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Biodegradation of Pesticides by Microorganisms Isolated from Agriculture Soil Source: An Invitro Study

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Abstract:- Agriculture is a potent source of various pesticides and microorganisms. Pesticides are a large and varied group of substances that are specifically designed to kill biological organisms including weeds, insects, and rodents. However, the extensive use of pesticides may result in their accumulation in agricultural produce.Pesticides are well known in preventing and controlling the diseases and pests of crops, but at the same time pesticide residues have brought serious harm to human's health and the environment.Biodegradation is an ecofriendly, cost effective, highly efficient approach and Pesticides of different varieties can be obtained based on agricultural soil and biodegradation of Microorganisms.The present study was aimed to identify and isolate pesticides degrading microorganisms from soil sources. Also based on the perimetry experiments, Monocil pesticide showed maximum degradation. Optimization has been carried out with different concentrations of Pesticides, Temperature and pH on microbes and trace elements for the degradation. HPLC analysis has been carried out to find out the percentage of degradation and it was found to be 48.14% based on area.The present study is sensitive to eliminating the level of toxicity from the environment and it can be coupled with other physical and chemical treatment methods to improve the soil quality in agricultural fields.

Keywords:- *Microorganisms, Biodegradation, Monocil, Optimization, HPLC.*

I. INTRODUCTION

Pesticides are the chemical substances use to kill or manage pests at tolerable levels. They have become indispensable in agricultural production. They play a critical role in agriculture. It is established that more than half of the agricultural crops would have been lost due to pests. Hence in order to reduce the diseases and to have good yield it becomes imperative for the farmers to use the pesticides. Unfortunately, incessant usage of pesticides has posed deleterious effects on the environment and living organisms. Extensive pesticides use is negatively disturbing the environment and humans (Gavrilescu M, 2005). The 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 have led to develop environmental pollution, drug induced organ toxicity and carcinogenesis. Enzymes take part in key role in Biodegradation of any xenobiotics and are able to renovate pollutants to a noticeable rate and have prospective to restore polluted environment (Prathap Somu et al. 2022). These are the toxic intermediates accumulated in the environment due to the use of different pollution treatment methods. Examples includes plant constituents, drugs, pesticides, cosmetics, flavorings, fragrances, food additives, industrial chemicals and environmental pollutants. Thereafter, it was discovered that microbes have the ability to transform and/or degrade xenobiotics, scientists have been exploring the microbial diversity, especially in the soil source where heavy number of pesticides can be used to improve the productivity of agricultural field (Jain RK et al., 2005) However, the indiscriminate use of pesticides has inflicted serious harm and problems to humans (Hussain S, 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, microorganisms provide potential wealth in biodegradation (Debarati P et al. 2005).

According to the definition by the International Union of Pure and Applied Chemistry, the term biodegradation is "Breakdown of a substance catalyzed by enzymes in vitro or in vivo. Biodegradation is a natural process, where the degradation of a xenobiotic chemical or pesticide by an organism is primarily a strategy for their own survival. Microbial degradation of chemical compounds in the environment is an important route for the removal of these compounds. The biodegradation of these compounds, i.e., pesticides, is often complex and involves a series of biochemical reactions. Although many enzymes efficiently catalyze the biodegradation of pesticides, the full understanding of the biodegradation pathway often requires new investigations. Most of these microbes work in the natural environment but some modifications can be brought about to encourage the organisms to degrade the pesticide at a faster rate in a limited time frame. This capability of microbe is sometimes utilized as technology for removal of contaminant from actual site. Not only in agriculture even the pesticides create contamination in water and coastal environment. Sources of organochlorine pesticide residues in tropical coastal environment of India have been reported

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by many workers. Therefore, pesticide application and management in the future and its scientific information has been reported (Muyesaier Tudi et al., 2021).The microbial species in the environment, the study of herbicide and pesticides degrading bacteria and the mechanism and application of pesticide microbial degrading bacteria has been studied by Yichen Huang et al. in 2018. Persistent organic pollutants in the form of pesticides have also been reported to be taken care of by microbial enzymes. A review on pesticide degradation has been studied by Satish G et al. in 2017. Limited microbial degradation at low pesticide concentrations could explain the discrepancy between overall degradability demonstrated in laboratory tests and their actual persistence in the environment. Studies on pesticide degradation are often performed using unrealistically high application rates seldom found in natural environments. (Johannes Wirsching et al. 2020). Biodegradation is an ecofriendly, cost effective, highly efficient approach and Agriculture is a potent source of various pesticides and microorganisms. Biodegradation against agricultural pesticides hazards have been reported by Khalid Nawaz et al. 2011. Pesticides of different varieties can be obtained base on agricultural soil and biodegradation of Microorganisms. organophosphate pesticide tetrachlorvinphos by bacteria isolated from agricultural soils in México by Ma. Laura ortiz–hernández and Enrique sánchez–Salinas, 2010. Another study by S.E. Agarry et al., 2013 reported biodegradation of Dichlorovos (Organophosphate Pesticide) in Soil by Bacterial Isolates.Degradation by Microorganisms have been reported by Brajesh Kumar Singh et al., 1999.Recent developments and methods of biodegradation of soil have been studied by Dileep K. Singh, 2008. Mohammed Mustapha et al. 2018, explore the recent studies that have focused on biodegradation of pesticide residues, the mechanism of microbial degradation of pesticides, the factors that affect the degradation of pesticides and the new application of microbial degradation of pesticides.The excessive use of these chemicals and their persistence in the environment have generated serious problems, namely pollution of soil, water, and, to a lower extent, air, causing harmful effects to the ecosystem and along the food chain. Carla Maria Raffa et al. has given a review on Bioremediation of agricultural soil polluted with pesticides.This study focuses on screening of some microorganisms having pesticide degrading capabilities using basic micro biological assay and quantification of biodegradation by HPLC method.

II. OBJECTIVES

- Isolation soil microorganisms from agricultural fields which are contaminated with pesticides.
- Screening for efficient pesticide degrading microorganisms from the soil samples.
- Designing the enhanced pesticide biodegradation assay.
- Optimization and quantification of biodegradation by HPLC methods.

III. METHODOLOGY AND RESULTS

A. Collection of Soil samples

Total five agriculture soil samples are collected from different location of Kolar, Malur and Chickkaballapur (More vegetables growing place and more pesticides are also used). Soil samples are collected exactly 5 cm depth from the surface (Wet soil) in a sterile polythene bag and carried to the lab for isolation of organisms.

Fig. 1: Soil Samples

B. Isolation of organisms

The organisms isolated by pour plate method using suspension culture. In this process inoculum prepared (1gm of soil samples in sterile 10 ml saline), from this 0.2ml of inoculum was poured in different sterile petriplate and above that approximately 15 ml of M9 modified media (Table 1) was poured and allow it for solidification. After solidification the plates were incubated in bacteriological incubator for 48 hours at 37 ºC.

ISSN No:-2456-2165

Table 1: Composition of Modified m9 media

Component	Quantity
Potassiumdihydrogen Phosphate	3 g
Di-sodiumhydrogen Phosphate	6 g
Sodiumchloride	5 g
Ammoniumchloride	2 g
Magnesiumsulfate	0.1 g
Peptone	Pinch
Pesticides	10mg
Distilledwater	1000 ml

Pesticides used are Capten, Mancozeb, Monocil, Melothione and Chlorpyrifos.

C. Preparation of Subculture:

After 48 hrs subculture based on the morphological character such as Colour, shape and size of the organisms subcultured on the LB agar Plates (Table 2).

Table 2: Luria-Bertani agar composition

Component	Quantity
Tryptone	10 g
YeastExtract	6 g
Sodium chloride	10 g
Agar	20 g
Distilledwater	1000 ml

D. Screening for the degradation:

In five 250 conical flasks 100 ml of modified M9 broth (without agar) along with each pesticide 10mg was prepared and loop of isolated organism was inoculated and incubated in rotatory Shekhar at 37 ºC. Every 48 hours of degradation of the organism is measured by using the spectrophotometer.

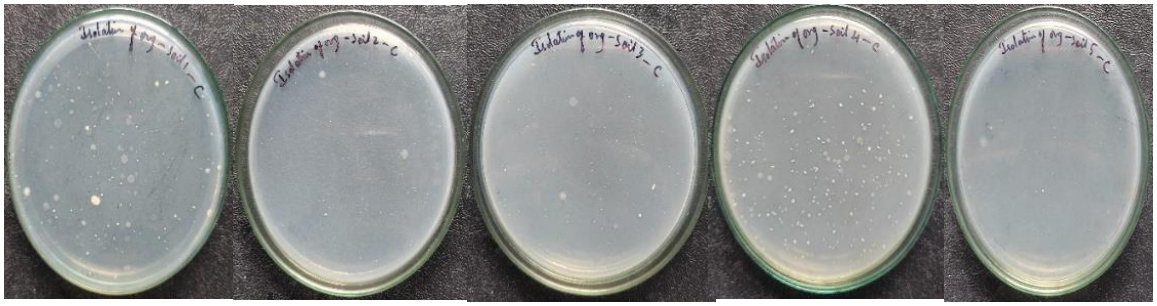


Fig. 2: Capten Pesticide

Fig. 3: Isolation of Organisms

ISSN No:-2456-2165

Fig. 4: Subculture of Organisms for Capten Degradation

Table 3: Degradation of Capten

Incubation time hrs	OD at 261					% of Degradation				
	CS1	CS2	CS3	CS4	CS5	CS1	CS2	CS3	CS4	CS5
Control	0.782	0.739	0.742	0.773	0.756	------	------	-------	------	-----
48	0.770	0.731	0.730	0.756	0.732	1.53	1.08	1.61	2.19	3.17
96	0.767	0.725	0.722	0.744	0.726	1.91	1.89	2.69	3.75	3.96
144	0.762	0.706	0.712	0.736	0.713	2.55	4.46	4.04	4.78	5.68
192	0.754	0.692	0.701	0.732	0.696	3.58	6.35	5.52	5.30	7.93
240	0.750	0.690	0.695	0.726	0.670	4.09	6.63	6.33	6.08	11.37
288	0.745	0.676	0.674	0.722	0.655	4.73	8.52	9.16	6.59	13.35
336	0.736	0.670	0.662	0.716	0.649	5.88	9.33	10.78	7.37	14.15
384	0.735	0.670	0.659	0.710	0.640	6.01	9.33	11.18	8.15	15.34
432	0.735	0.666	0.659	0.702	0.636	6.01	9.87	11.18	9.18	15.87
480	0.732	0.662	0.652	0.694	0.636	6.39	10.41	12.12	10.21	15.87
528	0.732	0.662	0.651	0.690	0.636	6.393	10.41	12.26	10.73	15.87

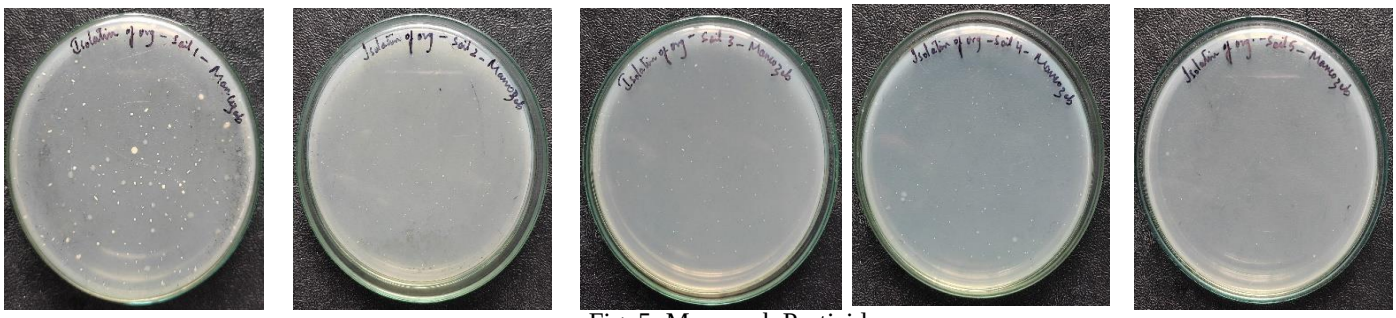


Fig. 5: Mancozeb Pesticide

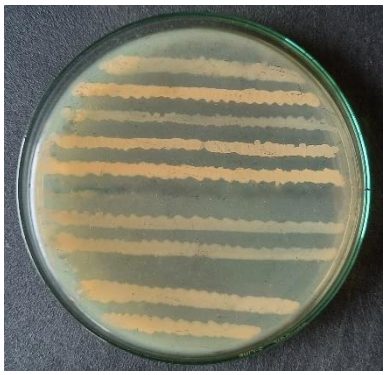


Fig. 6: Isolation of organisms

ISSN No:-2456-2165

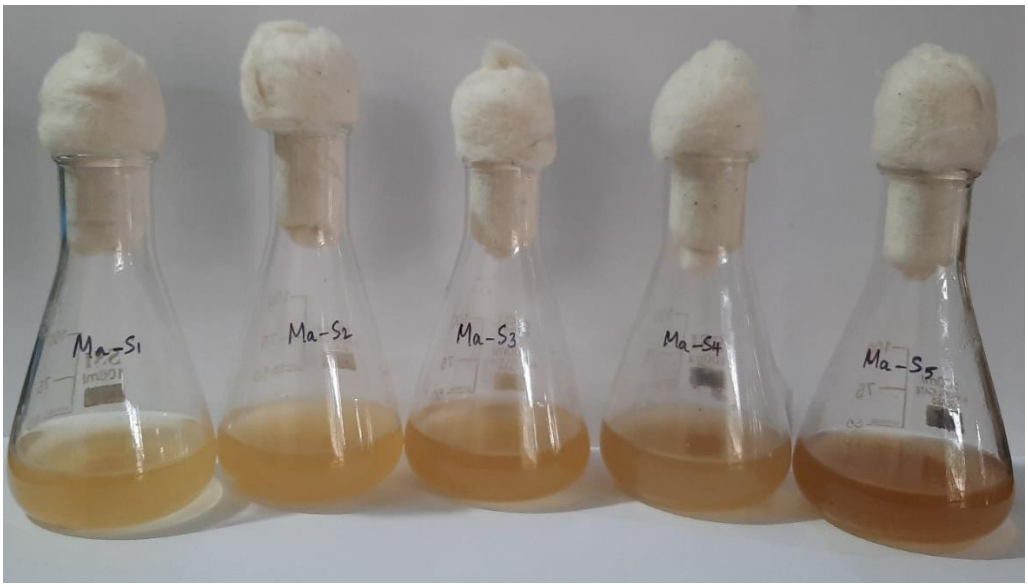


Fig. 7: Subculture of Organisms for Mancozeb Degradation

Table 4: Degradation of Mancozeb

Incubation time hrs	OD at 266					% of Degradation				
	MaS 1	MaS 2	MaS 3	MaS 4	MaS 5	MaS 1	MaS 2	MaS 3	MaS 4	MaS 5
Control	0.430	0.422	0.442	0.456	0.430	-----				
48	0.412	0.406	0.410	0.432	0.412	4.18	3.79	7.23	5.263	4.18
96	0.396	0.392	0.380	0.402	0.390	7.90	7.10	14.02	11.84	9.30
144	0.390	0.390	0.364	0.388	0.372	9.30	7.58	17.64	14.91	13.48
192	0.377	0.382	0.352	0.369	0.362	12.38	9.47	20.36	19.07	15.81
240	0.370	0.380	0.344	0.340	0.355	13.95	9.95	22.17	25.43	17.44
288	0.366	0.374	0.340	0.335	0.340	14.88	11.37	23.07	26.53	20.93
336	0.360	0.370	0.333	0.332	0.334	16.27	12.32	24.66	27.19	22.32
384	0.355	0.369	0.330	0.332	0.329	17.44	12.55	25.33	27.19	23.48
432	0.351	0.364	0.330	0.330	0.320	18.37	13.74	25.33	27.63	25.58
480	0.350	0.360	0.330	0.327	0.319	18.60	14.69	25.33	28.28	25.81
528	0.350	0.359	0.328	0.325	0.319	18.60	14.92	25.79	28.72	25.81

Fig. 8: Monocil

ISSN No:-2456-2165

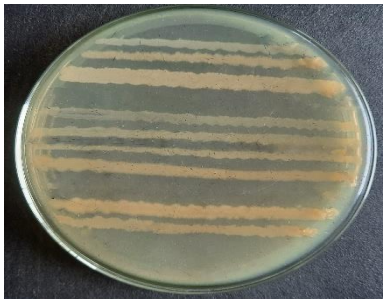


Fig. 9: Isolation of organisms for Monocil

Fig. 10: Subculture of Organisms for Monocil Degradation

Table 5: Degradation of Monocil

Incubation time hrs	OD at 260					% of Degradation				
	MS1	MS2	MS3	MS4	MS5	MS1	MS2	MS3	MS4	MS5
Control	0.237	0.228	0.243	0.212	0.230	--------	---------	----------	--------	-------
48	0.235	0.218	0.240	0.212	0.222	0.84	4.38	1.23	0.00	3.47
96	0.230	0.206	0.232	0.212	0.219	2.95	9.64	4.52	0.00	4.78
144	0.202	0.198	0.225	0.200	0.219	14.76	13.15	7.40	5.66	4.78
192	0.185	0.188	0.219	0.200	0.210	21.94	17.54	9.87	5.66	8.695
240	0.169	0.176	0.215	0.200	0.202	28.69	22.80	11.52	10.37	12.17
288	0.150	0.172	0.215	0.190	0.200	36.70	24.56	11.52	12.73	13.04
336	0.143	0.172	0.213	0.185	0.200	39.66	24.56	12.34	15.09	13.04
384	0.140	0.170	0.200	0.180	0.200	40.92	25.43	17.69	15.09	13.04
432	0.140	0.170	0.200	0.180	0.200	40.92	25.43	17.69	15.09	13.04
480	0.140	0.169	0.199	0.180	0.198	40.92	25.87	18.10	15.09	13.91
528	0.139	0.169	0.200	0.180	0.197	41.35	25.87	17.69	15.09	14.34

Fig. 11: Melothione

ISSN No:-2456-2165

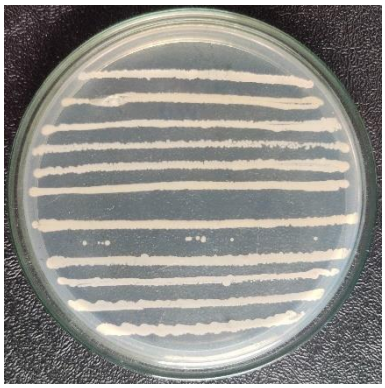


Fig. 12: Isolation of Organisms for the degradation of Melothione

Fig. 13: Subculture of Organisms forMelothione Degradation

Table 6: Degradation of Melothione

Incubation time hrs	OD at 253					% of Degradation				
	MeS1	MeS2	MeS3	MeS4	MeS5	MeS1	MeS2	MeS3	MeS4	MeS5
Control	0.943	0.922	0.956	0.963	0.933	-----	-----	------	----	-----
48	0.912	0.896	0.916	0.933	0.901	3.28	2.81	4.18	3.11	3.42
96	0.892	0.870	0.894	0.902	0.873	5.40	5.63	6.48	6.33	6.43
144	0.872	0.856	0.872	0.879	0.850	7.52	7.15	8.78	8.72	8.89
192	0.864	0.843	0.866	0.864	0.828	8.37	8.56	9.41	10.27	11.25
240	0.860	0.838	0.854	0.860	0.821	8.80	9.11	10.66	10.69	12.00
288	0.851	0.835	0.846	0.852	0.812	9.75	9.43	11.50	11.52	12.96
336	0.844	0.828	0.831	0.846	0.801	10.49	10.13	13.07	12.14	14.14
384	0.839	0.804	0.824	0.842	0.779	11.02	12.79	13.80	12.56	16.50
432	0.835	0.801	0.822	0.840	0.763	11.45	13.12	14.01	12.77	18.22
480	0.833	0.794	0.821	0.829	0.755	11.66	13.88	14.12	13.91	19.07
528	0.833	0.792	0.820	0.820	0.745	11.66	14.09	14.22	14.84	20.15

Fig. 14: Chlorpyrifos

ISSN No:-2456-2165

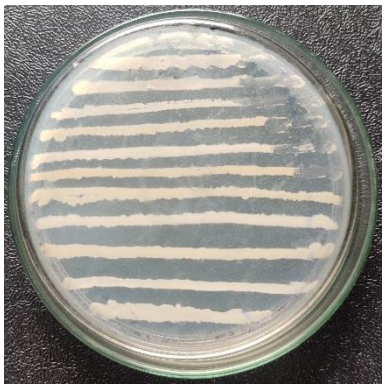


Fig. 15: Isolation of Organisms

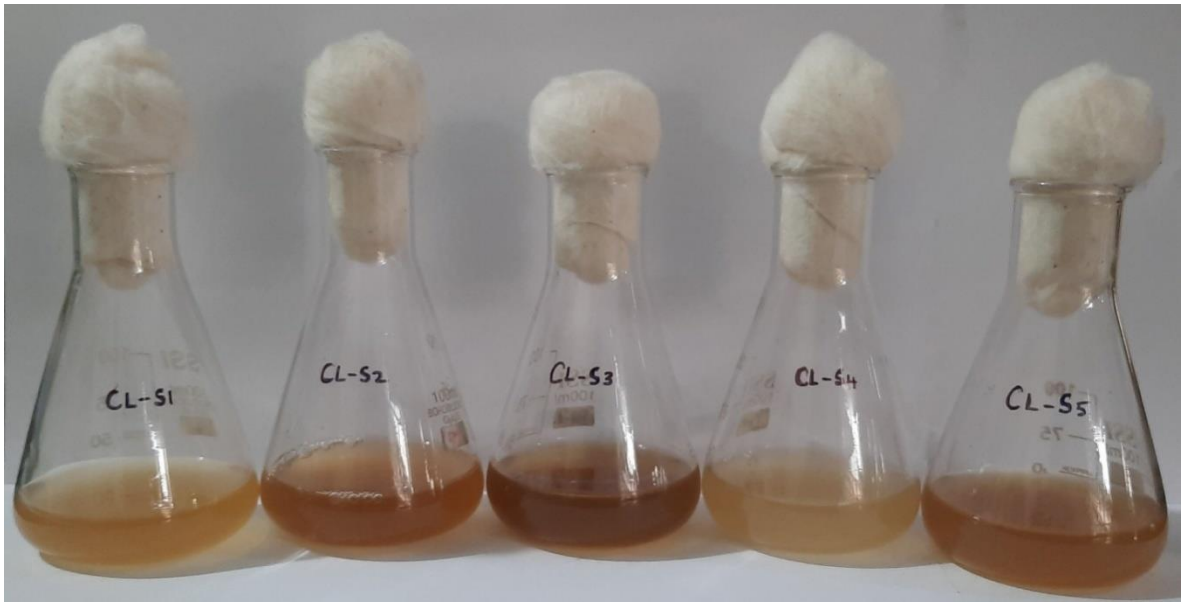


Fig. 16: Subcultureof Organisms for the degradation of Chlorpyrifos

Table 7: Degradation of Chlorpyrifos

Incubation time hrs	OD at 432					% of Degradation				
	ClS1	ClS2	ClS3	ClS4	ClS5	ClS1	ClS2	ClS3	ClS4	ClS5
Control	0.676	0.612	0.634	0.678	0.651	-----	------	-----	------	------
48	0.670	0.579	0.628	0.670	0.633	0.88	5.39	0.94	1.17	2.76
96	0.656	0.564	0.624	0.655	0.612	2.95	7.84	1.57	3.39	5.99
144	0.644	0.539	0.619	0.634	0.601	4.73	11.92	2.36	6.48	7.68
192	0.630	0.528	0.592	0.612	0.576	6.80	13.72	6.62	9.73	11.52
240	0.612	0.512	0.570	0.606	0.558	9.46	16.33	10.09	10.61	14.28
288	0.596	0.504	0.544	0.601	0.544	11.83	17.64	14.19	11.35	16.43
336	0.592	0.499	0.536	0.597	0.536	12.42	18.46	15.45	11.94	17.66
384	0.590	0.478	0.533	0.590	0.529	12.72	21.89	15.93	12.97	18.74
432	0.573	0.476	0.533	0.588	0.518	15.23	22.22	15.93	13.27	20.43
480	0.569	0.475	0.530	0.588	0.502	15.82	22.38	16.40	13.27	22.88
528	0.560	0.476	0.530	0.586	0.502	17.15	22.22	16.40	13.56	22.88

E. Optimisation

Based on the perimetry experiments, Monocil showed maximum degradation**.** To maximise the degradation, carried out Different concentration of Pesticides, Temperature and pH on microbes for the degradation.

- **Effect of Different Concentration of Monosil**: In this process 100ml of modified M9 medial along with that different concentration such as 10mg, 20mg, 30mg, 40mg and 50mg added in different conical flask. Inoculated the one ml **seed culture** and incubated in shaker incubator for 528hr (22 days) at 37 ºC. after incubation % of degradation was measured using Spectrophotometer at 260nm. Optical density and % of degradation below mentioned table.
- **Preparation of Seed culture**: In this process loopful organism was inoculated in 50 ml LB broth and incubated for 24hrs in shaker incubator.

Table 8: Preparation of seed culture

Concentration mg and OD at 260		OD @ 260 nm	% of degradation
Control	0.202	0.202	-------
10	0.242	0.141	41.7
20	0.278	0.172	38.12
30	0.312	0.236	24.35
40	0.346	0.284	17.9
50	0.396	0.344	13.13

- **Effect of temperature:** In this process 100ml M9 modified media along with 20 mg Monocil (Standardised from the different concentration of Pesticides) and inoculated the 1ml of Seed culture. After inoculation incubated in different temperature such 25 ºC, 30 ºC, 35 ºC, 40 ºC and 45 ºC shaker incubator and % of degradation was measured using Spectrophotometer at 260nm. Optical density and % of degradation below mentioned table.

Table 9: Effect of Temperature

Temperature ºC	OD @260 nm	% of Degradation
Control	0.284	-------
25	0.226	20.4
30	0.196	30.9
35	0.179	36.9
40	0.170	40.1
45	0.198	30.2

- **Effect of pH:** In this process 100ml M9 modified media and different pH such as 5,6,7,8 and 9 was adjusted using 0.1M HCL and 0.1M NaOH along with 20 mg Monocil (Standardised from the different concentration of Pesticides) and inoculated the 1ml of Seed culture. Incubated 40ºC shaker incubator and % of degradation was measured using Spectrophotometer at 260nm. Optical density and % of degradation below mentioned table.

Table 10: Effect of pH

pH and OD at 260		OD @ 260 nm	% of degradation
Control	0.365	-------	
5	0.254	0.192	31.6
6	0.352	0.226	35.7
7	0.393	0.230	41.47
8	0.402	0.284	29.35
9	0.406	0.317	21.92

- **Effect of Trace Element:** In this process 100ml M9 modified media and different trace element such as Magnesium, Manganese, Zinc, Iron and Copper along with 20 mg Monocil (Standardised from the different concentration of Pesticides) and inoculated the 1ml of Seed culture. Incubated 40ºC shaker incubator and % of degradation was measured using Spectrophotometer at 260nm. Optical density and % of degradation below mentioned table.

Table 11: Effect of Trace Elements

Trace Element and OD at 260		OD @ 260 nm	% of degradation
Control	0.406	-------	
Magnesium	0.274	0.238	36.94
Manganese	0.369	0.356	10.83
Zinc	0.256	0.244	48.27
Iron	0.312	0.334	20.44
Copper	0.401	0.396	1.970

F. HPLC Analysis

The analysis was made on C18 column (symmetry, 4·6mm×250mm) in isocratic mode with the mobile phase methanol and water in the ratio 7:3 with the RP-HPLC C-18 column at a flow rate of 1mL/min. The control and test were dissolved in the ratio1:1 of mobile phase and 20µL was injected and the elution was monitored at 254nm. The percentage of degradation was estimated using the formula,

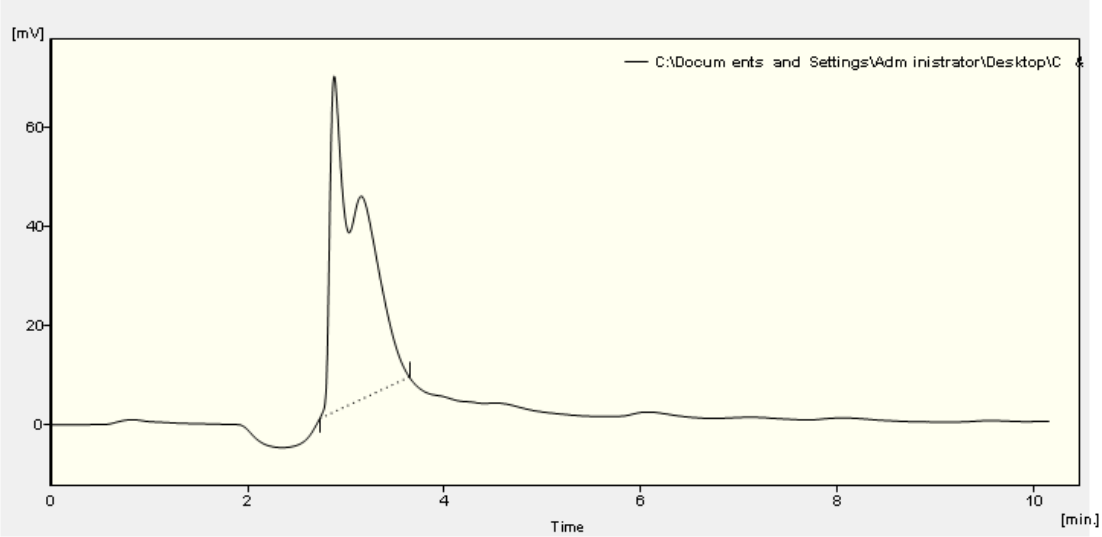
Percentage of degradation= [Control Area – Test Area/ Control Area] * 100

- *CONTROL*

Sample Info:

SampleID	:	Amount	:0
Sample	:	ISTDAmount	:0

Inj.Volume[ml] : 0 Dilution :1



Graph 1: Control

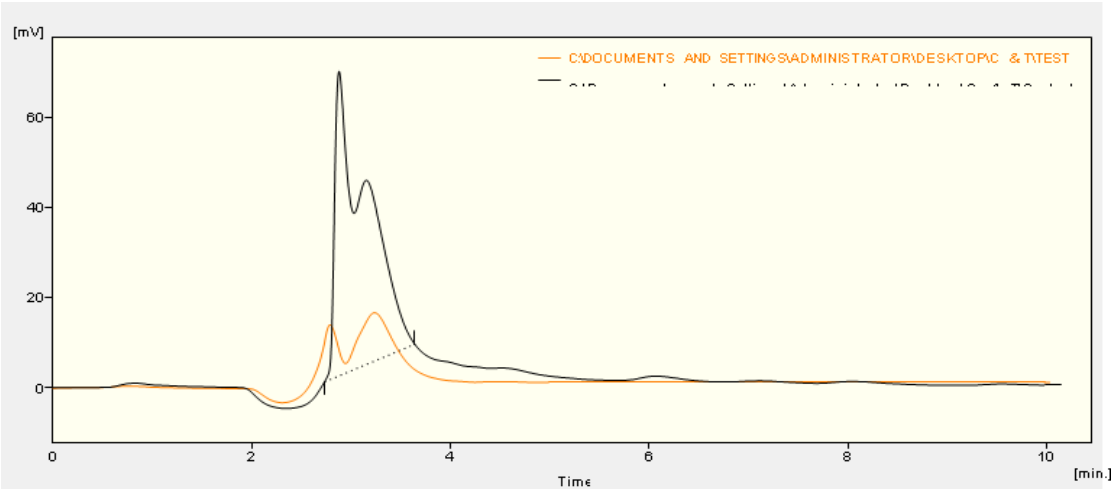
➢ *Result Table: Control*

	Reten.Time[min]	Area[mV.s]	Height[mV]	Area[%]	Height[%]	W05 [min]
1	2.880	1478.092	67.627	100.0	100.0	0.46
	Total	1478.092	67.627	100.0	100.0	

➢ *TEST*

Sample Info:

SampleID : Amount :0
Sample : ISTDAmount :0
Inj.Volume[ml] :0 Dilution 1



Graph 2: Test

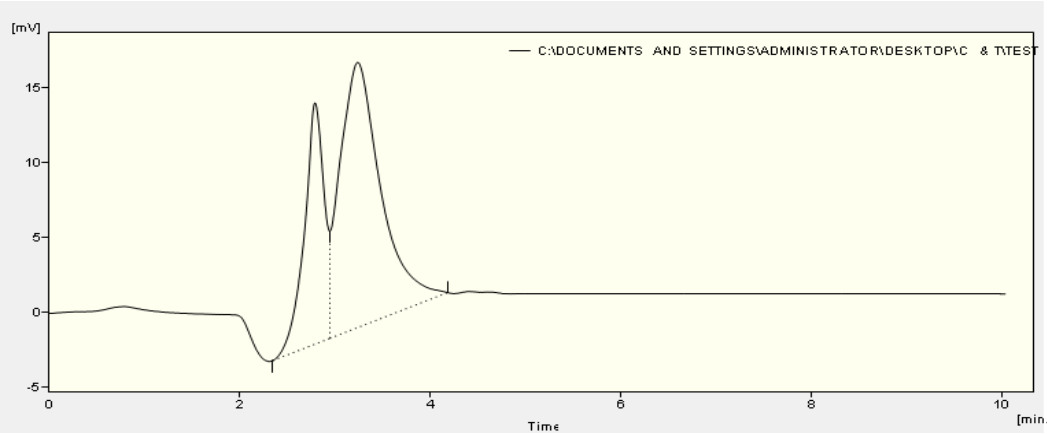
➢ *Result Table: Test*

	Reten.Time[min]	Area[mV.s]	Height[mV]	Area[%]	Height[%]	W05 [min]
1	2.790	232.694	16.124	30.4	47.6	0.23
2	3.237	533.900	17.718	69.6	52.4	0.48
	Total	766.594	33.842	100.0	100.0	

➢ *CONTROL and TEST*

SampleInfo:

SampleID	:	Amount	:0
Sample	:	ISTDAmount	:0
Inj.Volume[ml]	**:0**	**Dilution**	**1**



Graph 3: Control and Test

➢ *Result Table:C and T*

		Reten. Time [min]	Area[mV.s]	Height [mV]	Area [%]	Height [%]	W05 [min]
1		2.880	1478.092	67.627	100.0	100.0	0.46
		Total	1478.092	67.627	100.0	100.0	

Based on HPLC result the RT of the standard is 2.8 and area of the standard is 1478.092 mvs when compared with sample showed RT as the same 2.79. It showed clear degradation of the compound and it decreased to 266. Based on area percentage of degradation was calculated and showed as 48.14%.

IV. DISCUSSION

Pesticides in the soil could be degraded by different ways; the traditional methods included physical degradation, chemical degradation, and physical-chemical degradation, which basically caused secondary pollution (Zhang H et al., 2016). Variety of organisms has been involved to degrade pesticides. Hence, the process of bioremediation has been accelerated by the use of such organisms. In the current study a promising attempt has been made to find out microorganisms which can degrade pesticides from agricultural soil. The soil source is chosen from agricultural lands of Kolar where vegetables are grown to a maximum extent and pesticides have been used. The survey with local population revealed that they used four pesticidesprominently – CaptenMonocil, Mancojeb. Melathione, Insecticide, and. Chlorpyrifos. (insecticide) Capten and Mancojeb are fungicides and the other three are insecticides.

The soil samples thus collected were used as inoculum and used to isolate microorganisms. The modified M9 medium was used for isolation of microbes Further microorganisms were subcultured on LB agar plates Further the microorganisms were subjected to screening process

using Modified M9 broth during which the degradation process was assesed with respect to all the selected pesticides. Every 48 hrs degradation of pesticide the organism measured by using the spectrophotometer upto 528 hrs. the OD values of all the pesticides revealed that maximum degradation was observed with respect to Monocil which showed 41% of degradation whereas Mancozeb showed 18%, Capten showed 6%, Melathione showed 10% and Chlorpyrifos showed 17%. Hence further studies on optimisation was carried out with respect to Monocil.

Further studies were conducted to maximize the degradation process optimization was carried out by considering various parameters like different concentration of Pesticides, Temperature and pH and trace elements on microbes for the degradation.

Optimization protocol was initiated with respect to concentration of pesticide. At 20mg concentration 38% degradation was observed which was maximum. Further The degradation was assessed pertaining to temperature in which maximum degradation was observed at 40ºC which was 40%. with 20mg concentration. This was followed assessment of Degradation with respect to pH which was maximum (41%) at 7. Finally considering all these three standardized parameters effect of different trace elements was assessed. Presence of zinc in the medium showed maximum degradation of pesticide -48%. Zn plays an important role in activation of Oxidoreductase enzyme. Hence it is considered when compared to other trace elements. Thus, Biodegradation of pesticides depends on various factors like microbial species, metabolic activity, pesticide structure, and environmental factors (YichenHuang,et al. , 2018).

Further HPLC was carried out to quantify and to find out the percentage of the degradation process. The product of the biodegradation was determined by GC-MS analysis. The percentage of degradation was found to be 48.14%.

HPLC is widely used to detect pesticide residues in agricultural source with a broad range of column materials and detectors assisting in the execution of extremely accurate food quality and regulatory control. Biodegradation of Glyphosate by fungi species has beenreported. The products of degradation were determined by Thin-Layer Chromatography (TLC) and High-Performance Liquid Chromatography (HPLC) (Adelowo, F.E et al. 2014). A bacterial consortium which degrades tetrachlorvinphos (phosphoric acid, 2–chloro–1– (2,4,5–trichlorophenyl) ethenyl dimethyl ester) was isolated from agricultural soil. Hydrolysis products were detected and identified by gas chromatography–mass spectrometry. These data indicate that the isolated strains can be used for waste biodegradation or bioremediation of TCV–contaminated soil or water (Ma. Laura Ortiz– hernández et al. 2010). A new acephate-degrading bacterium from agricultural soil was reported and to investigate its biodegradation ability and pathway of degradation high- performance liquid chromatography (HPLC) and electron spray ionization-mass spectrometry (ESI-MS) analyses was carried out. These results highlight the potential of this bacterium to be used in the cleanup of contaminated pesticide waste in the environment. (Shashikala Ramu et al. 2014). The diuron degrading activity of 17 Streptomyces strains, obtained from agricultural and non-agricultural soils, was determined in the laboratory. Biodegradation activity was determined by high-performance liquid chromatography. The results indicated that all strains were able to degrade diuron, but to different amounts. Twelve strains degraded the herbicide by up to 50% and four of them by up to 70%. (M.A. Castillo et al., 2006).

V. CONCLUSION

Biodegradable material can undergo controlled biological decomposition. This property has led to the development of safe and environmentally friendly products that are not harmful to human life and health. Due to problems caused by persistent pollutants, development of technologies that guarantee their elimination in a safe, efficient and economical way is important. In order to reduce the effects of pesticides on the environment and health, for remediation of contaminated sites and for the treatment of pesticide residues, different methods have been developed. Process of detoxification of toxic contaminants in the soil and other environment by using microorganisms can be ecofriendly which can be applied everywhere in agricultural sector without any harmful effect to the environment. Using information gained from fundamental research, bioremediation technology has been used to detoxify different contaminated environments and the results of field studies are very encouraging. This study focuses on screening of some microorganisms having pesticide degrading capabilities using basic micro biological assay. The use of microorganisms to obtain Bioactive compounds and their application in Biotransformation. In the current studies effective degradation of the Pesticide Monocil was observed and it was further optimized with different parameters. The quantification of degradation was aassessed using HPLC technique and the percentage of degradation was found to be 48%.

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