Annals of Arid Zone 30 (1) : 47-52, 1991

# DISSIPATION OF RESIDUES OF ENDOSULFAN FROM MUNGBEAN UNDER ARID CONDITIONS

M. P. SINGH

Central Arid Zone Research Institute, Jodhpur - 342 003

**ABSTRACT**

Residues of endosulfan 0.05 and 0.1% sprays were determined on leaves, pods and grains of mungbean crop (cv S-8) raised at Jodhpur during rainy seasons of 1985 and 1986. Initial deposits were 10.89 - 11.17 and I5.71 - 16.40 ppm on leaves and 1.26 - 2.34 and 1.88 - 2.79 ppm on pods, from the two concentrations, respectively. Residues dissipated completely within 21 days on leaves and within 10 days on pods. Waiting period of 2 days was arrived for the pods for human consumption. Grains contracted no residues of endosulfan at harvest.

## INTRODUCTION

Endosulfan has been found to be effective against most of the insect pests of mungbean (*Vigna radiata* (L.) Wilczek) (Yadav et al. 1979; Lal, 1985). The persistence of endosulfan on mungbean under different agroclimatic conditions has been studied by Verma (1975), Verma and Pant (1976), Vyas (1977) and Verma and Saxena (1988). The present investigations were undertaken to study the dissipation of endosulfan from different parts of a short duration variety (S-8) of mungbean under arid conditions of western Rajasthan.

## MATERIAL AND METHODS

Crops of mungbean variety S-8 were raised in Randomized Blocks of 3x3m plots of 30 cm row to row and 10 cm plant to plant distance, during two consecutive kharif seasons in 1985 and 1986, at Research Farm of Central Arid Zone Research Institute, Jodhpur. First spray of endosulfan (0.05 and 0.1 per cent) was done on four week old crop and the second, two weeks after the first spray. Samples from treated and control plots were drawn randomly at 0, 1, 3, 5, 7, 10, 14, 21 and 28 days of treatment.

Leaf and pod samples were chopped into small pieces and quarterized to obtain final samples of 50g of leaves and 25g of pods. The samples of grain were taken immediately after harvest and were ground to a coarse powder from which final samples of 25 g were obtained. The final samples were extracted in a 2:1 mixture of n-hexane and isopropanol, using 150 ml solvent mixture for each sample. The

extracts were transferred to separatory funnels and washed thrice with 5% sodium sulphate solution in distilled water to remove isopropanol. To the washed extract, activated charcoal was added, shaken for two minutes and allowed to settle. The extract was then filtered through Whatman filter paper No. 1 overlaid with a layer of anhydrous sodium sulphate.

The cleaned extract was analysed through microbioassay using *Musca domestica* as test insect. The flies were reared on a nutrient mixture suggested by Gera and Gupta (1974). Dry film technique was employed to expose the flies to toxicants. Mortality counts were made after 24 hours. Moribund flies were considered dead. Regression equations in respect of each plant part were obtained through probit calculations (Finney 1971). Recovery of insecticide from different plant parts was determined by fortifying the control samples with known amounts of technical insecticides. The recovery factors were used as correction factors for calculating the actual residues.

## RESULTS AND DISCUSSION

### Residues in/on leaves

The first spray of 0.05% endosulfan left an initial deposit of 9.05 ppm on leaves in 1985. The deposit got reduced to 0.02 ppm after three weeks, undergoing 99.7 per cent degradation. It took 2.2 days for the deposit to reduce below MRL. From a higher concentration of 0.1% endosulfan, the resulting deposit on leaves was 12.94 ppm, which dissipated by 99.7 per cent in three weeks, reducing to level below tolerance limit in 3.6 days after treatment (Table 1).

Table 1. Residues of endosulfan in/on mungbean leaves-1985

| Days after treatment | Residue (ppm) (% reduction) | | | |
|---|---|---|---|---|
| | I spray | | I + II spray | |
| | 0.05% concn. | 0.10 % concn. | 0.05% concn. | 0.10% concn. |
| 0 | 9.05 — | 12.94 — | 9.78 | 13.46 — |
| 1 | 6.41 (29.1) | 9.05 (30.1) | 6.99 (28.5) | 9.78 (27.3) |
| 3 | 4.89 (45.9) | 4.89 (62.2) | 4.89 (50.0) | 5.00 (62.9) |
| 5 | 3.21 (64.6) | 3.79 (70.8) | 3.21 (67.2) | 3.79 (71.9) |
| 7 | 1.81 (80.0) | 1.96 (84.9) | 1.81 (81.5) | 1.85 (86.2) |
| 10 | 0.98 (89.1) | 1.08 (91.7) | 0.67 (93.1) | 0.91 (93.3) |
| 14 | 0.49 (94.6) | 0.58 (95.5) | 0.45 (95.4) | 0.49 (96.3) |
| 21 | 0.02 (99.7) | 0.04 (99.7) | BDL (100) | 0.04 (99.7) |
| 28 | BDL (100) | BDL (100) | BDL (100) | BDL (100) |
| RE | 0.9565-O.1151X | 1.1121-O.1141X | 0.9905-O.1003X | 1.129-O.1152X |
| $t_{\frac{1}{2}}$ | 2.615 | 2.638 | 3.000 | 2.613 |
| $t_{tol}$ | 2.237 | 3.621 | 2.906 | 3.733 |

In 1986, the first spray of 0.05% endosulfan imparted a deposit of 10.89 ppm on leaves, which got degraded to 0.50 ppm in two week's time, reaching below tolerance limit in 3.8 days. The higher concentration of 0.1% left 15.71 ppm of endosulfan on leaves which dissipated by 99.8 per cent in a period of three weeks and reached below tolerance limit in 4.4 days after treatment (Table 2).

The second spray of 0.05% endosulfan on pretreated 1985 crop resulted in deposition of 9.78 ppm of insecticide on leaves. After two weeks, the deposit was reduced to 0.45 ppm and in 2.9 days, its level was below the tolerance limit. Treatment of 1985 crop with second dose of 0.1% endosulfan resulted in a cummulative deposit of 13.46 ppm on leaves which degraded by 99.7 per cent in three weeks time, reaching below the safety level in 3.7 days of second treatment (Table 1).

The 1986 crop receiving second treatment of 0.05% endosulfan, recorded a deposit of 11.17 ppm on leaves, which after two weeks reduced to 0.55 ppm and reached below tolerance limit in 3.9 days. Spraying the 1986 crop with 0.1% endosulfan for the second time resulted in deposition of 16.4 ppm on leaves. This deposit dissipated by 94.9 per cent in two weeks, reducing to the safety limit in 5.8 days (Table 2).

Dissipation of the residues from mungbean leaves was faster in the first three days, the maximum loss being in the first 2 hours. Verma and Pant (1976) and Verma and Saxena (1988) also made similar observations, although the quantum of dissipated

Table 2. Residues of endosulfan in/on mungbean leaves -1986

| Days after treatment | Residue (ppm) (% Reduction) | | | |
|---|---|---|---|---|
| | I spray | | I + II spray | |
| | 0.05% concn. | 0.10% concn. | 0.05% eoncn. | 0.10% concn. |
| 0 | 10.89 — | 15.71 — | 11.17 — | 16.40 |
| 1 | 8.42 (22.7) | 10.89 (30.7) | 8.42 (24.6) | 11.78 (28.2) |
| 3 | 6.03 (44.6) | 7.06 (55.0) | 6.79 (39.2) | 7.06 (56.9) |
| 5 | 3.60 (70.0) | 5.59 (64.4) | 3.52 (68.5) | 5.45 (66.8) |
| 7 | 2.83 (74.1) | 3.38 (78.5) | 2.83 (74.7) | 3.38 (79.4) |
| 10 | 1.82 (83.3) | 1.69 (89.3) | 1.85 (83.5) | 2.00 (87.8) |
| 14 | 0.50 (95.4) | 1.81 (92.5) | 0.55 (95.1) | 0.84 (94.9) |
| 21 | BDL (100) | 0.04 (99.8) | BDL (100) | BDL (100) |
| 28 | BDL (100) | BDL (100) | — | — |
| RE | 1.037-O.0899X | 1.1961-O.1126X | 1.0481-O.0886X | 1.2147-O.0889X |
| $t_{\frac{1}{2}}$ | 3.348 | 2.673 | 3.397 | 3.386 |
| $t_{toP}$ | 3.760 | 4.415 | 3.940 | 5.801 |

the pods. Considering the $t_{tol}$ values for the two seasons (Table 4), a waiting period of two days appeared appropriate for consumption, if any, of the treated pods.

**Residues in grains**

No detectable residues of endosulfan were observed in mungbean grains at harvest from either concentration of the insecticide during both the years, indicating that endosulfan could be applied safely even at post pod formation stage on mungbean, to control the pests.

## ACKNOWLEDGEMENTS

The author is grateful to Dr. P. K. Ghosh, Principal Scientist, CAZRI, Jodhpur under whose guidance the investigations were carried out. Supply of technical grade insecticide by Hoechst India Ltd., and Bharat Pulverising Mills, Bombay is acknowledged with thanks.

## REFERENCES

Finney, D.J. 1971. Probit Analysis S. Chand & Co. Ltd., New Delhi pp. 333

Gera, R and Gupta, D. S. 1974. A simple method of mass rearing of house flies, *Musca damestica* L. Labdev Journal of Science & Technology 12: 70-72.

Lal, S. S. 1985. A review of insect pests of mungbean and their control in India. Tropical Pest Management 31: 105-114.

Verma, S. 1975. Determination of the residues of phorate (systemic insecticide) and endosulfan (contact insecticide, during the development of 'moong' and 'arhar' plants. Entomologist's Newsletter 5: 7-9.

Verma, S. and Pant, N.C. 1976. Dissipation of endosulfan on moong and arhar crops. Indian Journal of Plant Protection 4: 24-31.

Verma, S. K. Saxena, R.C. 1988. Residues of endosulfan and monocrotophos sprays in mungbean *[Vigna radiata* (L.) Wilczek] Annals of Arid Zone. 27 : 127-142.

Vyas, H.N. 1977. Toxicological and persistence studies of some insecticides in relation to pest complex of green gram. Ph. D. Thesis. Indian Agricultural Research Institute, New Delhi.

Yadav, L. S., Yadav, P. R. and Poonia, F. S. 1979. Effectiveness of certain insecticides against the insect pests of mungbean. Indian Journal of Plant Protection 7 : 165-169.