Biological performance of some organophosphorus insecticides against *Quadraspidiotus perniciosus* Comstock on apple

A K THAKUR* and S F HAMEED**
Department of Entomology-Apiculture, Himachal Pradesh Krishi Vishva Vidyalaya, Palampur 176 062, India

* Research Associate, Bee Research Station, Nagrota 176 047, India
** Tirhut College of Agriculture, Dholi 843 121, India

MS received 23 November 1979; revised 21 May 1980

Abstract. Toxicity and persistence of five organophosphorus insecticides following one summer spray in 1975 and two in 1976 at 0.05% conc. (400 gm a.i./ha) on apple cv 'red delicious' were evaluated against *Quadraspidiotus perniciosus* Comstock at Solan, Himachal Pradesh. Fenitrothion was found to be highly toxic to the crawlers of the scale; methyl-parathion and diazinon proved to be intermediate in toxicity while phosalone and malathion respectively were less toxic compounds. Phosalone was highly persistent (ca 2 weeks) but did not provide enough protection to the fruits against the pest insect owing to its low intrinsic toxicity. The deposits formed on apple by fenitrothion, methyl-parathion and diazinon were relatively less persistent but provided 23 to 27, 14 to 18 and 10 to 15 days protection respectively to the fruits. The fruits were found safe for consumers' use after 20-22 days following the application of fenitrothion, 14-16 days of phosalone, 12-13 days of diazinon, 9-11 days of methyl-parathion and less than 1 day when malathion was sprayed. All the insecticide residues were within the acceptable limits at the time of harvest.

Keywords. Organophosphorus insecticides; toxicity; persistence.

1. Introduction

San Jose scale *Quadraspidiotus perniciosus* Comstock is a serious insect pest of apple in Himachal Pradesh. The coccid infests fruits during summer and renders these unfit for human consumption. Sharma and Bhalla (1962), Bhalla and Mishra (1972), Anonymous (1975), Sud *et al* (1975) and Atwal (1976) reported that the pest could be controlled by a number of less persistent insecticides on apple during summer. However, none of these reports are based on detailed

* Part of Ph.D. thesis submitted to the Himachal Pradesh Agricultural University, by the senior author under the guidance of the second author.
experimentation of intrinsic toxicity of insecticides to the crawlers of San Jose scale, persistence of effective toxicity or consumers’ safety following their applications. Taking these as objectives in view, the present contribution reports the results of evaluation of the effectiveness of spray schedules of diazinon, fenithrothion, methyl-parathion, malathion and phosalone on apple against the crawlers of San Jose scale.

2. Materials and methods

Commercial formulations of 5 organophosphorus (OP) insecticides viz., diazinon, fenithrothion, methyl-parathion, malathion, and phosalone were sprayed on apple trees (cv Red Delicious) in an orchard at Kasauli (Solan) with the help of a foot sprayer (ASPEE make) to ‘run-off’ at the recommended rates of 0.05% conc. (400 gm a.i./ha). The experiment was conducted in a randomized block design taking single-tree plot for a replication. There were, therefore, 24 trees for 5 treatments and a control which were replicated 4 times. The trees were of 8 years age with 8 m planting distance in contour system. All the other horticultural operations and fertilizer applications followed in the orchard were according to the recommendations of the Package of Practices for Horticultural Crops, Himachal Pradesh (Anonymous 1975). The trees were first sprayed on 25th May, 1975 and the samples were collected at 0 day (immediately after the fruits were dry), 1, 3, 7, 15, 30 and 45 days following treatments. The samples were later processed for estimating the deposits.

The experiment was repeated with two sprays of the above insecticides at the same concentration in 1976 at the same location with another set of 24 trees having similar age and bearing. First spray of each insecticide was given on 15th May 1976, and the second after a month (15th June 1976). Sampling intervals are mentioned in table 7.

Five fruits of a treatment per replication were collected at each interval and brought to the laboratory, where these were pooled together. These fruits were later divided in 4 lots and 3 fruits from each lot were withdrawn randomly to form a sample. Before extraction, weight of the sample was recorded and the surface area of each fruit was measured by Turrell’s (1946) method. The deposits of the respective fruit samples of each insecticide were extracted in redistilled (AR grade) solvents (Pet. ether 60–80°C for diazinon; benzene for fenithrothion and methyl-parathion; CCl₄ for malathion, and acetone for phosalone) by taking a sample of 3 fruits in a wide mouth screw-capped bottle to which sufficient solvent was added to cover the fruits. Volume of the solvent was recorded and the bottle-sample was shaken on a flat-top Ganson’s shaker for 3 hr. The extract was then decanted and filtered in another labelled bottle to which sufficient quantity of anhydrous sodium sulphate (10 g for each 30 ml extract) was added to remove the moisture and stored in a refrigerator until analysed. Efforts were made to analyse samples the same day on which these were extracted, but sometimes they had to be stored due to unavoidable reasons. In such cases, separate set of samples with known amount of insecticides was maintained to have a check on the possible variation in the results due to storage. The extracts were