MEMORIA
DE LA
28ª REUNION ANUAL

Agosto 9-15, 1992
Santo Domingo, República Dominicana

Publicado por:

Sociedad Caribeña de Cultivos Alimenticios y
Fundación de Desarrollo Agropecuario

Santo Domingo, República Dominicana

FUNDACION
DE DESARROLLO
AGROPECUARIO, INC.

THE *Bemisia tabaci* PROBLEM IN MARTINIQUE

P. Ryckewaert
CIRAD-CA B.P.427 Fort de France MARTINIQUE (F.W.I.)

ABSTRACT

Since 1990, vegetable crops in Martinique have suffered severe problems caused by the rapid multiplication of the whitefly *Bemisia tabaci* (Gennadius) (Hemiptera, Aleyrodidae). The same phenomenon is found throughout the Caribbean and into the South of United States, and seems to be linked to the existence of a special form of this species, characterized by a low sensitivity to most insecticides.

Damage is found on most vegetable crops, but mainly on those grown in greenhouses. No whitefly-transmitted virus has been found in Martinique.Chemical control is insufficient and only a few authorized products are somewhat effective: phosalone, bifenthrine, profenofos, endosulfan.

The existence of a parasite wasp of the Eretmocerus genus and of several predators makes it possible to consider natural biological control of Bemisia as part of integrated pest management. This method has given good results on *Thrips palmi* and we compared nearby plots under intensive chemical control or integrated pest management. Six trials on tomatoes in open field show a slight development of *B. tabaci* populations under integrated pest management, whilst rapid multiplication was found under chemical control. However, in greenhouse cultivation, the right balance is rarely found, and damages are present.

INTRODUCTION

The Sweet Potato Whitefly *Bemisia tabaci* (Gennadius) has been known in Martinique for many years, but there were no signs of damage until 1990. Since that time, numerous problems have appeared on most vegetable crops and in particular on those grown under cover; it is thought that the first rapid multiplications of this pest appeared in Florida in 1986. Thereafter the phenomenon reached the Greater Antilles. In 1990, *B. tabaci* appeared simultaneously in all the Lesser Antilles.

At the moment, ***Bemisia tabaci*** is a major problem throughout the Caribbean, reaching as far as the southern United States.

ECONOMIC IMPORTANCE

In Martinique, there are two types of damage : direct, through the sucking of sap and weakening of the plant ; and indirect, with the appearance of sooty mould on leaves and fruits. Up to now we have not found proof of the transmission of any virus, notably the Yellow Leaf Curl, on crops on the island.

Two particular symptoms appear on tomatoes, and on squash and zucchini. On tomatoes, the ripening of fruit is affected (tomato Irregular Ripening) ; on the other two crops, a silvering appears on the leaves (Squash Silverleaf) along with a weakening of the plants.

In both cases the symptoms disappear when the whiteflies are eliminated. It would seem that it is insect's saliva which causes theses reactions and not a pathogenic microorganism infected by Bemisia. Such phenomena have already been found in Florida.

Losses in production are essentially due to a reduction in the length of the harvest. The most significant losses are found in crops grown under cover, where environmental conditions favor the development of whitefly populations.

The most susceptible crops are tomatoes, eggplants, melons and cucumbers. Some moderately susceptible plants can be noted: cabbages, zucchini and and lettuce. Finally, some crops are barely affected: sweet peppers, hot peppers, beans, onions and cristophines (chocho).

CONTROLS AVAILABLE

- CHEMICAL CONTROL

Among the many insecticides tested against ***B. tabaci***, only a few have shown any real effectiveness. We might mention bifenthrine (shock effect on adults), phosalone (on larvae and adults), profenofos and endosulfan. The bifenthrine profenofos mixture causes a high death rate of larvae and adults. The two active ingredients seem to act in synergy. Finally, imida-

chlopride, a new active ingredient that has not yet been authorized, has given excellent results against *B. tabaci*.

It is worth noting that in Europe, buprofenzine (APPLAUD) works very well against larvae, whereas it has no effect in Martinique. Conversely, phosalone is not effective in Africa. This suggests the existence of a particular population of *B. tabaci* (a biotype) specific to the region.

- NATURAL BIOLOGICAL CONTROL

Two years ago, we found the presence of a microhymenoptera parasite of the Eretmocerus genus associated with *B. tabaci*. Since then, we have confirmed the presence of this wasp in other Lesser Antilles islands.

A predator has been found - the Orius insidiosus bug - which is also one of the principal enemies of *Thrips palmi*. Other predators are undoubtedly effective. Under cover, in conditions of high humidity, an entomopathogenic fungus appears which kills the adults and fixes them to the leaves before covering them with a white felting.

- PHYSICAL CONTROL

Whiteflies are generaly attracted by the color yellow and in certain cases (nurseries, greenhouses) it is possible to use sticky yellow panels to trap the adults. Under our conditions, this method has proved to be insufficient to protect the crops, in additon to which there are practical and cost related problems.

Nevertheless, we do use some small sticky yellow panels or labels (of about 10 cm by 10cm) in order to assess the number of adults on test plots. This method is as valuable in open fields as it is in the greenhouse and makes it possible to seen population variations over time.

Another method of protection consists of using woven insect-proof nets. The nets give adequate protection to nursery plants and young low growing crops (notably cucurbits). During a trial on a zucchini plot, part of which was covered by a net, we did not find a single symptom of silver leaf on the covered part during the initial blooming stage, while the other plants were clearly affected. However, the net has to be removed at the beginning of the actual blossoming to allow pollination of the flowers by the insects.

A third possibility consists of removing the leaves from the base of a tomato crop in order to eliminate the unhatched larvae and pupae of the whitefly. In a greenhouse trial using 2 isolated compartments, one of which had plants whose leaves were removed 4 times before harvesting, we observed the increase in the whitefly populations (Diagram 1).

Overall, we found a slightly larger quantity of whiteflies where the leaves had not been removed, but the difference was not significant, at least not in such conditions of low infestation.

A NEW APPROACH: THE INTEGRATED PEST MANAGEMENT

Chemical control does not solve the problems caused by ***Bemisia tabaci*** in any effective, long-lasting way. On addition, we are well aware of the disadvantages resulting from the excessive use of insecticides : pollution, residues in the parts eaten, various toxic effects, the risk that whiteflies or other pests may become resistant, the destruction of useful wildlife, the increase in other pest populations and the high cost of successive treatments.

The experiments done by CIRAD in Martinique since 1988 on ***Thrips palmi*** have shown that integrated pest management is necessary, based on three fundamental principles :

1) Respecting prophylatic measures : isolating the plot, nurseries and new plot not being downwind of previous crops, the removal of crops after the final harvest, good agronomic practices, etc..

2) Biological control. Under our conditions, this means just using the predators and parasites present in the environment. This is only possible so long as chemical control does not affect them too much. Consequently, reasoned chemical control is necessary.

3) Reasoned chemical control. First of all, the most pest-specific pesticide possible must be chosen which does not harm auxiliary arthropods. The insecticides usable in Martinique are given in Table 1. Most fungicides are compatible with biological control.

Subsequently, it is necessary to decide on the moment of spraying. You treat either when the pest appears, or when a certain threshold for a given

pest and plant is reached. For example, you can start a treatment against leaf miners from a fixed threshold, based on initial observations, of 3 mines per leaf on melons. Nevertheless, other pests or diseases endemic to a given region have to be treated systematically (timetable to be defined), alternately using several products.

Integrated pest management has to take into consideration all the phytosanitary aspects of a crop, and the fight against *B. tabaci* should not be separated from that against other pests. In this methodology, we are not looking to eradicate a pest, but rather to maintain its population at a hard less level.

Over the last two years, we have carried out a certain number of trials of crops under integrated pest management as compared with crops treated in the usual way (intensive chemical control). Thus, in 1991 we began 6 trials on tomatoes in the field. Each of these covered 2 plots, one under intensive chemical control, and the other under raisoned chemical control.

On the second plot, no treatment was done against *B. tabaci* because the effective products are not compatible with biological control. Only the predators and parasites regulated the whitefly population. The increase in the whitefly population during the course of the trial is shown in Diagram 2. In this trial, as with the 5 others, the whitefly populations were always less, and sometimes considerably less, on the plots under reasoned chemical control, showing the greater effectiveness of natural biological control in relation to classic pesticides.

At the time of harvest, we noted from the trials a 60% parasitism rate of *B. tabaci* larvae by Eretmocerus under reasoned chemical management and of 1% on the other plot. The number and the cost of the treatments were clearly lower under reasoned management.

Other trials were carried out successfully against Bemisia on other open field crops. Regarding crops under cover, and in particular hydroponic ones, the results have not always been positive and some rapid multiplications of the pest have been found.

Several hypotheses can explain the rapid development of whitefly populations in greenhouses : favorable climatic conditions (temperature, humidity, lack of rain), nutritive quality of the sap,. ..

CONCLUSIONS

Integrated management seems to us to be the only lasting way of limiting *B. tabaci* populations, provided that the other pests are maintained at a level where they will not cause damage.

It is therefore necessary to define complete programs of reasoned chemical control for each crop in a given region.

In the near future, it seems timely to us to introduce new species of parasites or predators against *B. tabaci* and other pests in order to reinforce natural biological control.

TABLE 1: LIST OF INSECTICIDES-MITICIDES UTILIZABLE IN IPM PROGRAMS ON VEGETABLES

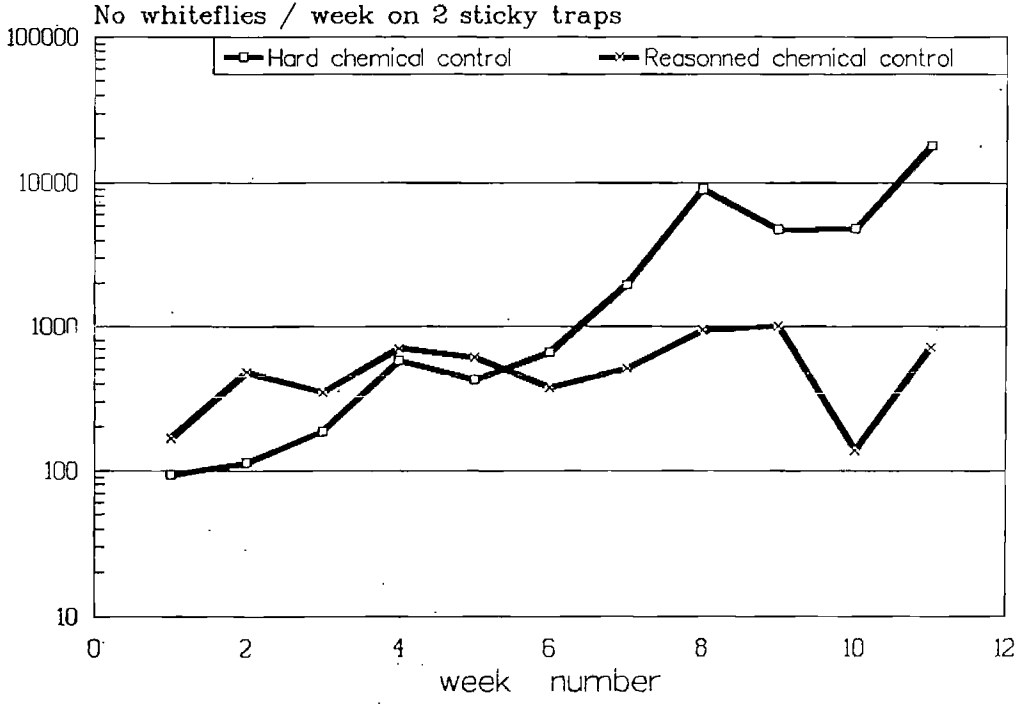
PEST	ACTIVE INGREDIENTS	NOTES
Thrips palmi	Oxamyl carbofuran	Spraying in the soil before planting
Aleurotrachellus trachoides (whitefly	Buprofenzine* Dichlorvos	don't repeat
Leaf miners	Cyromazine* Abamectine	don't repeat
Caterpilars, worms	Bacilus thuringiensis Teflubenzuron* Diflubenzuron* Trichlorfon	don't repeat
Aphids	Pyrimicarbe Ethiophencarbe Heptenophos	don't repeat
Beetles, Bugs	Dichlorvos Heptenophos Trichlorfon	don't repeat
Scales, Mealbugs	Buprofenzine* Methidathion	only focused
Leafhoppers	Buprofenzine*	
Mites	Fenbutatin oxyde Azocyclotin Bromopropylate Dicofol Tetradifon Cyhexatin Hexythiazox* Clofentezine* abamectine	don't repeat

*: Insect Growth Regulator

Don't repeat: because this chemical kills some beneficials insects or mmites (predators, parasites and pollinators)

TRIAL OF IPM PROGRAM ON TOMATO IN OPENFIELD

DIAGRAM 2 : EVOLUTION OF POPULATION OF WHITEFLIES



TRIAL OF LEAF-THINNING ON TOMATO UNDER COVER

DIAGRAM 1 : EVOLUTION OF NUMBER OF WHITEFLIES ON YELLOW STICKY TRAPS