CHEMICAL ANALYSIS OF DIAZINON RESIDUES ON SUGARCANE, MAIZE AND MANGO FOLIAGE

MUSHTAQ AHMAD AND MANZOOR AHMAD*

Diazinon was applied in the concentration of 0.1 per cent on sugarcane, maize and mango foliage during summer (May, 1969) and autumn (November, 1969). The residues were determined by Total Phosphate Method. The results of the experiments showed that the maximum quantity of residues in one gram of dried foliage of sugarcane, maize and mango on the day of application was, respectively, 277.49, 297.90 and 269.09 ppm which fell down to 0.44, 0.64 and 1.04 ppm 8 days after application in summer and 288.10, 314.90 and 292.90 ppm, in autumn, which dissipated to 0.84, 1.44 and 1.24 ppm, 10, days after application.

Spray residues of diazinon did not persist for a very long time and more than 99 per cent of the insecticide was lost during a period of 8 days after application in summer and 10 days after application in autumn. The disappearance of the insecticide was quicker during summer probably due to higher temperature (14.12°F) and low relative humidity (14.92 per cent).

INTRODUCTION

Diazinon, a wide spectrum insecticide, has proved its efficacy against a number of important insect pests of field crops, vegetables and fruits plants and is recommended for day-to-day use in Pakistan. Although a lot of work on the evaluation of toxicity of this insecticide has been done in Pakistan but the problem of spray residues has not been given due attention by the research workers. However, some information on this aspect of the diazinon is avaiable in literature.

Kalkat *et al* (1961) found that atmospheric humidity greatly affected the toxicity of diazinon. Fishchang and Shaw (1962) applied granular diazinon at the rate of 1.0 and 1.5 lbs. actual toxicant per acre to forage crops and recorded residues of 0.01 ppm. or less, two months after application. Sferra *et al* (1962) determined the rate of disappearance of diazinon and its harvest

*Department of Entomology, University of Agriculture, Lyallpur.

residues by chemical and biological methods. The insecticide was found to disappear rapidly from the fruit during the first week after application of sprays. After one week and until harvest diazinon residues declined gradually with no more than 0.2 ppm. Taschenberg *et al* (1963) applied this insecticide at the rate of 4.0 lbs. per hundred gallons of water on berries and found that the loss in deposits amounted to 90 per cent after one week of application, but a rapid decline took place for about 4 days.

Staples *et al* (1967) used 0.7 lb. a.m. per acre of diazinon against stripped cucumber beetle, *Acalymma vittatum* F. and recorded the residual effectiveness to last for 5 days. Harding *et al* (1969) applied diazinon in granular, capsular and ULV formulations at the rate of 1 lb. a. i. per acre to corn field for the determination of persistence and degradation of residues on the plants. No residues were present after 7 days, except in case of ULV formulation where the residues were detected on leaves for 28 days after application. Ahmad and Javed (1973) found that the residual effectiveness of diazinon, applied at the rate of 0.05 per cent, against *Bagrada hilaris* Burm. on radish crop during 1969, lasted for 6 to 7 days.

The present investigation embodies information on the residual persistence of diazinon on maize, sugarcane and mango foliage.

MATERIALS AND METHODS

Diazinon was applied on maize, mango and sugarcane foliage, in 0.1 per cent concentration during summer (May) and autumn (November), 1969. The residues were analysed by Total Phosphate Method, initially an hour and a half after the application and then at 2-day intervals upto the time the residues could not be detected. For this purpose, six leaf samples were taken each from the treated and check plants each time ; three for total phosphorus and three for inorganic phosphorus estimation. The samples were oven-dried over night at 60-70°C. For total phosphorus, one gram of oven-dried material of each sample was taken in a conical flask and digested by adding 20 ml. of nitric acid and 10 ml. of perchloric acid whereas for inorganic phosphorus, one gram of dry matter from each leaf-sample was first macerated in a mortar, added 20 ml. of distilled water to it and distilled in a conical flask and digested as above. The digested material was transferred to 100 ml. vulumetric flask and 5 ml. each of H_2SO_4 (1+6), ammonium vanadate (0.25 per cent) and ammonium molybdate (5 per cent) were added successively and

then the volume was made up. The optical density of the yellow colour developed, was read on the Unicam spectrophotometer at a wave length of 420 m. micron.

A standard experiment was carried out with known concentrations of 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0 8.0, 12.5, 15.0 and 20.0 ppm. of diazinon to prepare a standard curve.

The quantity of insecticide residue was calculated from the optical density data, obtained from the analysis of field samples, by projecting on the basis of following equation, derived from standard curve data

$$X = -0.0716 + 20.0041\ Y$$

RESULTS AND DISCUSSION

The results regarding the quantity of diazinon residues in one gram of oven-dried leaves, given in Table 1 and shown graphically in Fig. 1, indicate that the initial residues in one gram oven-dried foliage an hour and a half after application, in summer and autumn respectively were 277.49 and 288.10 ppm in case of sugarcane, 297.90 and 314.90 ppm in maize and 269.09 and 292.90 ppm in mango. These residues on the aforementioned crop plants dissipated, 8 days after application during summer and 10 days after application in autumn, respectively, to 0.44 and 0.84 ppm, 0.64 and 1.44 ppm, and 1.04 and 1.24 ppm.

The averages of maximum and minimum temperatures and relative humidity, respectively were 95.25°F and 70.49°F and 63.21 per cent during summer and 83.53°F and 53.27°F and 78.13 per cent during autumn. The temperature, on an average, was 14.12°F (average of maximum and minimum temperature) higher and relative humidity 14.92 per cent lower in summer than in autumn.

TABLE 1. *Residues (ppm) of Diazinon on Sugarcane, Maize and Mango Foliage*

Days after treatment	Sugarcane		Maize		Mango	
	Summer	Autumn	Summer	Autumn	Summer	Autumn
0	277.49	288.10	297.90	314.90	269.09	292.90
2	139.87	171.87	168.67	217.08	130.06	166.67
4	62.25	101.46	71.25	120.46	53.05	79.45
6	10.64	35.79	11.64	45.05	10.84	33.64
8	0.44	8.04	0.64	5.84	1.04	7.84
10	—	0.84	—	1.44		1.24
12	—	—	—	—	—	—

The amount of insecticide initially detected on all the three plant species during autumn was slightly higher than in summer. The statistical analysis of the data on the loss of residues at 2-day intervals, calculated on the basis of quantity present on the previous day' in case of three crops under study, in both the seasons, showed that it was maximum between 0 and 2 days (average 41.16 per cent) after application, followed by 2 and 4 days (average 32.55 per cent) and minimum between 8 and 10 days (average 4.74 per cent).

In the autumn season, however, duration of residual persistence was 10 days because the temperture in this season was comparatively low (14.12°F) and relative humidity was high (14.92 per cent). Similar results

were reported by Kalkat *et al* (1961) who observed that higher relative humidity increased the efficiency of diazinon and more than 95 per cent residue of diazinon were lost within a week. The present observations were in general agreement with the finding of Sferra *et al* (1962), who reported the residual effectiveness of diazinon to last for one week, Ahmad and Javed (1973), who found its residual effectiveness to persist for 6-7 days on radish and Harding *at al* (1969), who could not detect any residues of this insecticide 7 days after application.

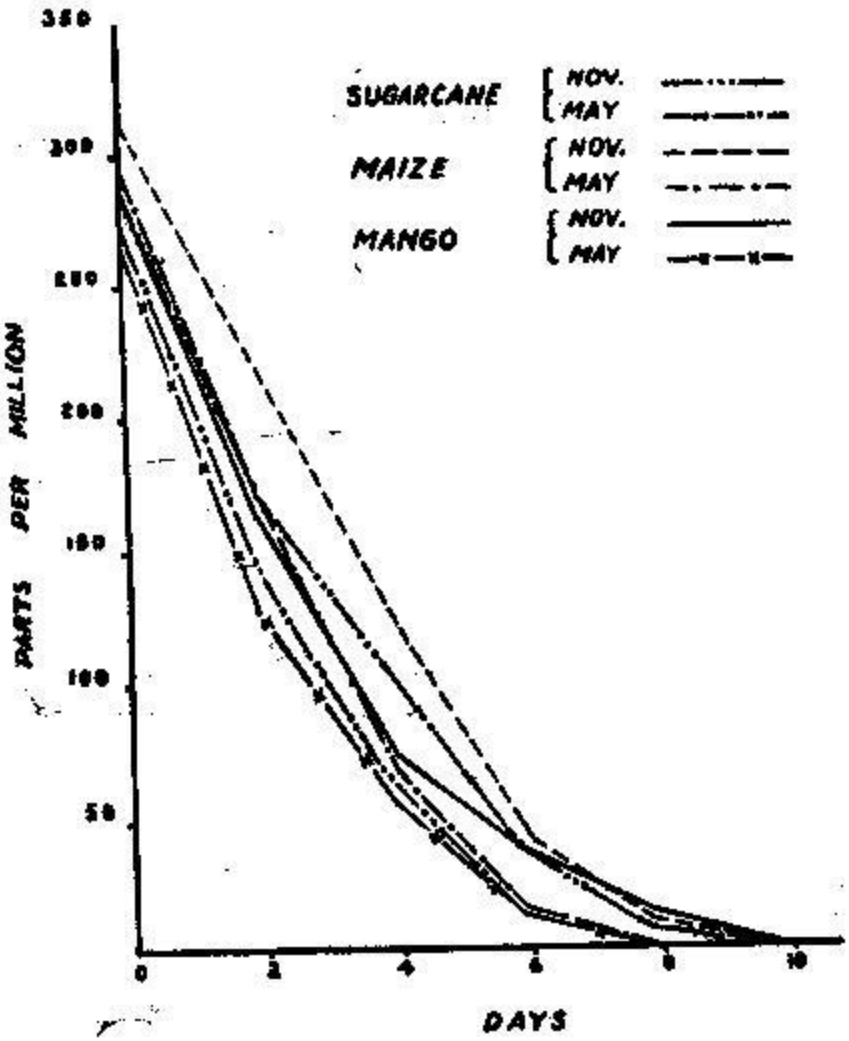

FIG. RATE OF DISAPPEARANCE OF DIAZINON RESIDUES ON SUGARCANE, MAIZE, AND MANGO FOLIAGE DURING 1969

Fisching and Shaw (1962) recorded 0.01 ppm or less residues on forage crops two months after application of 1.0 and 1.5 lbs. a.m. of granular diazinon, but this longer persistence may be due to less degradation of granular insecticide in comparison to spray application.

Staples *et al* (1967) recorded the residual effectiveness of diazinon against *Acalymma vittatum* F., to last for 5 days. It is seen from the data that the insecticide applied on sugarcane, maize and mango was lost to the extent of 96.15, 96.09, and 95.95 per cent, in summer, and 87.56, 85.65 and 88.50 per cent, in autumn respectively within 6 days after application. It is evident that the major portion of the insecticide residue was lost within that period and whatever was left might not be sufficient to give an effective kill of the insects. Similarly, Taschenberg *et al* (1963) found that on berries treated with diazinon at the rate of 4 lbs. per 100 gallons, the insecticide was lost to the extent of 90 per cent after one week of application but the decline was more rapid for about four days. The present finding are again in conformity with the results of the these authors as the progressive loss after 8 days of application was even higher than 90 per cent in the case of three plants species in both the seasons.

LITERATURE CITED

Ahmad, M., and J. Javed. 1973 Residual effectiveness of some insecticides on radish foliage using *Bagrada hilaris* Burm. as test insect. Sind Uni. Res. J. (Sc. Sr.) (in press).

Fischong, W. J., F.R. Shaw 1962 Diazinon residues on forage crops in Massachusetts. J. Eco. Ent., 55 (4): 573-74.

Harding, J.A., C. Corley, M. Beroza and W.G. Lovely 1969 Residues of diazinon on field corn treated with granular, capsular and ULV formulations for control of the European corn borer. J.Eco. Ent., 62 (4): 832-33.

Kalkat, G.S., R.H. Davidson and C.L. Brass 1961 The effect of controlled temperature and humidity on the residual life of certain insecticides. J.Eco. Ent., 54 (6): 1186-90.

Sferra, P.R., S.D. Gibbs, E.H. Glass and E.F. Taschenberg 1962 Chemical and biological analysis of diazinon on apples and grapes J.Eco. Ent., 55 (5): 641-43.

Stapples, R., M. Ahmad, S. Chaudhry and G.Diaz 1967 Effectiveness of several insecticides in controlling cucumber beetles in Eastern Nebrarka. J. Eco. Ent. 60 (2): 463-66.

Taschenberg, E.E., A.W. Avens, G.M. Parsons and S.D. Gibbs 1963 Disappearance of spray deposits of DDT, methoxychlor, perthane, sabion and diazinon from concord grapes. J. Eco. Ent. 55 (4): 431-38.