IJSRM
INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY
An Official Publication of Human Journals

Human Journals
Research Article
September 2016 Vol.:4, Issue:3

Degradation of Pesticide by Using Geofungi from Thanjavur District

IJSRM
INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY
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Submission: 7 September 2016
Accepted: 12 September 2016
Published: 25 September 2016

Keywords: *A. niger*, monocrotophos, biodegradation, pesticide

ABSTRACT

The effect of pesticide on the formation of soil and their ability to pesticide degradation was investigated. The efficiency of microbial concentration obtained from each of their bioprocess for monochrotophos degradation has been analyzed. Some of the selected fungi like *A. niger*, *A. flavus*, *A. fumigatus*, *P. lanosum* and *T. viride* were analyzed for pesticide degradation. *A. niger* and *T. viride* were maximum degradation by using *in vitro* experiments. Therefore, the fungi potential candidate for microbes mediated bioremediation of monochrotophos.

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INTRODUCTION

The pesticides are defined under the federal environmental pesticide control Act (FAPCA) as any substances intendent for preventing, destroying, repelling mitigating any pesticides (fungi, pest, rodents, nematodes and weeds). The objectives of biodegradation of pesticide with monocrotophos contaminated soil and effect of pesticide on soil mycoflora in Thanjavur District from paddy field soil. It is a widely used effective insecticide against broad crops. Degradation of the pesticide depends upon the type of the soil property, moisture content of the soil and pH. The fungal colonies were able to rapidly degrade monocrotophos and between 15 and 35^0C. Singh *et al.,* (2013) investigated the degradation behaviors of insecticide at termiticidal application rates under standard Laboratory conditions.

MATERIAL AND METHODS

Collection of soil samples

Monocrotophos contaminated soil samples were taken from two different regions of Vallam and Rajagri, Thanjavur district. Isolation and screening of fungal population from soil samples and remaining soil stored in plastic bags, then air sievesto be representation and homogeneous, then kept at 4^0C until use.

Isolation and identification of fungi

The collected soil samples was serially diluted and make upto 10^{-3} to 10^{-5} and then aliquots (0.5ml) were spread on PDA medium (Himedia Laboratories Pvt Ltd. Mumbai India) and incubated at 25^0 C for two days. The Streptomycin sulphate20mg/ml added to preventing bacterial growth in the Petriplates. After inoculation the plates subsequently incubated. Fungal colonies were originated and then obtain pure cultures. Identificationof isolated fungi with Lactophenol cotton blue strain with observed the morphological and anatomical characters offungi by using standard manual of soil fungi (Gilman 1957), Dematiaceous Hyphomycetes by Ellis (1956) More Dematiaceous Hyphomycetes by Ellis and Ellis (1976).

Degradation of monocrotophos by fungi

The inoculums were prepared to get sufficient quantity and desired growing phase of the selected fungal strains. The pure culture of fungi individually inoculated and inoculated in to the PDB medium broth containing (2-12ppm/l) monocrotophos then fungi degrade the monochrotophos with the liberation of organic phosphate ions which was estimated after specific intervals O.D values was measured and pesticide degraded by growth of fungi.

RESULTS AND DISCUSSION

According to Mishra *et al*., (2001) observed that physiochemical properties of the soil, nature of substrates and environmental degradation were determined the persistence of pesticide in nature. The excessive and biological active residues endanger non target organisms, prove hazardous and pesticide degradation of conditions. In recent years there has been a steady increase in the number and amount of residues of pesticides in our food and soil. While pesticides serve useful purposes, ceneen has been expressed regarding their possible effects on environment. Edwand (1973) gave following four effects of pesticides in living organisms in the soil. i) They may be directly toxic to living organisms ii) They may affect the soil organisms genetically to produce population resistant to the pesticides iii) they may have such lethal effects that results in alternative in behavior (or) changes in metabolic (or) reproductive activity iv) they may be taken in to bodies of soil flora (or) fauna and passes on to the other organisms. The pesticide alter the biological equilibrium that greatly affect both plant pathogens associated microorganisms and soil fertility. Among the various types of reaction change in the microbial equilibrium and ecological activities have often been reported in soil amended with fungicides (Domsh, 1984, Arunkumar and Singh, 1994).

Biodegradation of pesticides by using microbes have more advantages over the conventional methods. In biodegradation process, the agents like fungi and plants were frequently used.Singh *et al.,* (2013) reported that 77.7% of Malathion was degraded after 7 days of incubation by using fungi. Chalamala *et al*., (2012) worked on mycodegradation of Malathion by using *Aspergillus niger* with 86.72% of degradation.

Gray *et al*., (2002) studied the degradation of contrasting pesticides by white-rot fungi and its relationship with ligninolytic potential was analyzed. There was considerable variation among the white rot fungi in their ability to degrade the pesticides. There was no relationship between presumptive ligninolytic activity and the degradation of the pesticides. However, there was a clear relationship between the ability of the fungi to degrade the different pesticide classes, indication that similar mechanisms were involved in degradation of all compounds.

Similar results were done from the reports that mycore mediation process. *A. niger* was maximum potential for degradation of monocrotophos treated with PDA medium (Rani and Dhania *et al*., 2014; Kumar *et al*., 2015 and El-Ghany and Masmali, 2016). The monocrotophos concentration of 2,4,6,8,10 and 12 ppm with mycelial biomass was 20.8,17.6,14.0,10.8,10.1,08.7 and 05.28 gm weight and growth formation also represented 0,2,4,6,8,10 and 12 ppm with 100,72,63,57,53,45 and 38 percentage of growth calculated. The study elucidated that the fungal *A. niger* are effective degradation of pesticide whencompare to other fungi. *A. niger* can grow efficiently in the high concentration of pesticide. *A. niger* effectively destroyed monocrotophos from contaminated soils.

Table 1: Physiochemical analysis of soil sample from Thanjavur district

Sr.No	Parameters	Vallam	Rajagari
1	pH	7.2	7.4
2	Electrical conductivity(dsm-1)	0.43	0.52
3	Organic carbon (%)	0.12	0.18
4	Available Nitrogen (mg/g)	110.2	102.5
5	Available phosphorus (mg/g)	3.75	4.83
6	Available potassium (mg/g)	106.1	121.10
7	Calcium (mole protol)	10.6	17.2
8	Sodium (mole protol)	06.9	07.6
9	Magnesium (mole Protol)	1.10	1.00

Table2:List of the fungi isolated from soil sample of Thanjavur district

Sr.No	Name of the fungi	Vallam	Rajagri
1	*Aspergillus flavus*	+	-
2	*A. fumigutus*	-	+
3	*A. niger*	+	+
4	*A. terreus*	+	-
5	*Penicillum lanosum*	-	+
6	*P. citrinum*	+	-
7	*Trichoderma viride*	+	-
8	*T. harizanum*	+	+
9	*T. longibrachiatum*	+	-
10	*T. koningii*	-	+

Table 3: *Aspergillus niger* mycelial biomass with PD medium supplemented with different concentration monocrotophosin flask trails

Sr.No	Monocrotophos concentration (ppm)	Mycelial biomass (g)	Growth formation (%)
1	0	20.8	100
2	2	17.6	72
3	4	14.0	63
4	6	10.8	57
5	8	10.1	53
6	10	08.7	45
7	12	05.2	38

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