A COMPARATIVE STUDY OF THE EFFECT OF SOME PESTICIDES ON THREE PREDACIOUS MITE SPECIES: *TYPHLODROMUS PYRI*, *AMBLYSEIUS POTENTILLAE* AND *A. BIBENS* [ACARINA: PHYTOSEIIDAE]

W. P. J. OVERMEER & A. Q. VAN ZON

Laboratory of Experimental Entomology, University of Amsterdam, Amsterdam, the Netherlands

Toxicological responses to 10 different pesticides were determined for 3 species of typhlodromid mites, *Typhlodromus pyri* SCHEUTEN, *Amblyseius potentillae* GARMAN, and *A. bibens* BLOMMERS, in order to investigate whether or not *A. bibens* might be used as a substitute for the other species as a testing object for measuring adverse effects of pesticides.

*T. pyri* and *A. potentillae* are important predators in orchards on phytophagous mites. These species can be reared on the common spider mite, *Tetranychus urticae* KOCH, but they seem averse to the webbing of the spider mite. When placed on detached bean leaves on moist cotton wool with *T. urticae* present as prey, these typhlodromids tend to run off the leaves, especially when in addition such leaves have been treated with pesticides. *A. bibens* on the other hand will stay on the leaves when prey is present; it seems to be attracted by the webbing of the spider mite. This makes *A. bibens* an attractive testing object. In the present study the 3 species mentioned were tested comparatively in closed cells to see whether or not there might be differences in intrinsic susceptibility to pesticides. Mortality of adults, the effect on reproduction, and the mortality of eggs and juveniles were determined. It was found that *A. bibens* can reasonably well replace other typhlodromids as a testing object for obtaining information on adverse effects of pesticides in orchards.

The role of phytoseiids in controlling phytophagous mites on various kinds of crops is well documented (HUFFAKER et al., 1970). In abandoned orchards predacious mites seem very well able to keep spider mites in check. Outbreaks of tetranychids occur where orchards are under pesticide and fertilizer treatment. In these situations predacious mites are virtually absent. While spider mites developed resistance to a number of pesticides within an unexpectedly short period of time, predacious mites reacted not so promptly and for many species no cases of resistance have been reported till up to date. On the other hand, there are several selective chemicals which are more toxic to spider mites than to the phytoseiid predators (ROCK & YEARGAN, 1971). In integrated control programmes, therefore, a careful choice of pesticides should be made to harm phytoseiid populations as little as possible. Consequently, knowledge about possible adverse effects of fungicides and other specific pesticides is essential. Field and laboratory data on the toxicity of such compounds to predacious mites should be obtained. The development of adequate testing methods is called for.
Laboratory studies on the susceptibility to pesticides of phytoseiids often deal with tests on adult females whereby adult mortality is determined (e. g. Smith et al., 1963; Bartlett, 1964; Croft & Jeppson, 1970; Rock & Yeargan, 1971; Croft & Nelson, 1972; Croft & Stewart, 1973) though the techniques applied vary a good deal. However, in order to measure possible adverse effects of pesticides, it is also necessary to be informed about the effect on eggs and younger stages and on the reproduction of treated females (Ristich, 1956). Information in this respect has been provided by Ristich (1956) for A. fallacis (Garman) for a number of pesticides. Similar data have been obtained for Phytoseius persimilis Athias-Henriot (Skinhaja, 1976; Coulon & Barres, 1976; Van Zon & Wysoki, 1978.)

Van Zon & Wysoki (1978) tested this predator by placing it on detached bean leaves kept on pads of wet cotton wool contained in tin-foils dishes. The common spider mite, Tetranychus urticae Koch, was used as prey. The leaves with the mites were sprayed directly with a Potter Precision Spray Tower and results in terms of mortality and reduced reproduction were recorded. When predacious mites from orchards, such as Typhlodromus pyri Scheuten or Amblyseius potentillae (Garman), were used in tests with this techniques, it was found that they ran off the leaves and died in the cotton wool. If a sticky barrier was provided along the leaf margins, similar to Ristich's (1956) «Petri dish detached leaf sticky barrier method», the mites got stuck in this barrier. The predatory mites were furthermore often caught in the webbing of the spider mite. Tests on such species seem only possible in closed cells.

Another Amblyseius species, however, originally from Madagascar, which is similar in size to A. potentillae and T. pyri, is very easily tested on the bean leaves just as Phytoseius persimilis (Van Zon & Van der Geest, 1980). This species, A. bibens Bloemers, is not hampered by the webbing of T. urticae; its reproduction is even slightly higher than that of A. potentillae and T. pyri, which makes it easier to measure effects on reproduction. So the question arose whether or not this species could be used in testing programmes as a substitute for orchard typhlodromids.

In order to obtain information about this point it would be necessary to compare results with different types of pesticides in the three species in closed cells. In such cells, however, one can test the mites only on residue; vapours will remain in the cell over a longer period and the relative humidity will reach high values.

MATERIAL AND METHODS

The following strains were used in this study.

— Amblyseius bibens, collected in Tulear, Madagascar (Bloemers & Van Ettten, 1975).

— Amblyseius potentillae, collected in Zeeland, the Netherlands (McMurtry et al., 1976).

— Typhlodromus pyri, collected in Amsterdam, the Netherlands in 1977.

All these strains have been maintained in the laboratory for several years. A. bibens is kept on detached bean leaves (Phaseolus vulgaris C.) placed on wet cotton wool with T. urticae as prey. A. potentillae and T. pyri are being held on rearing units, similar to those described by McMurtry & Scriven (1975). A 12 X 7 cm black plastic tile (substrate) is placed on a 3 cm thick piece of foam plastic of the same size in a small tray with water. Kleenex tissue strips were folded over the edges of the tile covering a strip of 1.5 cm of the