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CONTENTS

| Sr. No. | Author Name | Title | Page No. |
|-------------------------|---------------------------------|---|---------------------|
| ENGLISH PART - I | | | |
| 1. | Prof. Milind V. Bildikar | Issues in E-Governance in India | 1-8 |
| 2. | Arun Kumar Gupta | Socio-Judicial Review on Triple Talaq Case Shayara Bano vs Union of India and Others | 9-16 |
| 3. | Manisha O. Sharma | Study of Optical Physics in Face Recognition to Overcome the Hurdle of Illumination Complexity | 17-19 |
| 4. | Satish Kumar Singh | A Historical Study of Urbanization in Koshal Mahajanpad | 20-24 |
| 5. | Ranjita Roy Sarkar | The Treatment Seeking Behaviour and Health Status of Waste Pickers in the Municipal Dump Yard in Siliguri Municipal Corporation, Darjeeling District, West Bengal | 25-32 |
| 6. | Minakshi Soni | Changing 'Recruitment and Selection' Practices in Current Scenario | 33-38 |

| Sr. No. | Author Name | Title | Page No. |
|--------------------------|---|---|----------|
| ENGLISH PART – II | | | |
| 1 | Dr. Tanmay A. Paithankar | The Perspective on Human Rights: From Three Generations to Third World Democracy | 1-7 |
| 2 | Mr. Nilesh B. Saste | Evolution of the World Wide Web in Library Profession: (Web 1.0 To Web 5.0) | 8-13 |
| 3 | Dr. Sandip Sisode | Complaints about Children and Anxiety among Parents | 14-17 |
| 4 | Dr. Kailash D. Tandel Ms. Meena S. Suryavanshi | Ethnography - Method of Exploring Library | 18-28 |
| 5 | Dr. L. Karthikeyan | Export Import Documentation of Charter Flights in the Aerospace Industry | 29-35 |
| 6 | Ahmed Abdul Satar Abdul Nabi | Existentialism in the 20 th Century | 36-41 |
| 7 | Ganesh Gadekar | Impact of Agile Methodology on Software Development Process | 42-48 |
| 8 | Gulam Farooq Mustafa | Physical Organic Chemistry | 49-56 |
| 9 | Dr. (CA) Subrahmanya Bhat | Study the New Trends in Financial Inclusion in India - Pradhan Mantri Mudra Yojana (PMMY) | 57-63 |
| 10 | Swati Warule Dr. Shekhar Shirsath | A Study of Scoio - Psychological Charateristics of Students Team Players | 64-67 |
| 11 | Dr. Vaishali M. Choudhari | Social Networking Tools for Libraries | 68-72 |
| 12 | Prof. Perke Vaishali Sheshrao | Dr. Babasaheb Ambedkar's Thought on Labours Movement's | 73-76 |
| 13 | Dr. Pissanu Horakul | European Citizen and European | 77-82 |

| | | | |
|----|--|--|---------|
| | Dr. Subramonian Shanmugham | Right: A Theory of European Rightst | |
| 14 | B. S. Salve P. B. Sirsat | Zooplnakton Diversity of Chirag Shah Pond, Hingoli, Maharashtra | 83-88 |
| 15 | Prof. Sarkate Subhash Uttam | Role of NGOs in Economic Development | 89-96 |
| 16 | Dr. Anil Pande | The Core Principles of Management for Business Management | 97-100 |
| 17 | Dr. Sandhya Madhukar Rotkar | Feticide: A Dark Side of Indian Rural Society | 101-104 |
| 18 | Dr. Shivaji Murlidhar Kakade | Rural Marketing: Opportunities, Challenges & Strategies | 105-109 |
| 19 | Syed Abdur Rahman Dr. Shaista Parveen | Trainee Teachers' Attitude towards Use of Information and Communication Technology: A Case Study of Irene Adhyapak Vidyalaya, Aurangabad (India) | 110-116 |
| 20 | Dr. K. G. Maske Dr. D. V. Vedpathak | Study of Microorganisms Degrading Herbicide Glyphosate: Mera-Excel-71 | 117-121 |

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| <p>‘जिनिअस’ या सहाय्य प्रसिध्द झालेली मते मुख्य संपादक, संपादक मंडळ व सल्लागार मंडळास मान्य असतीलच असे नाही. या नियतकालिकात प्रसिध्द करण्यात आलेली लेखकाची मते ही त्याची वैयक्तिक मते आहेत. तसेच शोध निबंधाची जबाबदारी स्वतः लेखकावर राहिल.</p> <p>हे नियत कालिक मालक, मुद्रक, प्रकाशक विनय शंकरराव हातोले यांनी अर्जिटा कॉम्प्युटर अँड प्रिंटर्स, जयसिंगपूरा, विद्यापीठ गेट, औरंगाबाद येथे मुद्रित व प्रकाशित केले.</p> |
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20. Study of Microorganisms Degrading Herbicide Glyphosate: Mera-Excel-71

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Abstract

Two indigenous bacterial strain capable of utilizing herbicide Mera-Excel-71- as the sole carbon and energy source was isolated from a soil agricultural field having history of herbicide application in Latur district. After successive enrichment for two weeks cultures were inoculated on nutrient agar medium containing herbicide. 30 isolates were obtained. Two strains H1 and H2 produced turbidity 0.2 and 0.3 O.D.in herbicide containing broth medium after incubation for four days. Standard microbiological characters of these strains were determined. Strains were found to degrade 45% and 70 % herbicide at optimal conditions pH 7.0, 30 °C, 3% (v/v) inoculum size, and an initial herbicide concentration of 2 G L⁻¹. Two strains H1 and H2 produced 2.9 CFU/ml and 3.5 CFU/ml of growth in herbicide containing broth medium after incubation for 7 days.

Introduction

Rapidly growing industrialization along with an increasing population has resulted in the accumulation of a wide variety of chemicals. Thus, the frequency and widespread use of man-made, “xenobiotic” chemicals has led to a remarkable effort to implement new technologies to reduce or eliminate these contaminants from the environment. Commonly-used pollution treatment methods (e.g.land-filling, recycling, pyrolysis and incineration) for the remediation of contaminated sites have also had adverse effects on the environment, which can leads to the formation of toxic intermediates (Debarati et al. 2005). Furthermore, these methods are more expensive and sometimes difficult to execute, especially in extensive agricultural areas, as for instance pesticides (Jain et al; 2005). One promising treatment method is to exploit the ability of microorganism to remove pollutants from contaminated sites, an alternative treatment strategy that is effective, minimally hazardous, economical, versatile and environment- friendly, is the process known as bioremediation (Finely et al.2010)

Microbes have the ability to transform and /or degrade xenobiotics. scientist have been exploring the microbial diversity, particularly of contaminated areas in search of organisms that can degrade a wide range of pollutants. Hence, biotransformation of organic contaminants in the natural environment has been extensively studies to understand microbial ecology, physiology and evolution due to their bioremediation potential (Mishra et al.2001)

About 30% of agricultural produce is lost due to pests. Hence, the use of pesticides has become indispensable in agriculture.

The abusive use of pesticides for pest control has been widely used in agriculture. However, the indiscriminate use of pesticides has inflicted serious harm and problems to humans as well as to the biodiversity (Gavrilescu, 2005, Hussain et al,2009). The problem of environmental contamination by pesticides goes beyond the locality where it is used. The agricultural pesticides that are exhaustively applied to the land surface travel long distances and can move downward until reaching the water table at detectable concentrations, reaching aquatic environments at significantly longer distances. Therefore, the fate of pesticides is often uncertain; they can contaminate other areas that are distant from where they were originally used. Thus, decontaminating pesticide-polluted areas is a very complex task (Gavrilescu, 2005).

Excel MERA 71 is a widely used glyphosate based formulation. It belongs organophosphorus group of herbicides. It is broad spectrum systemic nonselective and postemergent herbicide used in INDIA for controlling weeds in agriculture, forestry, urban areas, and even in aquatic bodies. Therefore present study is performed to isolate herbicide degrading microorganisms having potential of bioremediation.

Material and Methods

Mera Excel 71 utilizers: Mera-Excel-71-degreeding microorganisms were isolated by the enrichment and adaptation technique.

Soil Sample was collected from agricultural field having history of herbicide application. One G of soil sample added in conical flask conical flask containing 100 ml Mineral salt solution. Mixture was stirred for 10 min and allowed to stand for 10 min. 1ml of Supernatant inoculated in flask containing 100 ml mineral salt medium incorporated with 1 G of herbicide Mera-Excel-71.

MSM (Mineral Salt Medium) contained the following ingredients in one liter of distilled water.

K_2HPO_4 , 0.8g, KH_2PO_4 , 0.2g, $MgSO_4 \cdot 7H_2O$, 0.2g, $CaSO_4$, 0.1g, $(NH_4)_6MgO_7 \cdot 24H_2O$, 0.001g, $(NH_4)_2SO_4$, 5g yeast extract, 0.1g and 1 ml of a stock solution of trace element. The trace element solution was prepared in 100ml distilled water by dissolving $ZnSO_4 \cdot 7H_2O$, 10mg, $MnCl_2 \cdot 4H_2O$, 30mg, H_3BO_3 , 30mg, $CaCl_2 \cdot 6H_2O$, 20mg, $CuCl_2 \cdot 2H_2O$, 10mg, $NiCl_2 \cdot 6H_2O$, 20mg, $NaMoO_4 \cdot 2H_2O$, 30mg.

Flasks were incubated for 7 days at room temperature. After successive enrichment for two times 0.1ml of culture inoculated by spreading on nutrient agar plates incorporated with herbicide. Plates were incubated for 24 hr at room temperature. After incubation, plates were observed for growth of herbicide degrading microorganisms. Standard microbiological characters of isolates were studied. Colonies obtained were sub cultured for purification, preserved on nutrient agar slants and considered as potential Mera-Excel 71 degrading utilizing isolates. Selected strains were subjected for growth study.

Result and Conclusion

Two indigenous bacterial strain capable of utilizing herbicide Mera-Excel-71- as the sole carbon and energy source were isolated from a soil agricultural field having history of herbicide application in Latur district. After successive enrichment for two weeks cultures were inoculated on nutrient agar plates containing herbicide 2 g L^{-1} 30 isolates were obtained. Two strains H1 and H2 produced 2.9 CFU/ml and 3.5 CFU/ml of growth in herbicide containing broth medium after incubation for 7 days. Standard microbiological characters of these strains were determined. Strains were found to degrade 45% and 70 % herbicide at optimal conditions pH 7.0, 30 °C, 2% (v/v) inoculum size, and an initial herbicide concentration was 2 g L^{-1} .

These isolates can be applied for the bioremediation of contaminated site.

Glyphosate is an organophosphonate that can be used as a source of P, C or N by either gram positive or gram negative bacteria reported by van Eerd et al., 2003. Application of herbicide to the soil may adversely affect sensitive microorganisms and simultaneously those microorganisms that have ability to degrade herbicide get stimulated. (Wikinson and Ayansina and Oso, 2006) Glyphosate was found to be lethal to bacteria above 50 mg/L concentration and glyphosate reduced bacterial viability on solid media and complete inhibition of fungal growth reported by Busse et al. 2000. In the present study Strains were found to degrade 45% and 70 % herbicide. These isolates can be applied for the bioremediation of contaminated site.

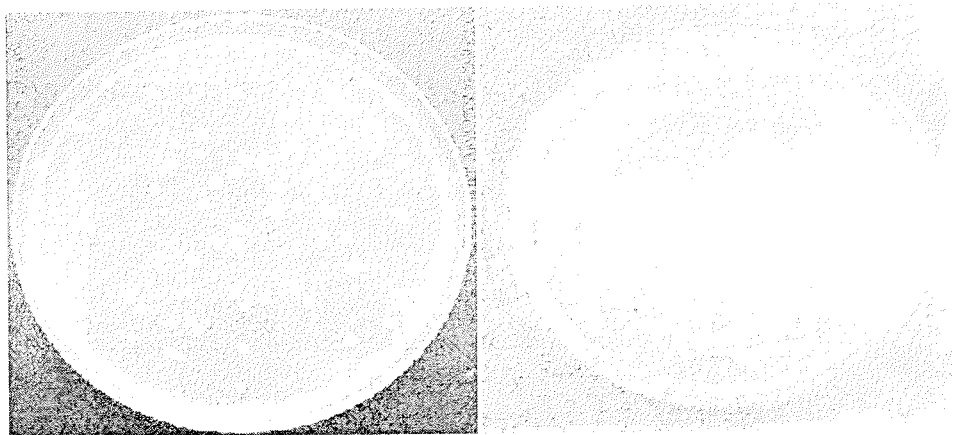


Fig. plate showing colonies of H1, H2 herbicide degrading isolates

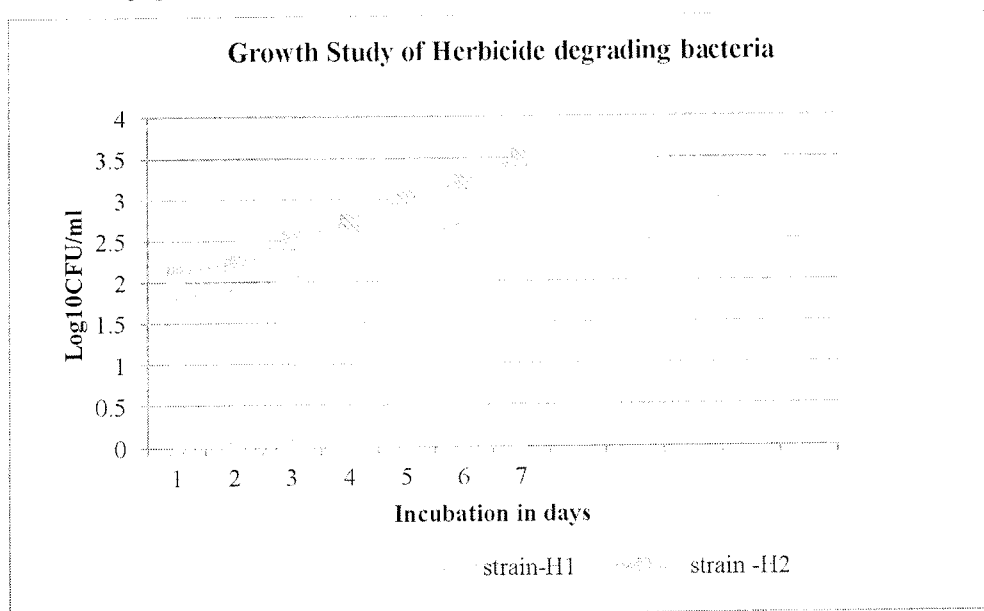


Fig: Growth study of Herbicide degrading isolated strains

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