Preliminary experiments on control of Myzus persicae (Sulz.) and Macrosiphum rosae (L.) with Coccinella septempunctata L. on greenhouse chrysanthemums and roses

Martti Markkula, Katri Tiittanen and Matti Hämäläinen

Agricultural Research Centre, Department of Pest Investigation
Tikkurila, Finland

Markkula, M., Tiittanen, K. & Hämäläinen, M. 1972. Preliminary experiments on control of Myxus persicae (Sulz.) and Macrosiphum rosae (L.) with Coccinella septempunctata L. on greenhouse chrusanthemums and roses. — Ann. Ent. Fenn. 38, 200—202.

When larvae of the ladybrid *Coccinella septempunctata* L. were placed on chrysanthemums, the numbers of *Myzus persicae* (Sulz.) fell substantially. For the same degree of control, the plants needed two treatments with naled.

When ladybird larvae were hatched from egg clusters placed on roses infested with *Macrosiphum rosae* (L.), they cleared the plants of aphids during spring and early summer. During the same period, dichloros had to be applied three times in the control greenhouse. During a period of hot weather in late summer, the temperature rose above 40°C from time to time, and the ladybird eggs did not hatch. The number of *M. rosae* then increased explosively, and the roses had to be treated with dichlorphos.

The use of ladybirds for the biological control of insect pests is an old device. However, apart from the experiments by Whitcomb (1940) and Doutt (1951, 1952), research on the use of ladybirds in greenhouses is a recent development (Gurney and Hussey 1970, Gurney 1971).

At the Department of Pest Investigation, Tikkurila, experiments were begun in spring 1970 to clarify the life habits of several coccinellids as a basis for biological control (e.g. Hämäläinen and Markkula 1972 a, b). The present study is an investigation of the suitability of the seven-spotted ladybird *Coccinella septempunctata* L. for the control of the green peach aphid *Myzus persicae* (Sulz.) on chrysanthemums and the control of the rose aphid *Macrosiphum rosae* (L.) on roses. The results are compared with those obtained with insecticides.

Methods and results

Chrysanthemum

The control of *M. persicae* on chrysanthemums was tested in three small experimental greenhouses. Seedlings of chrysanthemum (cv. Tuneful) were planted on 29 April 1971. One week later one virginoparous female of *M. persicae* was deposited on each seedling in all three greenhouses. The test was started when there were about 90 aphids per plant (17 May). One greenhouse was treated with naled, 0,2 % solution of Ortho Dibrom 65 % a.i. Two first-instar larvae of the seven-spotted ladybird were placed on the top of each chrysanthemum in the second greenhouse. As the number of larvae did not seem sufficient, another five larvae of the first instar were placed on each plant (21 May). Thus, a total of 1050 larvae were used. The plants in the third greenhouse were untreated.

The number of aphids was counted at intervals of a few days on sample plants selected evenly in the various parts on the greenhouses. Two ladybird larvae per plant were able to retard the proliferation of the aphids, but it was only the larvae brought in on 21 May (5 larvae/plant) that reduced their numbers effectively (Fig. 1). As the number of aphids declined there was a considerable increase in the mortality of the ladybird larvae, and only 14 specimens became adult. When the larvae had died or pupated, the aphids were again able to multiply in great numbers. The adults did not stay on plants but tended to fly out (see also Gurney and Hussey 1970).

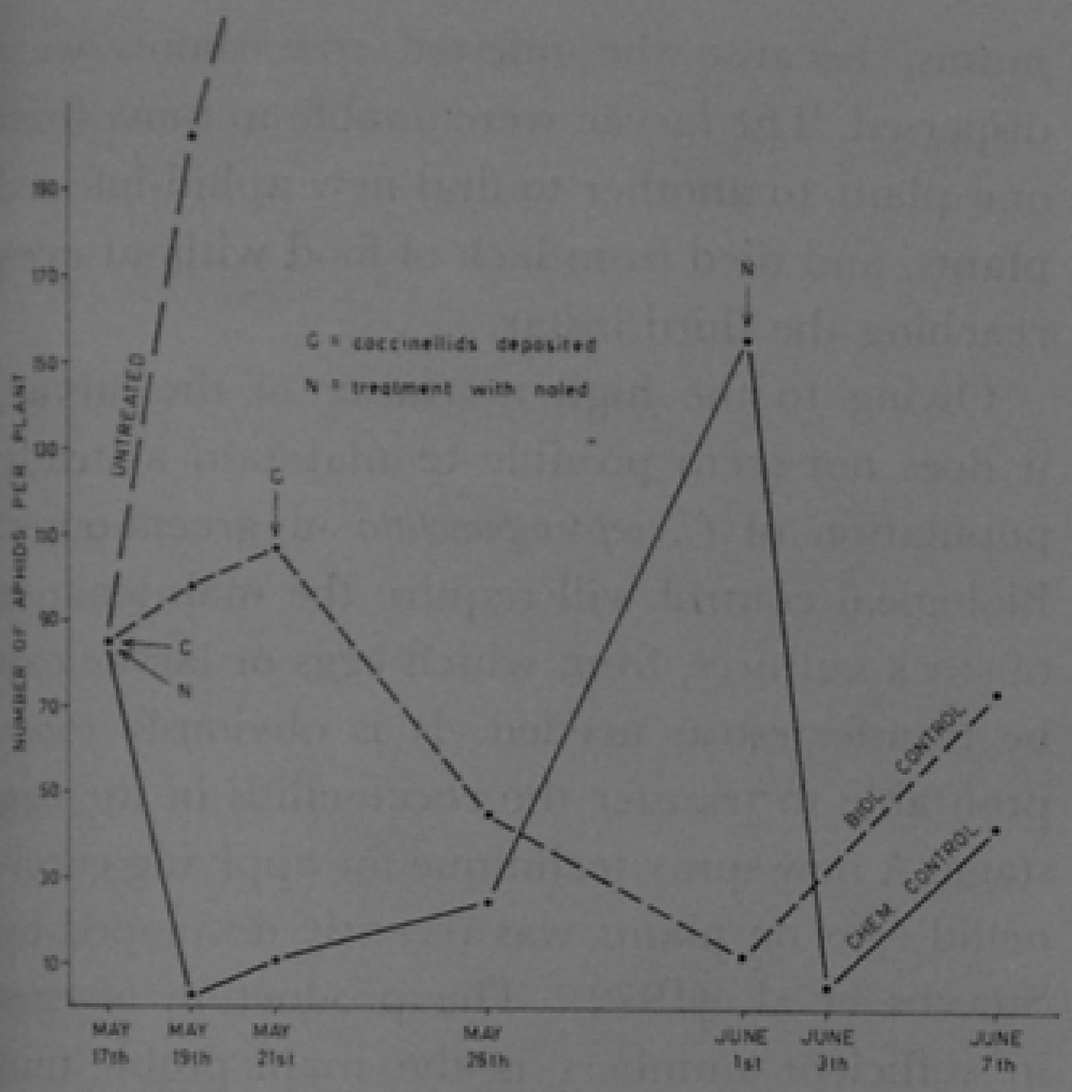

Fig. 1. Changes in the numbers of *M. persicae* as a result of biological (ladybird) and chemical (naled) control. The larvae of *C. septempunctata* were placed on chrysanthemums on 17 May and 21 May. Naled was applied on 17 May and 1 June.

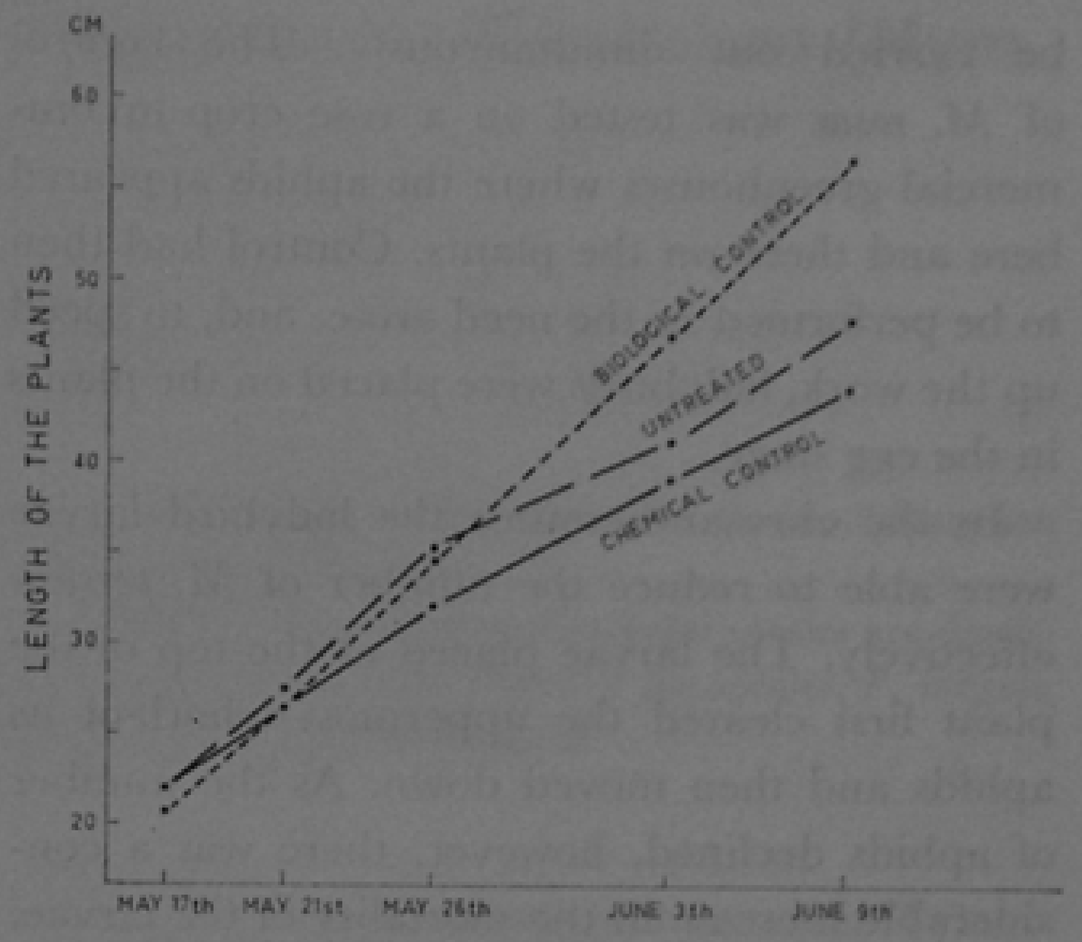

Fig. 2. Effect of biological control (ladybird) and chemical control (naled) upon the height of chrysanthemums.

In the greenhouse treated with insecticide, the aphids had multiplied to such an extent by 1 June that it was necessary to make a second application. In the greenhouse kept as a control, the aphids reproduced in great numbers, and on 3 June there was an average of 1 000 aphids per plant.

The growth of the chrysanthemums treated with the insecticide was clearly retarded as compared with those treated with ladybirds (Fig. 2).

Rose

The control experiments with *M. rosae* were performed in 1971 on a commercial rose crop grown in four greenhouses. As soon as aphids were found, a cluster of about 30 eggs of *C. septempunctata* was placed on each aphid-infested stem in two of the greenhouses. The greenhouses were checked once a week and, when necessary, further clusters of eggs of the ladybird were deposited on the rose stems or they were treated with dichlorros 0,2 % solution of Dadenvap 50 % a.i.

In one of the greenhouses with biological control, aphids were first found in mid-May, and in the other not until the beginning of July. The ladybird eggs hatched out within a week of being placed on the plants and the larvae destroyed the aphids. No larvae were ever found to have moved from one plant to another during any week. New clusters of eggs were always placed on the newly infested plants. In both greenhouses the ladybirds were able to prevent the numbers of aphids from reaching a destructive level until mid-August. At that time a period of hot weather set in, during which the temperature of the greenhouses rose above 40°C at times. The eggs of the ladybirds did not then hatch, and the aphids multiplied explosively and had to be destroyed with insecticide. By mid-August about 7500 ladybird eggs had been placed in each greenhouse.

The greenhouses where the control was chemical were treated with dichlovos on three occasions during the same period.

Discussion

The methods of controlling *M. rosae* and of *M. persicae* differed considerably. The control of *M. persicae* was done in small experimental greenhouses where chrysanthemums were artificially infested and control measures could

be carried out simultaneously. The control of *M. rosae* was tested on a rose crop in commercial greenhouses where the aphids appeared here and there on the plants. Control had then to be performed as the need arose, and, to speed up the work, ladybirds were placed on the plants in the egg stage.

In the chrysanthemums the ladybird larvae were able to reduce the number of *M. persicae* effectively. The larvae placed at the top of the plant first cleared the uppermost whorl of its aphids and then moved down. As the number of aphids declined, however, there was a considerable increase in the mortality of the larvae, for they found it difficult to discover the scattered aphids owing to their random manner of searching for food (see also Banks 1957).

On the roses the larvae prevented the aphids from reaching destructive numbers, in one greenhouse for three months and in another for six weeks. The mortality of the ladybird larvae was higher on the roses than on the chrysanthemums, because the infested rose shoots were dispersed. The larvae were unable to move from one plant to another to find new aphid-infested plants, and died from lack of food without even reaching the third instar.

Owing to the high mortality of the larvae, it does not seem possible to maintain a steady population of *C. septempunctata* in greenhouses. Biological control will require the maintenance of stock cultures, from which eggs or larvae can be transferred as needed. It is obviously more profitable to transfer the coccinellids in the egg stage. A new spray technique for applying coccinellid eggs on plants was recently developed by Shands et al. (1972). The production of eggs in sufficient numbers is the main proble min practical control work.

Acknowledgements. This study is part of a project supported by a grant from the Foundation for Research of Natural Resources in Finland (Suomen Luonnonvarain Tutkimussäätiö).

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Received 18. X. 1972.