution (air ,soil, or water) can be developed to meet design requirements to treat municipal storm water runoff. Or Contaminated water.

Toxic substances or excessive metal can present a health hazard for non-drinking purposes Due to different intended human uses(e.g., factories, power plants, refineries, mines, municipal sewage treatment plants) are also Contaminated by the (daily throws) are also mix to the, river, ponds & other natural water Resources by direact or indirect mean cause hazard for the growth of flora fauna & mankind by the addition of Excessive metals, total dissolved solid or harden the water by changing ph & creates a major problem to clean the rivers given study shows the fungi sieves making (economical sound method to clean the water by preparing mycorrhizal bed for lower down the parameter in control manner, Pleurtous Ostreatus Shows the mycorrhizal bed forming by10 units with conventional drip irrigation method to check the filtration rate at the treatment giving to the per day at on Consecutive day shows increasing of iron uptake or digestion by the Pleurotous mycorrhizal is more in 1day<2day<3day<4day<5day<6 day because of increase in the activity of multiplicatory mycorrhizal web formation day by day on their growth formation (activation stage) by use all polluted material as nutritive material to grow Symbiotically& make mycofilter like structure for microfiltration Succeed to solve the water cleaning problem at maximum extent. & rebuilt, clean water resources and purify the water.

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