The Asian Journal of Experimental Chemistry, (June, 2010) Volume 5 Issue 1 : 36-39

Research Paper :

Efficacy of four microbial cultures in dissipation of chlorpyriphos in mollisols

NIMISHA SINGH, ANJANA SRIVASTAVA, P.C. SRIVASTAVA AND NIVEDITA SRIVASTAVA

Accepted : *April, 2010*

ABSTRACT

The efficacy of four microbial cultures strains *i.e.* P (*Fluorescent pseudomonas* sp.), S8 (*Sphingomonas* sp.), Cf (*Gordonia* sp.), S9P (*Consortia* of *Bacillus* and *Pseudomonas* sp.) was evaluated in dissipation of chlorpyriphos (O,O-diethyl-O-3,5,6–trichloro-2-pyridinyl phosphorothioate), an organophosphate insecticide in mollisols under laboratory conditions. The data obtained in dissipation of chlorpyriphos treated with four cultures in (0–15cm) depth soil was evaluated after eight consecutive samplings (0, 1, 3, 5, 7, 10, 15 and 30 days). The results indicate that the degradation of chlorpyriphos was at slower rate during the first 5 days but thereafter became faster from 7 to 30 days. Dissipation studies could be better accounted by biphasic pattern involving an initial slower and a later faster phase. The kinetics of dissipation of chlorpyriphos from soil was accounted by first order kinetics. As per the data obtained indicates that S9P consortia have shortest half life of 5.37 d with chlorpyriphos in intial phase while P, S8, Cf and control showed half life of 6.53, 9, 8.45 and 9.62 d. While in later phase culture P and S8 showed more effectiveness followed by S9P and Cf in comparison to control in dissipation of chlorpyriphos. Thus S9P consortia was found to be most potent in degradating chlorpyriphos in comparison with rest of cultures.

See end of the article for authors' affiliations

Correspondence to:

NAMISHA SINGH
Department of Applied Chemistry, M.J.P. Rohilkhand University, BAREILLY (U.P.) INDIA

Key words : Microbial culture, Chlorpyriphos, Mollisols, Organophosphate insecticide

Chlorpyriphos (O,O-diethyl o-3,5,6 – trichloro-2-pyridinyl phosphorothioate) is used worldwide as an agricultural organophosphate insecticide .It is prominent acetylcholine inhibitor Chlorpyriphos alters cholinesterase, preventing it from inactivating Acetylcholine. As the acetylcholine builds up, the muscles of the body become over stimulated, leading to paralysis and death. Its environmental fate has been extensively studied and the reported half life in soil varies from 10 to 120 days (Singh, 2003). It is widely used for insect pest control on grain, cotton, fruit, nut and vegetable crops as well as lawn and ornamental plants, which has caused a wide range of soil contamination (EPA, 1997). The dissipation of Chlorpyriphos after a single application in soil and its effect on soil microbial biomass C and N, microbial population, microbial respiration and enzyme activity has been well investigated (Pandey and Singh, 2004). Soil microorganisms collectively decompose various xenobiotic compounds and return elements to the mineral state utilized by plants. They also play important roles in the dissipation of pesticides in the soil. Organophosphates have been extensively applied as alternatives to organochlorine compounds which possess long term persistence and high toxicity. Organophosphorus compounds such as chlorpyriphos rapidly undergo degradation by soil microorganisms, so they do not persist in the environment. To understand and control the enhanced biodegradation of organophosphates, it is important to know the individual degradation ability of microorganisms, the process of their acquisition of the ability, and their behavior in soil (Kazufumi *et al.,* 1996). Racke and Coats reported that the enhanced degradative phenomenon of microbes may exhibit much better degree of specificity in degradation of pesticides. Since, chlorpyriphos had shown adverse impacts on the environment therefore, it is critically important to develop different methods to enhance its degradation. The aim of this study is to determine the efficacy of four microbial cultures strains *i.e.* P (*Fluorescent pseudomonas* sp.), S8 (*Sphingomonas* sp.), Cf (*Gordonia* sp.), S9P (*Consortia* of *Bacillus* and *Pseudomonas* sp.) in dissipation chlorpyriphos in mollisols.

MATERIALS AND METHODS

Culture preparation:

Microorganisms were isolated from soil and were identified using various biochemical tests and prepared microbial cultures were provided by Department of Microbiology, G.B.Pant.University of Agriculture and Technology, Pantanagar, for studying potential of four bacterial cultures in dissipation of chlorpyriphos. The standard chlorpyriphos of 99.5% purity grade was obtained