Comparison Among Two Acaricides And a Predator For *Tetranychus urticae* (Acarina: Tetranychidae) Control On Beans, *Phaseolus Vulgaris*

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Abstract

H. Chahine, S. Michelakis and M. Aslam. Comparison among two acaricides and a predator for *Tetranychus urticae* (Acarina: Tetranychidae) control on beans, *Phaseolus vulgaris*. Arab. J. Pl. Prot. 10 (1): 24-22.

Savona^R at the rate of 10 ml/500 ml water, Pentac^R at the rate of 1.25ml/100ml water and a predator, *Phytoseiulus persimilis*, at 1:12 predator: prey ratio were evaluated to control *Tetranychus urticae* at an average population level fo 47 to 65 mites per leaflet of beans, *Phaseolus vulgaris*, in a greenhouse. Pentac^R was more effective in reducing the mite population up to nine days of application followed by the predator and Savona^R treatments. Mite population started increasing after nine days and in a month the increase was 12 and 6 folds in Savona^R and Pentac^R treatments, respectively. The population only doubled in predator treatment in one month. One release of the predator may provide effective control of the mite whereas, at least two pesticide applications will be required for effective pest management.

Key words: Biological control, chemical control, *Tetranychus urticae*.

Introduction

The protection of crops against mite pests is important in confined environment. Low relative humidity and high temperature and light encourage the build up of mite populations to harmful levels. The two-spotted spider mite, *Tetranychus urticae* (Acarina: Tetranychidae), is the most widespread and destructive mite on vegetables grown in greenhouses (Hatzinikolis, 1970).

Phytoseiulus persimilis (Acarina: Phytoseiidae), a predaceous mite, is considered the most effective biological control agent against *T. urticae* (Bravenboer and Dosse, 1962). The predator undergoes the same developmental stages as its prey and all mobile stages of the predator, except the larvae, feed on all stages of the prey (Oatman et al, 1985). It has been found that the predator develops twice as fast as its prey between 25 and 30° C (Hussey *et al.*, 1969).

Mites in their dormant stage are mostly hard to kill for they are protected by their old skin. Only acaricide formulations with relatively longer residual effect could give satisfactory results with a single application. The control can be achieved with these when applied to one or more mobile stages of the pest (unwin, 1971). There is a particular need to minimize the use of chemicals to reduce the toxic residue in the crop and the environment. The development of resistant strains is another problem with organophosphorus pesticides (Port and Scopes, 1981). Despite the ever-present threat of resistance, chemical control of the two-spotted spider mite is not unpromising. In recent years, numerous new miticides have been developed with new mechanism of action.

In greenhouses where one may have knowledge of various climatic parameters and to a certain extent be able to control them, it is more advantageous to concentrate on integrated pest control. The present study was conducted to compare the efficiency of two pesticides with each other and with a natural enemy to control the two-spotted spider mite in the greenhouse.

Materials and Methods

The experiment was conducted in a plastic house in a completely randomized block design with four replications. Each treatment consisted of two rows having 16-18 plants. Eight rows of beans, *Phaseolus vulgaris* were planted in each block. The treatments were *P. persimilis* at 1:12 predator prey ratio, one application of Savona^R at the rate of 10 ml/500 ml water, one application of Pentac^R at 1.25 ml/1000 ml water and a control. Six plants per treatment were infested at 4-leaf stage with five to seven adult mites using infested pieces of *Carica* sp. (Caricacae) leaves. After one week the plants were checked to ensure the maintenance of the initial number of mites. A week later the plants were checked again to determine the population of mites on each infested plant. Then the pesticides were sprayed with a 20 l knapsack sprayer. Right after pesticide application the predator adults were released on the plants by putting them on a piece of white paper and allowing them to move over the plants, or by transferring them with a paint brush. The mean minimum and maximum temperature during the experiment was 10.2° C and 37.0° C, respectively. The relative humidity was betwen 45 % and 80 % which was recorded only up to 20 days after the start of the experiment. Due to malfunctioning of the hygrometer, relative humidity could not be recorded during the last 10 days of the experiment.

Sampling was done once before the treatments and 5 times after at 4, 9, 17, 22 and 29 days. One leaflet from each infested

plant was collected randomly. The samples were put in Petri dishes and stored in a portable cooler during the period of sampling to prevent the samples from wilting. The samples were then transported to the laboratory refrigerator before being examined within 24 hours (Oatman *et al.*, 1968, 1976). Refrigeration of the samples was done to stop the continued development and oviposition of mites (Trumble *et al.*, 1984). Active stages of the two-spotted spider mite on each leaflet were counded under a dissecting microscope.

The results were based on the mean number of mites per leaflet. Statistical analysis was performed by a two way analysis of variance and mean separation was done by Duncan's (1951) multiple range test at 5 % level of significance.

Results and Discussion

The average number of the two-spotted spider mite ranged from 47 to 65 per sampled leaflet before treatments. Four days after treatments, the mean number of mites decreased in all the treatments to half of the control but the difference among treatments was not significant (Table 1). The decrease in number of mites in the control might have been the result of pesticide drift.

Table 1. Mean number of mites per leaflet of beans, *Phaseolus Vulgaris,* in different treatments.

Treatments	Before Treatment	Sampling (After treatment) 4 Days	9 Days	17 Days	22 Days	29 Days
Savona^R	65.50	12.25	11.50b	87.50b	82.25b	143.50a
Pentac^a	63.50	14.50	5.75c	53.25c	74.25b	95.50b
P. Persimilis	47.00	16.50	13.25b	31.25d	38.50c	36.75c
Control	51.00	28.25	36.00a	105.25a	11.00a	178.25a

Means followed by the same letter in columns are not significantly different at P≤ 0.05.

Nine days after treatments, the number of mites was still decreasing in all treatments except the control. The numbers were slightly reduced in Savona^R and the predator but to almost half in Pentac^R. Pentac^R showed the best results up to this day as the mean number of mites was significantly lower in this than in other treatments.

Seventeen days after treatment, the number of mites per leaflet increased in all treatments. This might have been caused by a 2.2° C temperature increase. On this day the mean number of mites per leaflet was significantly different in all treatments. After control, Savona^R had the highest number of mites/leaflet followed by Pentac^R and *P. persimilis. P. persimilis* kept the prey at low level but Pentac^R seemed to have lost its action. As no other application of pesticide was made in this study, the mean number of mites had increased with both pesticides 17 days after treatment. However, in the predator treatment the number of mites per leaflet was quite low. The favorable range of temperature for *P. persimilis* is 21-24° C but 27° C at 80 % RH has also been reported to be favorable (Stenseth, 1979). Although the temperature was favourable for both the predator and the pest in the present study the predator multiplies faster than its prey (Hussey *et al.*, 1969) and therefore, was capable of keeping the pest under check.

Twenty two days after treatments, mean number of mites/leaflet continued to increase in Pentac^R but did not change much in the other treatments. The number of mites in the control and Savona^R treatments was still high but stable. The reason for this could be the death of the plants and consequently less availability of food for the mites to develop and multiply. The average number of mites in the predator treatment was significantly lower than other treatments. The number of mites in Pentac^{R}and Savona^{R}were not significantly different but was still lower than that in control. In the Pentac^R treatment the plants were still healthy and the number of mites was still increasing. This could be explained by the availabilty of food for the pest. The last count was made 29 days after the treatment. The predator treatment had the lowest number of mites/leaflet and was keeping the prey population at low level compared with other treatments. *P. persimilis* provided a remarkable control of *T. urticae.* The number of mites/leaflet in Pentac^R was significantly different from Savona^R treatment in which they had increased greatly and approached a population level in the control.

It can be concluded from the results that if only pesticides are used, both Savona^R and Pentac^R would need repeated applications after 15 days. Osborn (1982) also stated that the multiple applications of Pentac^R are needed for complete control of the mite. The predator can keep the mite population quite low for a month and may be longer. At the initial population level in our study (about 64 mites/leaflet) it would take two pesticide applications to manage the mites whereas, only one release of *P. persimilis* at a ratio of 1:12 can keep the pest under check without any extra expense and environmental pollution.

الملخص

شاهين هالة وستيليوس ميشيلاكس ومحمد اسلام. 1992. مقارنة بين بعض مبيدات العناكب والمفترس *Phytoseiulus persimilis* لمكافحة *Tetranychus urticae* على الفاصولياء. مجلة وقاية النبات العربية. 10 (1) : 22-24

تم في احد البيوت البلاستيكية تقويم مبيد سافونا بمعدل 10 مل/500 مل ماء، ومبيد بنتاك بمعدل 0.625 مل/500 مل ماء والمفترس *Phytoseiulus persimils* بمعدل 12/1 مفترس/حيوان لمكافحة العنكبوت *Tetranychus urticae* عند

كثافة مجتمع وسطي قدرها 47-65 عنكبوت/وريقة فاصولياء. أوضحت النتائج ان مبيد بنتاك كان أعلى كفاءة في تخفيض مجتمعات العنكبوت حتى بعد تسعة أيام من استخدامه تلاه المفترس ثم معاملة السافونا. وقد بدأت مجتمعات العنكبوت بالتزايد بعد اليوم التاسع، ووصلت بعد شهر إلى اثني عشر ضعفاً في معاملة السافونا وإلى ستة اضعاف في معاملة البنتاك؛ بينما تضاعفت فقط في معاملة المفترس خلال شهر واحد. ويعتقد ان القيام بإطلاق المفترس مرة واحدة قد يحقق مكافحة فعالة للعنكبوت، بينما يحتاج استخدام المبيدات الكيميائية الى الرش مرتين لإدارة الآفة بشكل فعال.

كلمات مفتاحية: مكافحة احيائية، مكافحة كيميائية، *Tetranychus urticae*.

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