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CHEMICAL ANALYSIS OF DIAZINON RESIDUES ON SOME VEGETABLES

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Diazinon was applied in 0.1 per cent concentration, as a spray, during summer (July–August) and autumn (September–October) on lady's finger, bitter gourd and 'tinda' gourd. The residues were determined on the foliage of these crops by the Total Phsophate Method, initially an hour and a half after application, and at 2-day intervals thereafter, till their lowest detectable limit was reached.

The initial quantity of residues in one gram of fresh leaves, during summer and autumn, respectively, was 83.96 and 81.30 ppm in lady's finger, 81.48 and 80.34 ppm in bitter gourd and 72.90 and 69.67 in 'tinda' gourd. These residues fell down to a maximum detectable limit of 0.24 to 0.27 ppm within 10 days during summer and 0.78 to 0.87 ppm, 12 days after application in autumn in all the three crops. The general pattern of dissipation of insecticide residue in cases of all the three crops, was similar in summer and autumn except that it took 2 days more in autumn for its completion. This earlier dissipation of the residue by 2 days in summer, appears to be due to the temperature being higher by about 11°F in that season, during the period occupied by these experiments as a whole. The maximum dissipation of insecticide residue occurred during the period between 2 and 4 days after application.

INTRODUCTION

Economic Entomologists of our country are, mainly engaged on the screening and evaluation of ever-increasing number of modern synthetic insecticides against various insect pests of crops. Since most of these insecticides have high mammalian toxicity and long lasting residual effect, it is becoming increasingly imperative day-after-day, that critical studies on pesticide residues should be carried out under local conditions with a view to precluding the possibility of occurrence of toxic hazards. Unfortunately, such studies are either altogether wanting in the case of many insecticides in our country or they have not been carried out properly to serve the purpose for which they are meant. However, work on this aspect of the problem has received some attention of research workers in some other countries of the world.

Fischang and Shaw (1962) found diazinon residues below the tolerance level for fresh alfalfa within 5 days after treatment. They also found that

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granular diazinon when applied by hand broadcast at the rate of 1.0 and 1.5 lb. actual toxicant per acre on alfalfa, birds foot trefoil, ladino clover and grass, resulted in residues of 0.01 ppm or less, two months after the application.

Coffin and Mckinley (1964) observed that residues of diazinon applied on lettuce, decreased from 8.1 ppm to 0.3 ppm during four hours to seven days after spraying and detectable quantity of this insecticide was present after 14 days of the application. Jack *et al.* (1965) reported that the residues of diazinon, sprayed on spinach, snapbean and tomato plants fell rapidly below the tolerance level (0.75 ppm) on all the crops. Harding *et al.* (1969) found that the residues from the granular and capsular formulations of this insecticide on corn leaves were completely absent after 7 days but persisted for 28 days in case of ultra-low volume formulation.

Menzer and Ditman (1963) reported that at higher temperature desethyl phosphamidon was reduced faster and a difference of 15°F in temperature caused a difference of approximately 2 days in the time required for a complete breakdown of the insecticide.

The present investigation embodies information on the residual persistence of an important insecticide, diazinon, on three common vegetable crops viz. lady's finger (*Hibiscus esculentus*), bitter gourd (*Momordica charantia* L.) and 'tinda' gourd (*Citrullus vulgaris* var. *fistulosus* Stocks).

MATERIALS AND METHODS

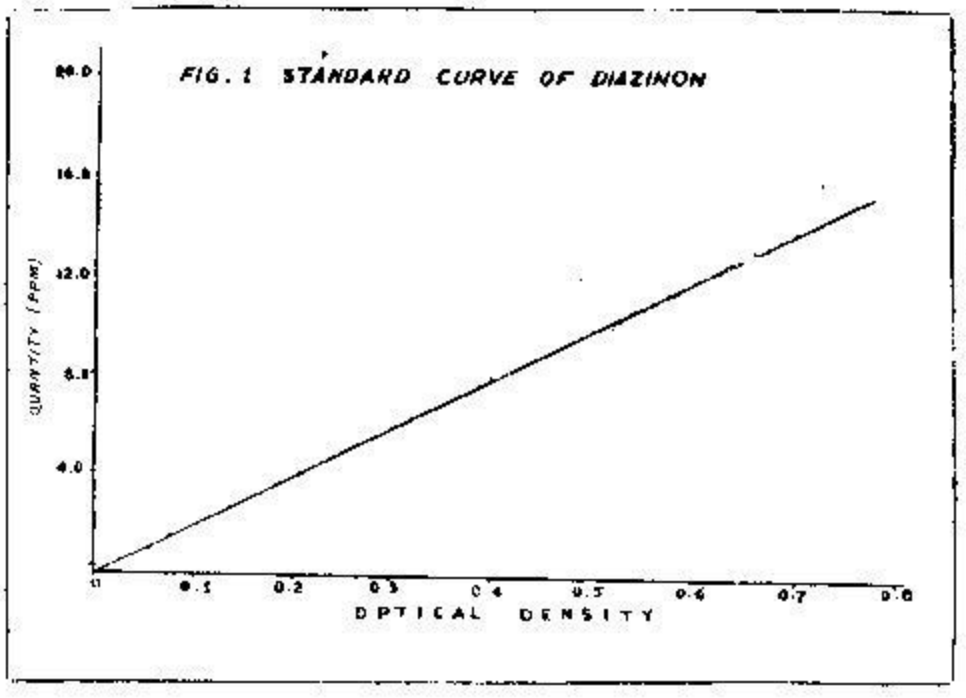
Diazinon was applied in 0.1 per cent concentration, as spray, uniformly on both sides of leaves to the point of run off, during summer (July-August) and autumn (September-October) on lady's finger, bitter gourd, and 'tinda' gourd crops. Control plots were simply sprayed with tap water.

About an hour and a half after the treatment, when the spray liquid applied got dried up, six lots of leaves of uniform size, were collected at random, both from treated and check plots, in the case of each crop. The insecticide residues were determined by Total Phosphate Method following U.S. Salinity Laboratory Staff Method (Method No. 55 b: 134, 1954). Subsequent sampling was done at 48 hours interval, up to the period when no residue could be detected.

One gram of oven-dried matter at 100°C from each lot of leaves was digested with 20 ml. concentrated nitric acid and 10 ml. of concentrated perchloric acid. The digested material from each sample was transferred to 100 ml. volumetric flask and 5 ml. each of sulphuric acid (1:6), ammonium vanadate

(0.25 per cent) and ammonium molybdate (5 per cent) were added to it, shaking the contents vigorously after each addition. The development of characteristic yellow colour indicated the presence of phosphorous. The optical density of coloured material was read on the Unicam Spectrophotometer set at 420 millimicrons.

A standard curve was drawn by reading the colour density of 15 known concentrations of the insecticides ranging between 1 ppm and 25 ppm, digested and treated separately as above. Using this curve, the quantity of residues in the field samples was calculated according to the following regression equation which has been derived from the standard curve data, depicted graphically in **Figure 1.**



$$x = -0.0171 + 20.004\ y$$

where x is the resulting ppm of the trial, and y is the optical density of the test data.

The residues so calculated indicated the quantity present in one gram of dry weight. Using the moisture content in the fresh sample, the amount of residue on fresh weight basis was calculated. The moisture percentage on an average was 70.11, 71.40 and 73.09 per cent in lady's finger, bitter gourd and 'tinda' gourd, respectively.

RESULTS AND DISCUSSION

The results regarding the quantity of insecticide residue in one gram of fresh leaves, are given in Table 1. The initial quantity of residue, determined an hour and a half after application, during summer and autumn, respectively, was 83.96 and 81.30 ppm in lady's finger, 81.48 and 80.34 ppm in the bitter gourd and 72.90 and 69.67 ppm in 'tinda' gourd. The residue fell down to the maximum detectable limits of 0.24 to 0.27 ppm, 10 days after application, in summer, and 0.78 to 0.87 ppm, 12 days after application, in autumn, in all the three crops. Dissipation of residue further below these limits could not be detected in this work when an effort was made to do so, two days later, in each case.

It is seen from the table that the general pattern of dissipation of diazinon residue during the two seasons, in case of all the three crops, was almost similar, except that it underwent a protraction of two extra days occupied by it for its completion in the autumn, as compared to the summer season. The reason for this protraction, evidently, appears to be the difference in temperature in the two seasons concerned. On the basis of overall average of the maximum and

TABLE 1. *Residues of Diazinon in one gsam of fresh levels of Lady's Finger, Bittes Gourd and 'Tinda' Gourd treated in Summer and Autumn*

Days after application	*Lady's finger*		*Bitter gourd*		*'Tinda' gourd*	
	Summer	Autumn	Summer	Autumn	Summer	Autumn
0	83.96	81.30	81.48	80.34	72.90	69.67
2	69.61	63.63	60.89	71.18	51.37	58.90
4	4.45	27.77	5.40	11.12	6.70	14.23
6	3.85	9.83	3.69	5.98	4.01	6.70
8	3.25	4.45	3.12	3.68	2.93	4.00
10	0.27	3.26	0.26	3.11	0.24	2.93
12		0.87		0.83		0.78

minimum temperatures recorded during the different periods occupied by the experiments carried out in this study, it has been found that it was warmer by about 11°F in summer than in autumn. This observation appears to be in conformity with that of Menzer and Dittman (1963) who reported that a difference of 15°F in temperature caused a difference of approximately two days in the time required for a complete breakdown of phosphamidon, another organophosphate insecticide.

Besides, the residue fall was observed to be the highest during the interval falling between 2 and 4 days after application (followed by that which occurred during the 2–day period after application) in all the three crops, in both the seasons. However, the residue fall after 4 days of application was observed to be nominal in all the cases, except in lady's finger treated in autumn where it was as high between 4 and 6 days after application as during the 2 days after application. The differential behaviour of the residue in lady's finger in autumn, may be due to some inherent difference in this malvaceous plant species in its response to the autumn and summer seasons as compared to the other two plants, which are both cucurbitaceous.

Another striking observation has been that the residue fall during the 4 days period after application was much higher in summer than in autumn, in all the three crops.

The loss of insecticide residues was significantly quicker and higher in summer, as compared to that in autumn, in all the three crops under study. It also shows that the dissipation of residues recorded during the different 2–day intervals of observations in this work taking the two seasons together, was significantly different from one another in each crop. It further reveals that the variation in the crop species had no significant effect on the loss of insecticide residues, taking the two seasons together.

The observations of Fischang and Shaw (1962) on alfalfa, Jack *et al* (1966) on spinach, snapbeans, tomato and Harding *et al* (1969) on clover indicate that the residues of diazinon disappeared rapidly and were reduced either completely or appreciably during the first week after application. These observations are generally in conformity with those recorded in the present study.

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