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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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TOXICOLOGICAL STUDIES OF SOME CHEMICAL COMPOUNDS AGAINST SOME ENVIRONMENTAL BIOTICS

By

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To

My Dear Father

My Lovely Mother

My Dear Husband

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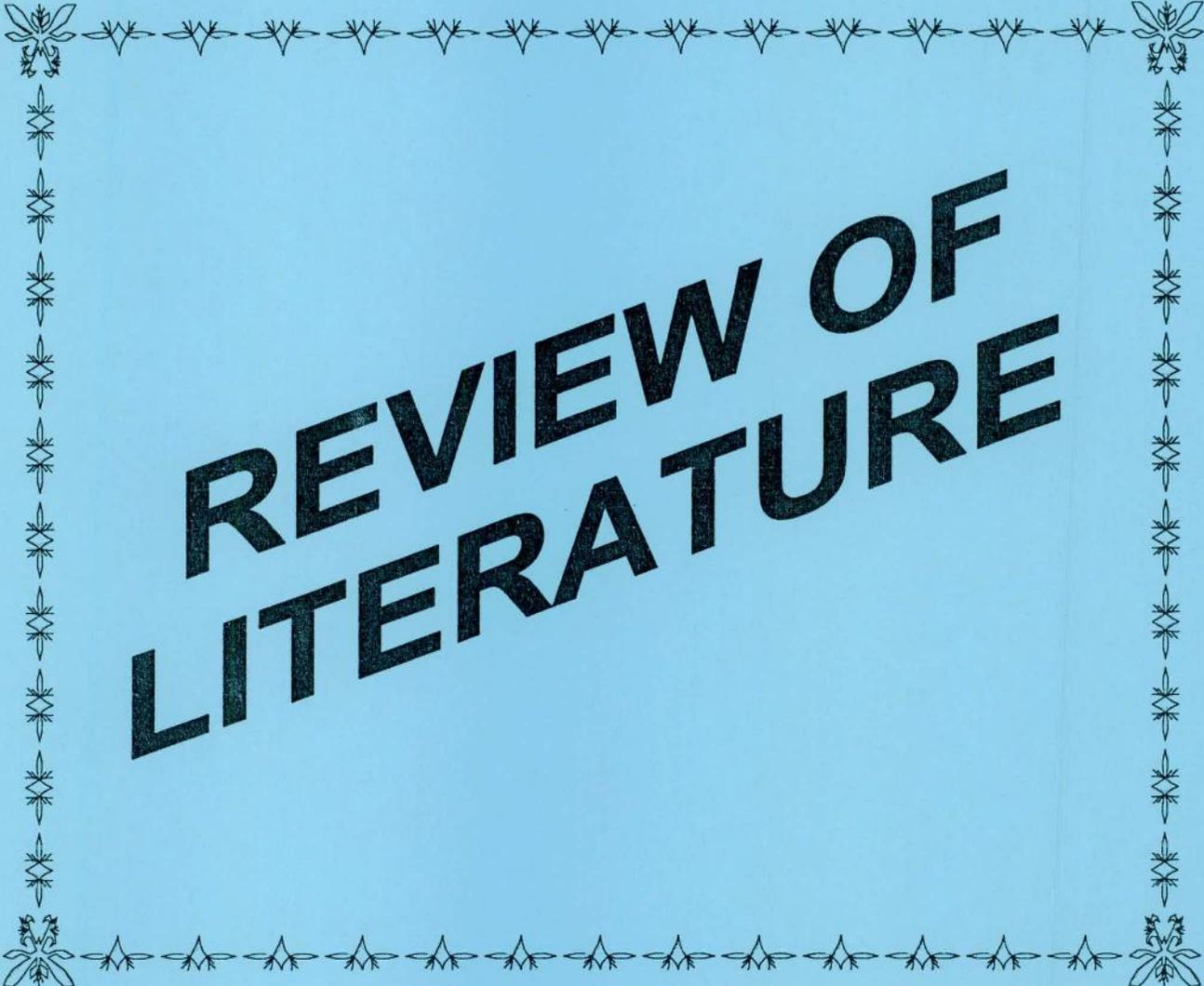
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ARABIC SUMMARY

INTRODUCTION

Increase in the use of chemical pesticides in food and fibre protection and vector control has resulted in widespread environmental problems including pest resurgence, pest resistance, human health hazards and destruction of birds and wildlife. Moreover, percolation and run-off from agricultural land, drift from aerial and ground applications and discharge of industrial waste water is considered as indirect way of pollution. Under these conditions, fish and other aquatic organisms could be greatly exposed to acute or sub-lethal doses of pesticides. As a solution of these problems, a large number of alternatives known usually as non-conventional pesticides has been produced and applied for crop protection. Of these, mineral oils, botanicals and microbial biocontrol agents are prominent and also referred to as biorationals. On the other hand, synthetic conventional pesticides will continue to play an important role in crop protection for the foreseeable future as there are no practical and realistic alternatives at the moment (Persley, 1996). However, there have been tremendous changes in some of the newer pesticides produced. An example of the newer insecticides, is imidacloprid belonging to a novel chemical group known as "neonicotinoids". The compound has a revolutionary mode of action as it is a highly specific agonist of insect nicotinic acetylcholine receptors and thus it is of low toxicity to vertebrates (Yamamoto *et al.* 1995). Neonicotinoids are generally of low degree of toxicity to mammals and aquatic life (Okazawa *et al.* 1998) and also, negative side effects are likely to be much lower with other biorationals (Whitten *et al.* 1996). However, these materials might pose certain environmental repercussions. Imidacloprid, formulated as seed dressing material (marketed under the trade name, Gaucho) might be hazardous to granivorous birds especially those foraging near agricultural fields. Seed extracts of the tropical neem tree, *Azadirachta indica* A. Juss are of low acute oral toxicity for laboratory mammals and are generally regarded as safe for use (Isman, 1995). Furthermore, azadirachtin, a complex tetranortriterpenoid and one of the key active ingredients present in the seed extract, has minimal mammalian toxicity and is not neurotoxin (Larson, 1990). Nevertheless, several neem-seed extracts, some used for preparing commercial azadirachtin-containing insecticides, are cytotoxic. The



**REVIEW OF
LITERATURE**

REVIEW OF LITERATURE

Pesticide application mainly requires scattering onto large areas (millions of feddans of soil) and using concentrations capable of killing selected plants and animal species. The records showed that destruction of birds, wildlife and fish had occurred due to extensive application of different pesticides particularly in certain localized areas. Pesticides applied repeatedly over long stretches of time, pose the more serious possibility of chronic toxicity to humans, fish and wildlife. The hazards involved, especially to wildlife, in the use of persistent organochlorine pesticides are widely appreciated. This had led to search for less persistent pesticides and thus, organophosphorous, carbamate and pyrethroid insecticides had been extensively applied. Although these compounds are less likely to have chronic effects, many of them are acutely poisonous and methods are needed for examining wild birds and possibly other animals thought to have been killed by these compounds.

For the last few decades, literature has contained a great deal of informations on the detrimental side effects of the conventional pesticides (organophosphates, carbamates and pyrethroids) to non-target organisms. However, relatively less has been reported on such effects produced by certain biorationals recently introduced as safer insecticides i.e. imidacloprid (a neonicotinoid compound), neem oil, the entomopathogenic fungus, *Beauveria bassiana* and petroleum oils.

In general, two types of studies are usually carried out for evaluating pesticides as pollutants against warm blooded animals and other non-target organisms (acute and subchronic toxicity). Pharmacologically the chemical insecticides are often neuropoisons which affect certain neurological targets. For example organophosphate and carbamate esters may be classified as anticholinesterases referring to their ability to produce phosphorylation or carbamoylation of the ChE esteric site. However, it is known that OP compounds are not only cholinergic agents but also produced inhibition of neuropathy target esterase (NTE) and release of alkyl groups attached to the phosphorus atom, and alkylation of macromolecules, RNA and DNA (**Kaloyanova and El-Batawi,**

1991). However, OP pesticides could also produce a variety of other pharmacological and toxicological effects (Eto, 1974). Such effects include those on liver and kidney functions which could be confirmed by biochemical and histopathological examination. Many studies have been frequently reported in this respect.

1. Conventional pesticides:

1.1. Warm-blooded animals and wildlife:

1.1.1. Acute, lethal effects and their epidemiology:

In the experimental toxicology of pesticides to vertebrates, the objectives of acute toxicity tests are: to predict hazard to non-target species, to assess toxicity in target species when the pest is a vertebrate animal, to provide information on the mechanism of toxic action, to provide data on which user-risk benefit relationships may be assessed and to aid the establishment of exposure levels in studies designed to assess long-term effects (Brown, 1980). Predictive acute toxicity tests are often carried out in the laboratory using captive birds and valuable information can be obtained from such studies provided that possible differences between the responses in feral and the non-feral birds are taken into consideration. The avian species quite often used in laboratory investigations are the Japanese quail (*Coturnix coturnix japonica*) and the common pigeon (*Columba livia*). However, birds can not generally be used as an indicator of acute toxic hazard for mammals in which two rodent species are most often used for this purpose, the laboratory rat, *Rattus norvegicus* and the laboratory mouse, *Mus musculus* (Brown, 1980). Many organophosphorus compounds have acute and moderate chronic toxicities that manifest itself upon the frequent introduction of toxic or sublethal dose. Moreover, it has general action or quite selective in their toxicity to insect and mammals. Malathion displayed the highest desirable ratio between insect and rats while schradan was the most toxic to rats because of its general toxicity (Kruger and Casida, 1957). The modern commercial pyrethroids, in general, possess a very favorable safety ratio rat/insect. The range of toxicity of highly insecticidal pyrethroids to rats or mice varies considerably from highly toxic (below 10 mg/kg) to non toxic (> 1500 mg/kg i.p.) (Holan *et al.*, 1982). The determined LD₅₀ for a given pyrethroid depends on the type of carrier of the formulation.