STUDIES ON THE BEHAVIOUR OF CERTAIN POLLUTANTS IN THE EGYPTIAN ENVIRONMENT

THESIS

SUBMITTED BY

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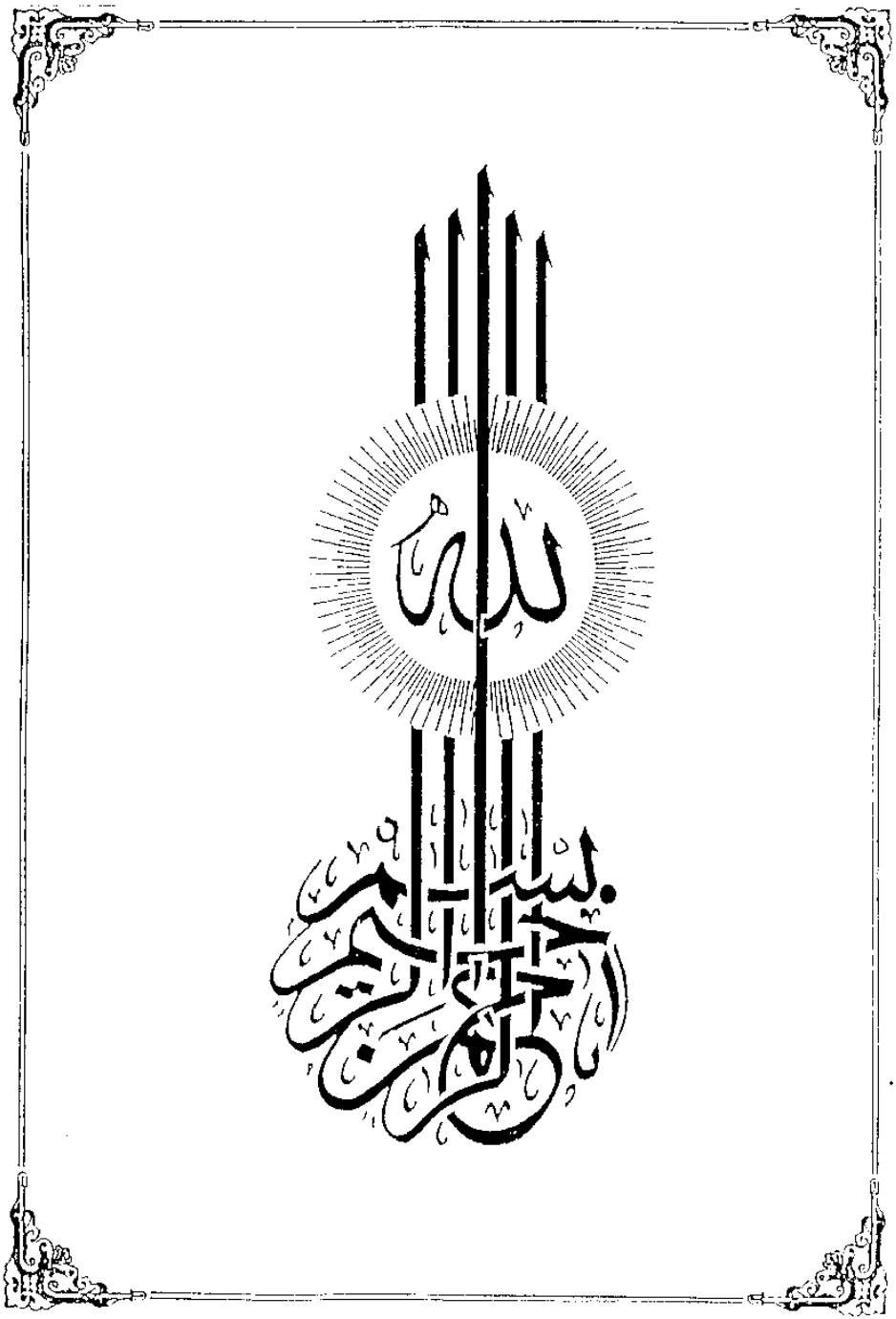

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INTRODUCTION

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Since chemical control of pests is so successful, there has been an explosive expansion in the development of synthetic organic insecticides. The most widely used insecticides, the chlorinated hydrocarbons were generally preferred in the past because they have long residual effects. However, some of these compounds such as DDT and Dieldrin persist amazingly long in soils, water, plants, and animal tissues[1-6].

On the contrary, organophosphorus , and carbamate insecticides are generally unstable and short life in the environment as well as the biological system. They are commonly degraded into nontoxic and water soluble metabolites. The rapid decomposition of these compounds and their transformed metabolites have led to their disappearance from the ecosystem.

Synthetic pyrethroids, have introduced in the Egyptian market since 1978, possessed an excellent and efficient performance against a wide range of pests infesting field crops and vegetables.

Synthetic as well as natural pyrethroids are non-polar compounds and have very small solubility in water. Although they have no systemic or translaminar properties, unlike the organochlorine compounds, they are unstable and non-persistent. The insecticidal activity of pyrethroids is up to four or five times higher than that of the other classes to most insect species. They are both very active against insects and relatively non-toxic to mammales.

The introduction of granular insecticides has opened up new possibilities of application for the control of insects. Granular application of systemic insecticides also, helps to minimise toxic hazards to mammales and birds during application[11] .

The increasing demand for pesticides and their massive use for agriculture and vector control have resulted in increased occurrence of these toxic chemicals and their degradation products in the biota e.g. in Egypt the quantity of pesticides used since 1952 to 1984 is 617507 metric tons[12].

These accumulations lead to several environmental problems such as contaminations of natural waters. Also, fish death caused by various insecticides have been reported

on a global scale. Even if these compounds are present only in very low concentrations, they are hazardous because some species of aquatic life like fish are known to concentrate these compounds 1000 fold or more in their bodies. Thus there is no predictable safe level for insecticides in water where food-chain build-up can occur.

To overcome the problem of the pollutions of the aquatic ecosystems with pesticides, information about the persistence of these compounds under different conditions are of utmost importance . The information also, should include the effects of water treatment methods on the removal of the pesticide residues.

The present investigation aimed to throw light on the persistence and behaviour of two organophosphorus insecticides namely, CYANOX and ACTELLIC, and two pyrethroid ones, namely DANITOL and CYFLUTHRIN , in Nile water under different conditions of pH's and temperatures .

The accumulation of these insecticides in fish tissues head, intestine, liver and edible flesh (muscle) and their rates of disappearence in thesetissues and its aquatic medium were concerned. Besides, the effect of fish cooking

on the mentioned insecticides was studied. ALso, studies were carried out to evaluate water treatment methods like adsorption on activated powdered carbon, and oxidation by Chlorine, Chlorine dioxide and/or ultra-violet irradiation and coagulation by alum on the removal of these insecticides from natural water.

INSECTICIDES STUDIED

I- Organophosphorus insecticides:

A- CYANOX [16]:-

Common names:-

Cyanophos (BSI, ISO), and CYAP (JMAF).

Other names:

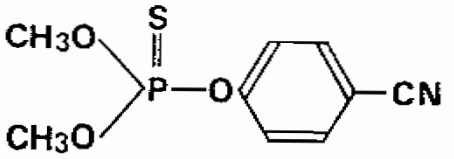
(Former), S 4084.

Action:

Insecticide.

Chemical Name:

0-4-cyanophenyl 0,0-dimethyl phosphorothioate.



CYANOX "Cyanophos"

Chemical properties:-

Clear amber liquid, melting point at 14-15 ^{o}C. Miscible with alcohol, ketones, benzene, toluene, xylene and chloroform.

Toxicity:

Acute oral half lethal doses (LD_{50}) for female and male rats were 610 and 580 mg/kg respectively.ively.

Application:

Used on vegetable and fruits, when used in regular schedules, gives excellent control of lepidopterous larvae on apples and vegetables, used also as a grain protectant and in house hold insect control especially against cockroaches as a residual spray, taking advantage of its long lasting effectiveness.

B- Actellic[16]:

Common name:

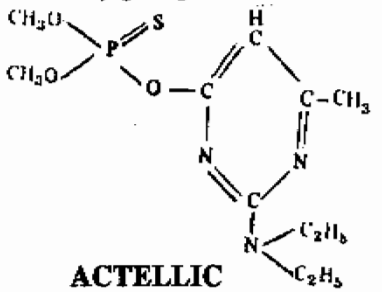
Pirimiphos - methyl.

Other names:

Acetellifog, Blex, and PP - 511. (Discontinued name of ICI plant protection), silos on.

Chemical name:

0 - (2-Diethylamino - 6 - methyl pyrimidin -4-yl) 0,0- dimethylphosphorothioate.



ACTELLIC

Action:

Fast acting and broad spectrum insecticide.

Chemical properties:

Miscible with most organic solvents. Solubility in water approx. 5 PPm at $30^{o}C$. Vapour pressure 1.1×10^{-4} torr. at $30^{o}C$.

Toxicity:

Acute oral half lethal doses (LD_{50}) for female rat > 2000 mg/kg. and acute dermal LD_{50} female rate > 4592 mg/kg.

Application:

For control of a wide range of pests of stored products of domestic and industrial premises, and of fruits, vegetables and other crops.

II Pyrethroid Insecticides:

A- DANITOL[16]:

Common Name:

Fenpropathrin.

Other Names:

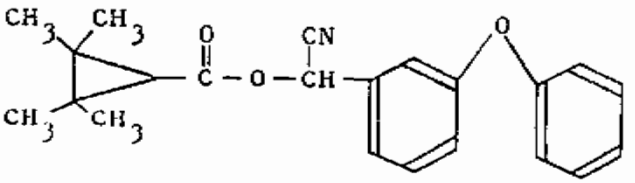
Meothrin, Ortho Danitol, Rody, S - 3206, SD - 41706, S - 3206, WL - 4706, XE - 938.

Action:

Acaricide and insecticide.

Chemical Name:

(Rs)-α- Cyano-3- Phenoxybenzyl 2,2,3,3 - tetramethylcyclopropanecarboxylate.



DANITOL

Chemical properties:

Yellow to brown liquid or solid melting point 45 - 50^{o}C. Soluble in common organic solvents such as xylene, cyclohexane, chloroform, acetone, and amol methanol. Almost insoluble in water. Stable except in alkaline solution.

Toxicity:

Acute oral half lethal doses (LD_{50}) for male and female rats were 70.6 mg/kg, and 66.7 mg/kg. respectively mg/kg. Acute dermal (rabbit) 2000 mg/kg. Toxic to fish, Mild toxicity to birds.

Application:

For control of various species of mites, white flies, leafminers, cotton bollworms, leafworms, leafrollers, armyworm, cabbage worms, cabbage looper, aphids, fortrixes, psyllas, bugs, fruit moths, tuberworms cutworms, budworms, diamond back moth, mosquito bugs, and stem borer on fruit trees, vegetables ornamentals and other field crops.

B- CYFLUTHRIN[16]:

Common Name:

Cyfluthrin.

Other Names:

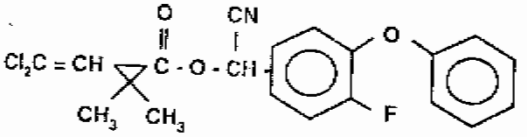
BAY FCR 1272, Baythroid H and Solfac.

Action:

Nonsystemic synthetic pyrethroid with good insecticidal activity.

Chemica l Name:

Cyano (4-fluro- 3-phenoxyphenyl) -3- (2,2-dichloroethenyl) -2-2- dimethyl - cyclopropane carboxylate.



CYFLUTHRIN