

Photo-Degradation of Pentachlorophenol and Dimethoate in Limuru Loam Soil and Nairobi River Sediment by Incandescent and Fluorescence Bulbs

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Abstract

Photo-degradation of pentachlorophenol and Dimethoate by incandescent bulbs and fluorescence light on Nairobi river sediment and Limuru loam soil. The study involved applying 0.01g of each pesticide on 1g of river sediment and loam soil. The applied pesticide on each surface was shaken thoroughly for five minutes and thereafter exposed to sunlight, 40w, 60w, 75w and 100w incandescent bulb, 9w, 11w, 15w and 20w fluorescent tubes at 10, 20, 30, 60 and 120 minutes after which the set-up was allowed to stabilize for an hour. The stabilized set-up was washed with 2ml of analytical grade acetone. The remaining residue level was determined using Shimadzu UV-Visible spectrophotometer at 322nm and 229nm for Pentachlorophenol and Dimethoate respectively. The results obtained revealed that, photo-degradation of both pentachlorophenol and dimethoate depends on the light intensity, temperature and pesticide molecular structure. The rate constant ranged from 0.0023 to 0.0013 days for dimethoate and 0.00736 to 0.076 for pentachlorophenol in incandescent light and 0.078 to 0.093 days in fluorescent light. In both pesticides, first order kinetics was followed. This was also dependent on the light intensity, surface of exposure and radiation time.

Keyword

Photo-Degradation; Pentachlorophenol; Dimethoate; Kinetic; Rate Constant

Introduction

Most pesticides are not easily biodegraded, they persist in soils, leach to the ground water and surface water and hence bio-accumulate in food chains thus influence human health thereby resulting in several negative effects on the environment. Photo degradation is one of the natural pathways common for pesticides degradation after it is released into the environment.

Photolysis process on soil surfaces is vital when a pesticide is placed directly on the soil.

Pesticides reach the soil indirectly through Spray drift, leaching, volatilization or wash off after rainfall and crop absorption [1].

Once a pesticide is placed into the environment, several processes take place. Among them, the commonest

is the leaching process. Leaching aids the herbicides reach into the root zone of the plant and this gives a farmer a better control of weeds. The Pesticides (chemical) that does not get or reach the target, would be very harmful to people and other organisms in the environment [2]. Degradation of pesticide residues results from light, micro-organisms,

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