EFFECT OF SOME INSECTICIDES ON THE NUTRITIONAL VALUE OF CERTAIN LEGUMENOSAE SEEDS WITH SPECIAL REFERENC TO THEIR ACTION ON THE ENZYMATIC ACTIVITIES IN THE LIVER OF THE EXPERIMENTAL RATS

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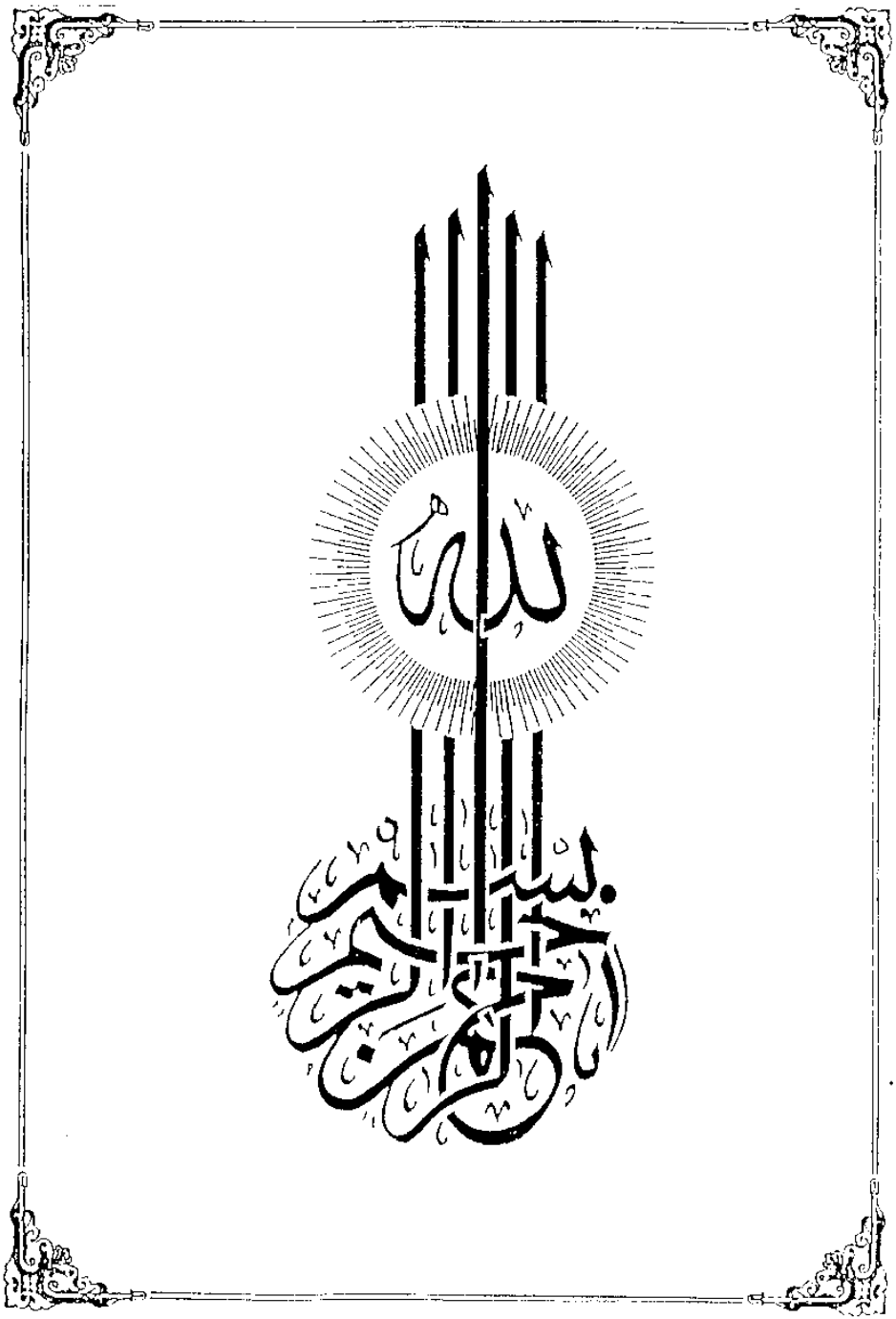

A C K N O W L E D G E M E N T

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Aim of the Work

It was known that insecticides have many side effects on soil, plants, animals, atmosphere and human being. This directed the work to fetsch for the biochemical action through which the insecticide induces the discomfortable toxic effect on plants and animals and to find out the reliable and valid explanation to the changes that occur in the body.

Our work was carried out to show the effect of 3 different insecticides (diazinone, galecron, and sumi combi), on carbohydrate, fat, protein, ash and fiber contents of Vicia faba and Phaseolus vulgaris (Legumenosae family).

Our studies were extended to show the effect of these insecticides on the nutritive value of the selected seeds protein via the study of P.E.R. and N.P.U.

Also the biochemical action through which diazinone induces its toxic effect on rats was investigated and the study was extended to show the protective effect of Vicia faba bean against the toxicity of this insecticide.

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CHAPTER I

Review Of Literature

Review of Literature

Pesticides is a general name including insecticides, herbicides, and fungicides. Contamination of food stuffs arises either from deliberate treatment or by accident in a variety of ways.

Valter, (1940) reported that soaking ciliated seeds in a solution of magnesium chloride ($MgCl_2$) considerably reduces their germination when the seed is germinated under illumination.

Jacobs, (1941) reported that hydrocyanic acid gas or hydrogen cyanide (HCN) is one of the most toxic vapours to higher animals. On being absorbed into the blood stream , it is carried to the tissue, where it inactivates the cytochromes and cytochrome oxidase, that are essential for cellular respiration .

Ivens and Blackman, (1949) have shown that, isopropyl-N-(3-chlorophenyl) carbamate (IPC) affects cell division. Spindle formation is inhibited and the chromosomes fail to arrange themselves on the equatorial plane of the cell during metaphase. Cell elongation is also retarded while the chlorophyll content of the whole plant increased by, from 19 to 28% and respiration is affected.

At a concentration of 10^{-4}M, isopropyl-N-(3-chlorophenyl) carbamate (IPC) almost completely inhibits the activity of certain respiratory enzymes and have suggested that this might be connected with a blocking of cell division at the metaphase.

Schoene and Hoffmann, (1949), found that maleic hydrazide (MH), is a general inhibitor of plant growth and specificially inhibitor of respiration. MH can be translocated within plants being toxic to meristematic tissue and causing loss of apical dominance. It will prevent suck development and also arrests sprouting in stored root crops such as potato, carrot and beet.

Freeland, (1949) found that a concentration of 100 p.p.m. 2,4-dichlorophenoxy acetic acid reduces the photosynthetic rate by 20% in bean leaves during an experimental period of 4 days.

Hagen and Kvamme (1949), reported that, 2, 4-dichlorophenoxy acetic acid affects the lipase of castor beans and wheat.

Bottomley et al., (1950) reported a marked disappearance of non-reducing sugers in corn stored under favouring deterioration conditions.

Wort, (1950) demonstrated that bean plants sprayed with 500 p.p.m. 2,4-dichlorophenoxy acetic acid showed lowered ascorbic acid content over 11-day post period.

Weller et al., (1950) showed that the analysis of Red Kidney bean plants 6-days after the application of 1000 p.p.m. 2,4-dichlorophenoxy acetic acid showed the following changes, depletion of reducing and non-reducing sugars, reduction in starch, crude fiber and acid hydrolyzable polysaccharides in the stems of the plant and accumulation of protein and amino acids. Roots and leaves suffered from depletion of non-reducing sugars, whereas reducing sugars, starch, polysaccharide and crude fiber showed no change.

Neely et al., (1950) found that amylase ∝ and B in bean plants were affected by 2,4-dichloroacetic acid 50 ug/ plant. Its value increased in stem after 4-days, and in leaves decreased after 6-days. They also found that invertase enzyme activity increased in Vicia, Taraxacum when treated with the same pesticide.

Olsen, (1950) found that 2,4-dichloroacetic acid increased the activity of phosphatase enzyme in corn root when used by a concentration of 1.5 p.p.m.

Dunham, (1951) reported that the treatment of flax with numerous formulations of 2,4-sichloroacetic acid resulted in a reduction in oil content amounting to 2.37% . An adverse effect on iodine number also occured. The maximum reduction in oil occured when the plants were treated at pre-bud, at which time vegetative growth had almost ceased .

Wort , (1951) applied 4 concentrations of 2,4-dichloroacetic acid ranging from 50-1000 p.p.m. to buck wheat plants (Fagopyrum esculentum). Analysis were made at intervals from 12hr. to 8-days- after the application of 2,4- dichloroacetic acid , the total suger contents of stems and leaves of treated plants increased within one day of treatment , but by the eighth . day, it had fallen to 4.8% of the content in control plants. The suger of the roots diminished steadily . The starch-dextrin in stems fell immediately after treatment , rose above control level by 12hr. and declined rapidly, thereafter, becoming completely depleted in eight days in those plants which had received 1000 p.p.m. 2,4-dichloroacetic acid.

Nayler, (1951) found that maize plants treated with maleic hydrazide (MH) contained less glucose than control plants but up to thirteen times more sucrose.

Wagenknecht et al., (1951) reported that ascorbic acid oxidase enzyme activity was affected by some chemicals in bean leaves and roots.

Rhodes, (1952) reported a diminution in the rate of synthesis, rather than a depletion of starch and suger, occured when tomato plants were sprayed with 2000 p.p.m. sodium MCPA (4-chloro-2-methyl phenoxy acetic acid). The rate of synthesis was reduced to less than 50% of that in control plants. The actual response was dependent on the nitrogen nutrition of the tomato plants. The starvation of the roots, resulting from carbohydrate depletion in these organs, coupled with some other effects was suggested as the primer reason for the death of the plant.

Payne et al., (1952) reported that, the treatment of potato with 2,4-dichloroacetic acid decreased the amount of 11 amino acids but increased the free glutamic acid in tubers formed by potato plants compared with the content of these substances in untreated plants.

James et al., (1953) reported that phlorizin inactivates muscle phosphorylase enzyme.

Loustalot and Muzik, (1953) found in their studies on velvet bean with 2,4-dichloroacetic acid that photosynthesis was not affected by the lowest rate untill a weak or more

after application and while a concentration of 0.01% reduced photosynthesis. The 2 highest concentrations produced a sharp drop in the rate as little as 5 hours after treatment.

The higher rate of 2,4-D application has resulted in damage of mesophylles and to stem phloem . The direct effect of 2,4-dichloroacetic acid on the photosynthetic rate was thus apparently augmented indirectly by tissue damage.

Paterson, (1953) reported in his experiments in which a single aqueous spray containing 500, 1000 or 2500 p.p.m. maleic hydrazide(MH)and2,4,5-trichlorophenoxy acetic acid applied to various root crops at intervals before harvest that the reducing and non-reducing sugers were lowered in stored tubers from plants given MH treatment, but in another trial no difference were evident in the percentage of the various sugars or starch.

Wort and Cowie, (1953) found that the activity of catalase enzyme in potato was increased by treatment with 2,4-dichloroacetic acid-(5 to 500 p.p.m.)

Hofmann and Schmeling (1953) reported an increase in the activity of invertase enzyme in beans and vicia treated with 2,4-dichlorophenoxy acetic acid.

Zeleny,(1954) found that ∝- and B-amylase attack the starches of grain during storage, converting them into dextrins and maltose. He reported that the determined changes in grain fats or oils may be either oxidative resulting in typical rancid flavour and odours or hydrolytic resulting in the production of free fatty acids. He added that the fats in grain are readily brocken down by lipases into free fatty acids and glycerol during storage particulary when temperature and moisture content are high, thus favourable to general deterioration. Fat hydrolysis takes place much more rapidly than protein or carbohydrate hydrolysis in stored grain.

Freiberg and Clark, (1955) reported that, the value of proteinase enzyme is increased in soya bean when treated with some compounds of 2,4- dichloroacetic acid Also they reported an increase in peptidase activity in the same plant when treated also by 2,4-dichloroacetic acid

Tappel and Archs(1955) reported that oxidizing lipid in lipid-protein mold system reacts with the protein components and conversely the proteins accelerate the oxidation of lipid component.

Yakushkina, (1956) found that phosphorylase