BIOCHEMICAL STUDIES ON THE NUTRITIONAL VALUE OF SOME LEGUMES AND ITS VARIATION AS DUE TO THE EFFECT OF INSECTICIDE

THESIS

Submitted by

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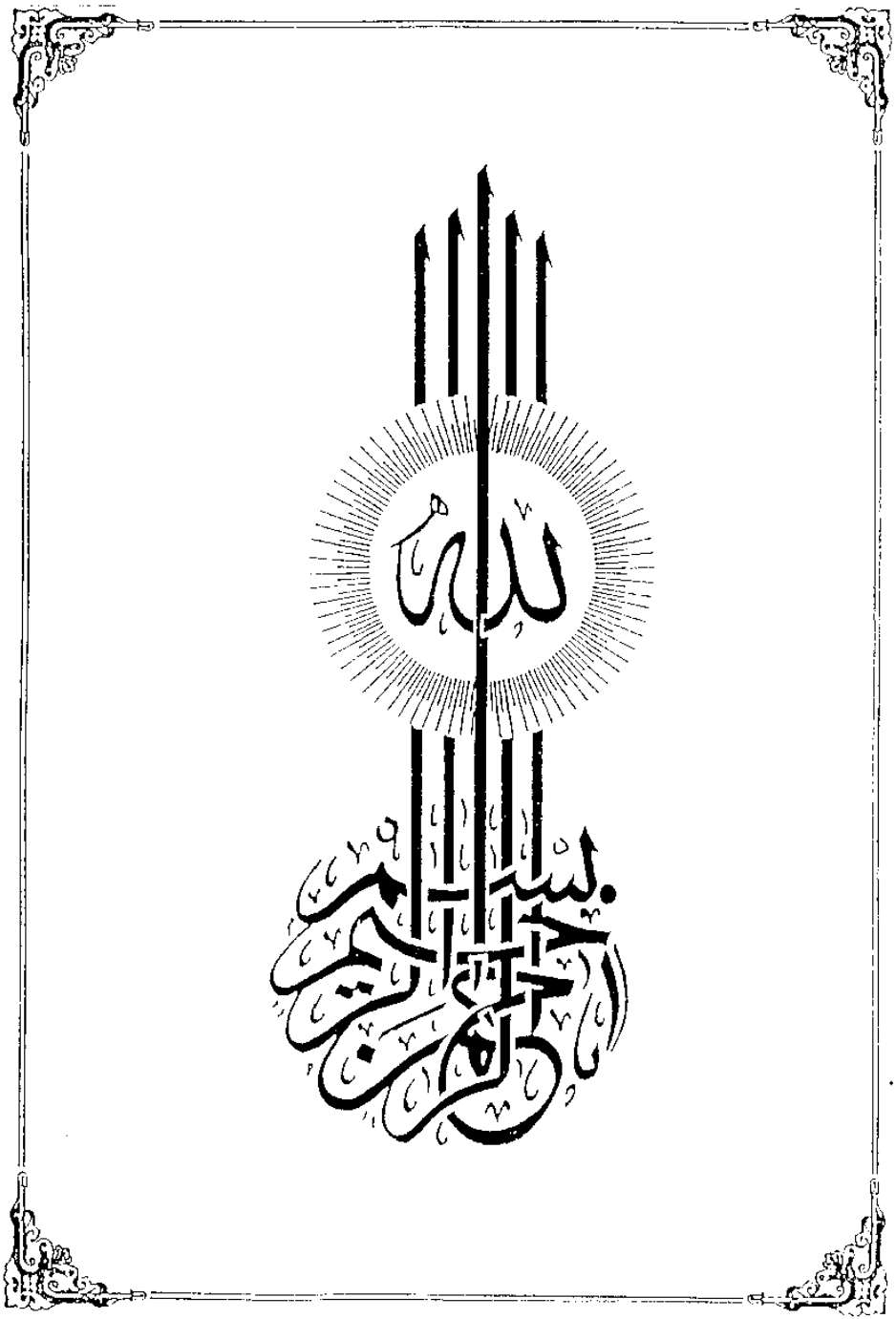

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Page

This draw our direction to estimate the electrophoretic pattern and the amino acids present in these seeds to illustrate any change in their natural contents as due to the effect of the insecticide.

It is hoped that, the information resulting from the present study might throw some light on the problem of phytotoxicity.

INTRODUCTION

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Crops are the main source of food for man who does all his best to produce more cheap and efficient food for him and his domestic animals, so pesticides have come to stay (Jones and Jones 1974).

The desirable properties of pesticide should include :

1- High toxicity to the pests to be controlled.
2- Low toxicity to plants.
3- Low toxicity to man and warm blooded animals.
4- Selective effect in use so that beneficial and harmless animals are not affected.
5- Leaving behind no undesirable residue.

They concluded that pesticides may be grouped according to the type of the animal against which they are used (insecticides, acaricides, miticites, molluscicides, nematicides). Insecticides are further divided according to their mode of action; stomach poisons must be ingested, contact poison gain entry through the integument, and systemic poisons are stomach poisons translocated by plants and ingested in plant sap by insects with biting or sucking mouth parts.

The organophosphorus chemicals are one of the largest groups of pesticides presently used (Bohmont 1983). The group includes insecticides such as parathion, malathion, phorate, mevinophs, diazinon, tetraethylpyrophosphate (TEPP), and others. Toxicity values of these pesticides range from high toxicity for parathion, to low toxicity in the case of malathion. The organophosphorus pesticides can be absorbed dermally, orally, or through inhalation of vapors.

Organophosphorus insecticides are divided into two groups (Barnes 1953). The first group inhibits the enzyme in vitro, and as a general rule, their activity as inhibitors is proportional to their toxicity to mammals. The second type may be of little or no toxicity as inhibitors of cholinesterase in vitro, but once inside the animal body, they become changed into active inhibitors of uncertain chemical constitution. The signs and symptoms of acute poisoning by all members of the organophosphorus group of insecticides are the same.

Toxicites of pesticides are generally expressed as LD_{50} or LC_{50} values, which means lethal dose or lethal concentration to 50 % of a test population (Bohmont 1983). To determine LD_{50} or LC_{50} values, the dosage of a particular

pesticide necessary to kill 50 % of a large population of test animals under certain conditions is computed.

(Jones and Jones 1974) found that the U.S.A. and Canada have laws determining the tolerance levels for the pesticides that have residues on or in the crops to which they are applied. In Canada the maximum tolerance level for a particular combination of food and pesticide is calculated from the harmful dose expressed in part per million (p.p.m.).

Death by poisoning usually arises as a result of interfering with some vital process. The poisonous substance may react with groupings on a surface, interface, or on enzymes and prevent them from reacting with normal substrate (Jones and Jones 1974). The action of organophosphorus compounds and some carbamates is thought to arise from interference with an enzyme that splits acetylcholine into acetic acid and choline.

Aerial treatment is especially convenient for large, compact areas of crops, for plantation, forests, tall, dense growing vegetation and difficult terrains (Jones and Jones 1974). Pesticides used in seed treatment are either powders, slurreys or steeps (solutions or

suspensions) similar in properties to sprays.

Pesticides must be manufactured in as pure a form as possible as the impurities, rather than pesticide, may be phytotoxic , carcinogenic or cause taints and off flavours.

Bohmont (1983) found that pesticides are very rarely used in the form of a pure or technically pure compound, but rather are formulated to make them easy to apply. Formulation may be in the form of dust or granules, which usually contain 5 to 10 % of active ingredients or wettable powders or emulsifiable concentrates, which usually contain 40 to 60 % of active ingredients. Formulations which are used as sprays are further diluted with water, oil, or other solvent to a concentration of about 1 % or less before application.

As the use of pesticides increased within the year 1950-1960, fears were expressed of their possible adverse effects on wild life (Jones and Jones 1974). It soon became clear that scharadan, used to kill aphids in sugar beat and Brussels sprout, caused many bird deaths. As Scharadan was replaced by more selective organophosphorus compounds of lower toxicity to warm-blooded animals incidents of this kind decreased.

(Bohmont 1983) found that, pesticides can injure plants. Injury to sensitive crops has led to restricte use of those materials in some states. The injury can range from slight burning or browning of leaves to death of the whole plant, this injury is called phytotoxicity. Other pesticides may move through the soil to surrounding areas and cause phytotoxicity there.

Residues of many types of pesticides such as arsenicals, organochlorine, organobromine compounds may persist in the soil for months or years after applying to plants (Jones and Jones 1974).

Pesticides may be also harm to fish, birds and beneficial insects such as honey bee. In Canada honey bee produce honey and bees wax valued between 130 to 140 million dollars annually but it may be killed when crops are treated with pesticides. Research to resolve problem of bee losses due to posticides has been under way since 1881. Up till now there is still no solution of this problem, although intensive study is continuing (Barnes 1953).

Pesticides can reduce reproduction in mammals eating contaminated food. Most animals store certain

kinds of pesticides in their body fat. Some animals such as ducks and bats use their fat quickly when they go without food for any period of time. They may then be poisoned by pesticides that were stored in their fat systems several months earlier (Barnes 1953).

In Egypt, cotton which is the first export crop can also seriously be reduced by pests, and a great number of insecticides have been used on cotton because there is no fear of residue hazards as there in the case of food crops.

Organophosphorus pesticides are selected in this thesis because they represent the largest group of pesticides usually used (Bohmont 1983), and because of being of lower toxicity to warm blooded animals (Jones and Jones 1974).

Diazinon is usually used in Egypt because of the following properties :

1- It is safe to plants (Dennis and Edwards 1963), as for example: soybean of high viability were not injuried appreciably by emulsion of diazinon (Starks & Lilly 1955).

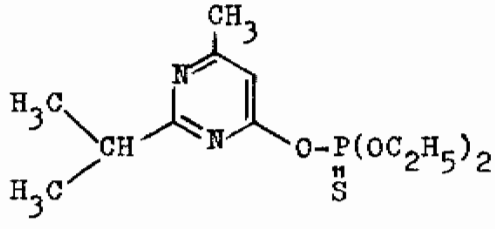
2- It is rapidly metabolized and easily excreted (Robbins et al. 1957).

3- The activities of serum aldolase and glutamic acetic and glutamic - pyruvic transaminases were not affected in people working with diazinon (Casula et al 1959).

4- Diazinon gives good insect and mite controls in bean crops, and significantly increases the yield (Arruda 1960).

5- The residue level of diazinon falls rapidly below tolerance level (Ralls et al. 1966)b.

Diazinon:



Diazinon has the emprical formula $C_{12}H_{21}N_2O_3PS$ and a molecular weight 304.36 (Hayes 1982)a..

Diazinon is the common name approved by U.S.A., for a O,O-diethyl-O-2-isopropyl-6-methyl-4-pyrimidinyl phosphorothioate (Martin and Worthing 1977). Its insecticidal properties were first described by Gasser (1953), and it was introduced in 1952 under the code number "G24480" , trade marks "Basudin", "Diazitol". It is a colourless oil, b.p. 83 to 84°C at 0.0002 torr. It is miscible with ethanol, acetone, xylene and soluble

in petroleum oils. The technical product is a pale to dark brown liquid of at least 95 % purity. It decomposes above 120°C and is susceptible to oxidation, it is stable in alkaline media but is slowly hydrolyzed by water and by dilute acids. The presence of traces of water promotes hydrolysis on storage to the highly poisonous tetraethylmonothiopyrophosphate (Margot & Gysin 1957). It is compatible with most pesticides but should not be combined with copper fungicide. It is a non systemic insecticide with some acaricidal action. Its main applications are in agriculture, in rice, fruit trees, vineyards, sugarcane, tobacco, potatoes, horticultural crops for a wide range of sucking and leaf-eating insects. The oral LD_{50} for rats ranges from 300 to 850 mg/kg body weight, according to the degree of stabilization of the product; earlier values were sometimes lower due to the formation of very toxic deterioration products. The acute dermal LD_{50} for rats is $>$ 2, 150 mg/kg. Rats fed for ten months on diets containing up to 65 p.p.m. showed no gross toxic symptoms. Typical formulations for agriculture use : granules, "Basudin 5" (50 g a.i. / kg), "Basudin 10" (100 g a.i./ kg), w.p. (Waterry powder) "Basudin 40 w.p." (400 g a.i./ kg) seed dressing "Basudin 50 SD" ; "Basudin 20 Mush room