

Behavior of Adult of the Potato Tuber Moth (*Scrobipalopsis solanivora*) on Potatoes and Chemical Control in Guatemala

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Abstract

Experiments were carried out in a greenhouse at ICTA-Chimaltenango and in a farmer's potato field at Quetzaltenango, Guatemala to develop a method of control of the insect. The insect oviposits eggs mainly on the soil surface of the pots with potatoes. In the present experiment, it was observed that the insect adults did not require stems and leaves of potato to oviposit eggs on the soil surface in contrast to a previous assumption based on the prolonged longevity of the insect adults. In a greenhouse, several insecticides were sprayed on stems and leaves of potato in a flower pot, and then the insect adults were inoculated. It was assumed that the insects were affected by the application of two insecticides, syfrutrin and methyl parathion, since longevity of the insect adults inoculated on potatoes became short and the damage of potato tubers caused by hatched larvae from eggs was remarkably reduced. Five applications at about one week interval of a pyrethroid insecticide, 0.05% syfrutrin solution to potatoes, reduced remarkably the damage of potato tubers caused by the insect.

Discipline: Insect pest

Additional key words: adult longevity, egg-laying sites, insecticidal control

Introduction

The potato tuber moth (*Scrobipalopsis solanivora*) was detected in Costa Rica in 1970 and at present it is spreading throughout Central America, Panama, Venezuela and Colombia, etc. Presently, the control of the insect in farmers' potato fields is not satisfactory.

It is known that the insect oviposits eggs mainly on the soil surface of the pots with pota-

toes and hatched larvae from eggs injure the potato tuber in soil. Therefore, it is difficult to kill the larvae by spraying some insecticides. However, if the insect adults could be observed occasionally on the stems and leaves of potatoes, they may be killed by the spraying of insecticides on the stems and leaves of potatoes.

Experiments were conducted from May 1991 until June 1992 to analyze the behavior of the insect adults and to evaluate the pesticidal effect of chemicals sprayed on potato plants. This

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report deals with data obtained in these experiments.

1) Egg-laying sites by the insect adults

(1) Methods

The insect adults were multiplied on potato tubers under dark conditions in the laboratory.

Experiments were conducted in a greenhouse by using potatoes cultivated in flower pots. Potatoes were used when they reached the flowering stage. Potatoes in a flower pot were taken into an insect rearing box (40 × 40 × 50 cm) with an insect net on 4 walls, and 5 pairs of insect adults were introduced into this box. The stems and leaves were cut at 14–15 days after the insect adults had been inoculated on the potatoes, and then the number of eggs on the stems and leaves were counted by using a magnifying glass. Furthermore, the damage of tubers caused by hatched larvae from the eggs on the soil surface was examined at 38–42 days after the insect adults were inoculated on the potatoes.

(2) Results

The results obtained in experiments repeated twice are shown in Table 1. The 8.7 and 7.0 insect eggs per plant were detected on the stems and leaves of potatoes, respectively for the 5 pairs of insect adults.

Leal²⁾ recorded an average number of 169 eggs oviposited on paper by one female adult in the laboratory while Casados¹⁾ recorded an average number of 23.0 eggs in the laboratory

and 28.0 in a greenhouse, respectively.

The small number of eggs on the stems and leaves of potatoes in the present experiment was attributed to the fact that most of the eggs were oviposited on the soil surface of the pots with potatoes. Although in the present experiment it was impossible to count the insect eggs from the soil surface of the pots with potatoes, it appeared that many eggs were oviposited on the soil surface based on the heavy damage of potato tubers caused by hatched larvae from eggs on the soil surface of the pots with potatoes (Table 1).

2) Comparison of number of eggs oviposited between potatoes with or without stems and leaves

(1) Methods

Experiments were conducted in a greenhouse by using potatoes cultivated in flower pots. In some of the potatoes the stems were cut (potatoes without stems and leaves). Other procedures are indicates in Table 2.

(2) Results

Results obtained in the experiments repeated twice are shown in Table 2. There was no difference in the percentage of tuber damage induced by the inoculated adults between potatoes with or without stems and leaves.

Before the experiments, it was assumed that the insect adults would not select potatoes without stems and leaves to oviposit eggs on the soil surface. However, no difference in the

Table 1. Number of eggs oviposited on the stems and leaves of potatoes after inoculation of the insect adults, and percentage of tuber injury caused by hatched larvae from eggs on the soil surface of the pots with potatoes

Inoculation date of 5 pairs of adults per plant	Number of eggs detected on the stems and leaves per plant ^{a)}	Percentage of tuber injury per plant ^{a)} (%)
June 14, 1991	8.7	100 (10) ^{b)}
Feb. 10, 1992	7.0	100 (21)

a): Average of 3 plants.

b): Numbers in parentheses indicate no. of observed tubers.

Table 2. Comparison of percentage of tuber injury caused by the insect adults inoculated on 2 potatoes in a flower pot; one with stems and leaves, the other without stems and leaves

Inoculation date of the insect adults	Method	Percentage of tuber injury at 38–42 days after the insect adults were inoculated ^{a)} (%)	
		With stems and leaves	Without stems and leaves
Nov. 10, 1991	2 potatoes in flower pots were taken into an insect rearing box, and then 5 pairs of insect adults were introduced into the box.	70.8	88.9
Jan. 15, 1992	6 potatoes in flower pots were taken into a mosquito net, and then 80 pairs of insect adults were introduced into this net.	91.0	100.0

a): Average of 3 plants.

insect adult preference for the oviposition of eggs on the soil surface was observed between potatoes with or without stems and leaves.

3) Comparison of the longevity of insect adults between potatoes with or without stems and leaves

(1) Methods

Experiments were carried out in a greenhouse by using potatoes cultivated in flower pots. Potatoes were taken into an insect rearing box, and 5 pairs of insect adults were introduced into this box. Survivorship of the insect adults at 14–15 days after inoculation on the potatoes was determined.

(2) Results

Results obtained in experiments repeated 3 times are shown in Fig. 1. Average survivorship of adults on potatoes with stems and leaves was about 63%, while that of adults on potatoes without stems and leaves was about 23%.

It was thus demonstrated that the insect adults survived longer on potatoes with stems and leaves than on potatoes without them.

4) Evaluation of effect of a pyrethroid insecticide, *syfrutrin* on the insect in a greenhouse

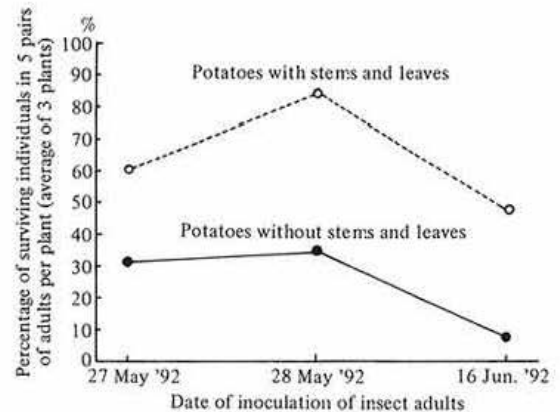


Fig. 1. Difference in longevity of inoculated insect adults on potatoes in flower pots between plants with and without stems and leaves in a greenhouse

(1) Methods

The insecticide was sprayed on the stems and leaves of potatoes cultivated in flower pots at the time of flowering. Then potatoes were taken in an insect rearing box, and 5 pairs of insect adults were introduced into this box. After about 20 days, the 5 pairs of adults were removed from the insect rearing box and their survivorship was determined. Later after about 20 days, the percentage of damage of potato

tubers caused by larvae was examined.

(2) Results

Results obtained in experiments repeated 12 times are shown in Fig. 2. It was assumed that the insects were affected by the insecticide applied on potatoes, since the longevity of the inoculated adults on the potatoes became shorter and the damage of potato tubers caused by the larvae was remarkably reduced.

5) Evaluation of effects of 3 other insecticides on the insect in a greenhouse

(1) Methods

Methods were the same as those used in the former experiment, but the determination of the longevity of the inoculated insect adults was omitted.

(2) Results

Effects of metamidofos, methomyl and methyl parathion were compared with that of syfrutrin. Results obtained in experiments repeated 3 times are shown in Fig. 3. Methyl

parathion reduced remarkably the damage of potato tubers caused by the insect while metamidofos reduced it slightly and methomyl did not affect it at all.

6) Insect control by spraying of syfrutrin on potatoes in a farmer's field

(1) Methods

An experiment was carried out in a field at Las Tapias Olinstepeque in Quetzaltenango. Potato variety used was an ICTA-381392.8 clone. Six hundred plants were planted in a field at the end of June in 1991.

A 0.005% solution of syfrutrin was sprayed on 300 plants 5 times at about 1 week intervals from August 27. The remaining 300 plants were not sprayed with the insecticide.

On October 30, tubers of 430 plants were harvested and carried to the laboratory of ICTA-Chimaltenango to examine the extent of the damage of potato tubers caused by the insect.

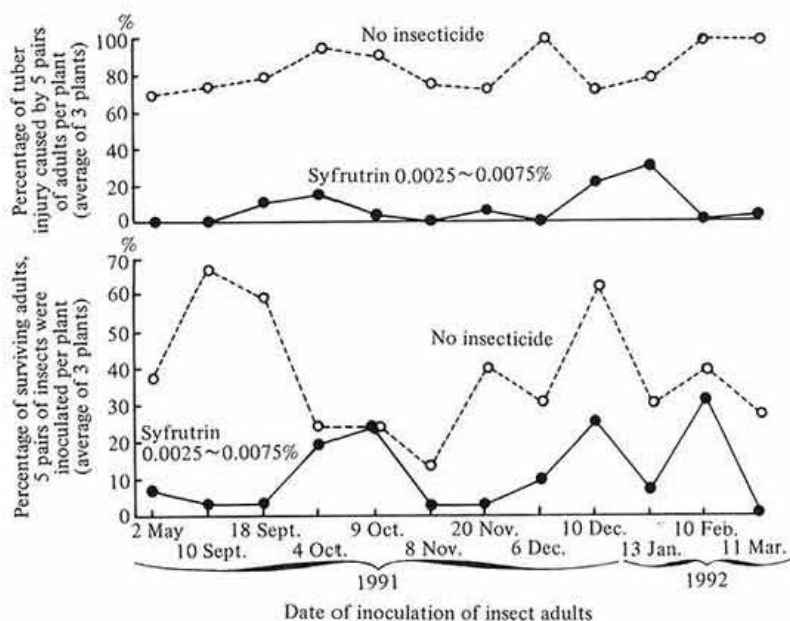


Fig. 2. Effect of syfrutrin spray on potatoes in flower pots on adult longevity and tuber damage caused by larvae of the insect in a greenhouse

(2) Results

Results obtained are shown in Table 3. The damage of potato tubers caused by the insect was remarkably reduced by the application of a 0.005% syfrutrin solution, five times.

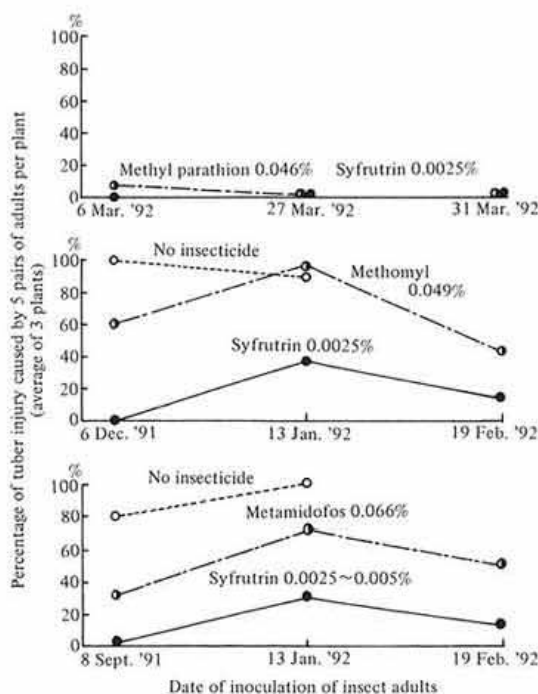


Fig. 3. Comparison of effect of 4 insecticides sprayed on potatoes in flower pots on tuber damage caused by inoculated insect adults in a greenhouse

Discussion

As mentioned previously, the authors did not anticipate that they would be able to control this insect on potatoes satisfactorily by using insecticides because the eggs were oviposited on the soil surface of the pots with potatoes and hatched larvae from eggs did not eat the stems and leaves of potatoes but only the tubers in the soil.

Nevertheless, it was observed that inoculated insect adults lost their mobility when a syfrutrin solution was sprayed on potatoes, and the longevity of these adults was shorter. On the other hand, it was observed that inoculated adults could not survive on potatoes sprayed with a methyl parathion solution.

In the present experiment, although it could not be demonstrated that the insect adults needed the stems and leaves of potatoes to oviposit eggs on the soil surface of the pots with potatoes, it was demonstrated that the insect adults survived longer on potatoes with stems and leaves than on potatoes without them.

It is considered that the insect adults move on the stems and leaves of potatoes to survive longer. Therefore, it is assumed that the insect adults can be killed if insecticides are sprayed on the stems and leaves of potatoes and it

Table 3. Control of insects by spraying of syfrutrin on potatoes in a farmer's field

Treatment	Percentage of injured plants (%)	Percentage of injured tubers (%)
5 Applications of 0.005% syfrutrin solution	20.5 (220) ^{a)}	2.1 (2,684) ^{b)}
No application	51.9 (210)	17.5 (1,467)

1st application: Aug. 27, 1991, 2nd application: Sept. 3, 1991, 3rd application: Sept. 12, 1991, 4th application: Sept. 19, 1991, 5th application: Sept. 26, 1991.

a): Numbers in parentheses indicate no. of observed plants.

b): Numbers in parentheses indicate no. of observed tubers.

appears that spraying of insecticides such as syfrutrin or methyl parathion may be effective in the control of the insects on potatoes.

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Algunos Hábitos del Adulto de la Polilla de la Papa (*Scrobipalopsis solanivora*), y su Control Químico

Resumen

Los experimentos fueron hechos en el año de crecimiento 91/92, usando las papas cultivadas en las macetas puestas en un invernadero del ICTA-Chimaltango, y así también las papas cultivadas en el campo, por agricultor de Quetzaltenango, Guatemala. El adulto de la polilla puso pocos huevos sobre el tallo y la hoja de la papa cultivada en la maceta. Así también se hizo la prueba de una maceta de la papa con tallos y hojas y otra sin tallos y hojas. Resultó que el adulto de la polilla puso bastantes huevos, casi las mismas cantidades en la tierra de las ambas macetas. O sea que este adulto para poner sus huevos no necesitó los tallos y las hojas, sin embargo este adulto vivió más tiempo en la maceta con tallos y hojas. Por lo tanto para vivir más tiempo este adulto necesitó los tallos y las hojas de la papa. En el invernadero, sobre los tallos y las hojas de la papa, se esparció un insecticida "syfrutrin (Baytroid)", la vida del adulto se acortó, y así también se disminuyó considerablemente el número de los tubérculos dañados por este insecto. El efecto del insecticida "methyl parathion (Folidol)", contra este insecto, fue también positivo. Esparciendo syfrutrin al 0.005%, 5 veces sobre la papa del campo, se disminuyó considerablemente el número de los tubérculos dañados por este insecto.